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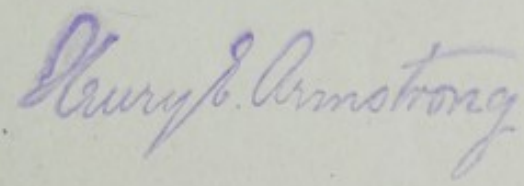
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REPORT

ON THE

CHOLERA EPIDEMIC

OF

1866

IN

ENGLAND.

SUPPLEMENT TO THE TWENTY-NINTH ANNUAL REPORT OF THE REGISTRAR-GENERAL OF BIRTHS, DEATHS, AND MARRIAGES IN ENGLAND.

Presented to both Houses of Parliament by Command of Her Majesty.



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TO THE REGISTRAR GENERAL.

SIR,

I HAVE the honour to submit to you the Report on the recent Cholera Epidemic in England.

In the text I have endeavoured to embody the chief facts and results of previous observations.

The Appendix contains in a series of tables and notes a view of the topographical distribution of the disease, and many facts of interest supplied by health officers in the towns and other medical men in the provinces.

The Reports for the epidemic weeks have been reprinted as the first impressions were exhausted. They can thus be read chronologically, and, presenting things as they appeared at the time, form a partial journal of the plague, and may be useful at future times. They comprise two of Professor Frankland's valuable reports and an interesting series of accounts of the sanitary proceedings in each district by the health officers of London. I have added an account of the proceedings at this office.

The returns of the water supply of London by the companies and of the water supply of Paris, that other great city, will be studied with interest. The information that has been obtained respecting the water supply of Rome is still imperfect. One of the great lessons we have learnt from the epidemic is the importance of a pure water supply.

I have great pleasure in calling your attention to the services of Mr. Knight during the epidemic. Mr. F. J. Williams has calculated and skilfully compiled many of the tables in the Appendix. To Mr. James Lewis I am indebted for much valuable assistance in editing this volume, to which he has prepared an excellent analytical index.

I have the honour to be,
Sir,
Your very faithful Servant,
W. FARR.

General Register Office,
Somerset House, July 25, 1868.

REPORT

ON THE

CHOLERA EPIDEMIC IN ENGLAND,

BY

WILLIAM FARR, M.D., F.R.S.

Asiatic cholera has visited England four times. It first appeared in October 1831, and in that and in the following year was fatal in many parts of the kingdom. Many thousands of the people were attacked, and many thousands perished of this new disease. The numbers are unknown, as no registration of the causes of death then existed. In the United Kingdom the deaths of 52,547 persons were reported through various channels to the Board of Health. The disease created consternation; and although it was observed closely, and combated by the most active remedies, little progress was made in the discovery of causes.

Its causes were indeed supposed to be enveloped in inscrutable mystery, and to be above human control. No comet was at hand to account for the phenomena, and there was only a whisper of telluric and meteoric influences on the Continent. "The cholera," said the Annual Register for 1832, "left medical men "as it had found them,—confirmed in most opposite opinions, or in total ignorance "as to its nature, its cure, and the causes of its origin, if endemic,—or the "mode of transmission, if it were infectious." Thus English history is written.

Now the disease was well described by the Board of Health; its pathology was studied, and the effect of a variety of remedies was to some extent tested. Great care was bestowed upon the sufferers, for whom hospitals and provisions of various kinds were made. The facts were published as far as they were known. And although it was a time of great political excitement, and a year of election riots, the people nowhere in England entertained the dreadful suspicions of occult poisoning which excited the populace to madness and to murder, not only in Hungary, but in Paris.*

And furthermore, an important discovery was made in 1832. It was found that the cholera in its worst forms was preceded by diarrhœa; and that this diarrhœa was in some cases a mild form, in others a first stage of the disease. Now, to arrest this diarrhœa is to prevent cholera, as to extinguish a spark is to prevent a conflagration. It is true that perhaps ninety cases out of a hundred of epidemic diarrhœa left to themselves go no further, but it is equally true that the ten residual cases turn into cholera if they are not treated in the first stage; and the fact that one of the ten, even with treatment, turns into cholera, does not invalidate the practice.

Sir Thomas Watson, at King's College, delivered in his lectures, with his usual lucidity, the lesson of 1832, and discussed the qualifications of the doctrine.†

"The epidemic cholera [in 1832] made its attack in two different modes. In one it seized upon the patient suddenly, and without warning; this was comparatively rare. Much more commonly the specific symptoms were preceded for some little time, even for some days perhaps, by diarrhœa; and this I take to be the most important practical fact that was ascertained during its prevalence among us. When the disease was once fairly formed medicine had very little power over it; but in the preliminary stage of diarrhœa it was easily manageable. Unfortunately people are inclined (especially those classes of the community among whom the cholera most raged) to regard a loose state of the bowels as salutary, and to make no complaint of it, and to do nothing for it; or, in other cases, they conceive it to proceed from some peccant matter within, which requires to be carried off, and they take purgative medicines to get rid of it. Both of these are serious and often fatal mistakes. Mere neglect of the diarrhœa frequently permitted it to run into well-marked and uncontrollable cholera; and the employment of purgatives hastened or insured that catastrophe.

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* Annual Register, 1832. History, page 306.

† These Lectures were first delivered in the Medical Session 1836–7, and afterwards appeared in the London Medical Gazette. They were revised and separately published in 1843. The quotation is taken from the fourth edition ["Principles and Practice of Physic." 4th Ed., 1857, Vol. 2., p. 526–7] of the Lectures, but it is an exact reproduction of the passage as printed in the number of the London Medical Gazette for April 15th, 1842.

The proper plan of proceeding, I am convinced, was to arrest the diarrhœa as soon as possible after its commencement by astringents, aromatics, and opiates. You may object, perhaps, that the cases that were cured in this way were not cases of cholera at all, and never would have been, but simply ordinary diarrhœa. It is impossible to *prove* the contrary, no doubt; but the presumption is strong that the diarrhœa would in many, and, perhaps, in most instances, have run on, if not checked, into the more perilous form of the disease. In many places when, taught by experience, the authorities established *diarrhœa dispensaries*, to which those attacked by looseness of the bowels were warned and invited to apply, that the looseness might forthwith be corrected; in many such places the cholera, which had before been cutting off the inhabitants by scores and by hundreds, began instantly to decline in frequency. I venture to advise you, supposing the disease should reappear, or whenever in the autumn a suspicion arises that this form of cholera is present in the community, not to try, in cases of diarrhœa, to carry off the presumed offending matter, but to quiet the irritation and to stop the flux as soon as you can."

The practical importance of the discovery was well established in 1849 and in 1854; it led to the system of house-to-house visitation, which has a striking effect in limiting the fatality of the epidemic by restraining the disease in numberless instances from proceeding to extremities.

Both in pathology and in therapeutics it is of the utmost importance to learn whether algid cholera is in any case preceded by diarrhœa; in India it is asserted such cases are frequent, and in England, according to some observers, they are not uncommon. Dr. Macloughlin holds that every case of cholera is preceded by diarrhœa. Experience is deceptive, as Hippocrates tells us, and good observers are rare. I am inclined to believe that the evidence in respect of alleged cases not preceded for some hours by loose discharges is exceedingly imperfect. Dr. Sutton gives a table of 127 cases of cholera, in 85 of which the diarrhœa commenced less than 24 hours=one day, before "violent vomiting, purging, and cramps" set in. In 8 cases the diarrhœa preceded cholera by one and under two days; in 12, by 2—3 days; in 6, by 3—4 days; in 5, by 4—7 days; in 5, by 1 and under 9 weeks. In *one* case the number of days is not given; in *five* Dr. Sutton leaves us to suppose that he detected no diarrhœa preceding cramp and vomiting. He cites two cases which at once illustrate his views, and enable the reader to reconsider his judgments.* The importance of instant attention to the first symptoms in an epidemic season is evident.

The Board of Health consisted of Lord Ashley (now the Earl of Shaftesbury), Mr. Chadwick, and Dr. Southwood Smith in the years of the next epidemic (1848–49), who had associated with them at that time Dr. John Sutherland, as well as Mr. Grainger, a man of science, full of humanity, and of indefatigable industry, now, alas! no more. This Board rendered great services to the country in various ways; but in none more, perhaps, than in insisting on the universal application of house-to-house visitation in infected districts, and in the firm expression of faith in the efficacy of preventive measures. They assert in their report, dated August 14th, 1850, that "the late extended experience has shed no light on the primary "or proximate cause of this pestilence . . .; that remains involved in the same "impenetrable mystery as ever." At the same time they affirm "that the disease "is not, in the common acceptation of the term, contagious, but spreads by an "atmospheric influence, its progress consisting of a succession of local outbreaks."†

The registration system had been in operation since the year 1837, and as the causes of death are recorded, the registers contained the particulars of every death. The facts were analyzed at this office, collected in tabular forms, and in every one of the sub-districts the deaths from cholera and diarrhœa were compared with the population. The tables were published, with illustrative diagrams, in a volume of nearly 500 pages. Some of the general results of this extensive analysis of the facts, involving the deaths of 53,293 of the English people by cholera, 18,887 by diarrhœa, out of 17,564,656 living in a great variety of circumstances, are thus briefly summed up in the second paragraph of my Report to you:—

"In following cholera through its fatal way, however, the inquirer meets with "some grounds of consolation. He sees places on every side which the epidemic

* Ninth Report of Med. Off. Privy Council: Paper by Dr. Sutton, pp. 369–371.

† The Report of Dr. Sutherland is dated April 24, 1850; that of Mr. Grainger, June 10, 1850. Both these Reports are full of valuable information collected in the large experience of the two observers.

"passed over, leaving the inhabitants in the serene enjoyment of health and "complete immunity. And the hope is, perhaps, not fallacious that an examin- "ation of the results of the second may be the means of mitigating if not "preventing a third invasion; for whatever may be the immediate cause of "cholera, it will appear evident that in England it is only seriously fatal under "certain known physical conditions, which admit to a great extent of remedy."

The various theories are discussed, the zymotic theory is developed, the cholera matter is named *cholerine*, and an account is given of the doctrine of diffusion by water. Passages of the Report are reprinted, pp. 288–294.*

The Report of the College of Physicians by Dr. Baly and Dr. Gull gave a critical history of the epidemic.

In 1854, Sir Benjamin Hall was the President of the Board of Health. He addressed a Report to Lord Palmerston, then Home Secretary. In a letter to his Medical Council the following paragraph occurs:—"Upon scientific matters "connected with the sanitary administration of the country, where the medical "profession are to be consulted, advised with, laid under contribution for service "or information, or called upon to act, I wish to have the aid of a medical "council, to whom I may submit questions for consideration, and whom I may "ask to suggest or undertake such inquiries as may from time to time be "necessary." By this institution the President of the Board took the justest steps to induce the heads of the medical profession, and men of science, to devote that attention to the study of the public health which its paramount importance demands. The Medical Council consisted of Dr. Paris, then President of the College of Physicians, Sir James Clark, Dr. Alderson, Dr. Arnott, Dr. Babington. Dr. Tweedie, Dr. Baly, Mr. Lawrence, Vice-President of the College of Surgeons, Mr. Simon, Mr. Richard Owen, Mr. Ward, Master of the Society of Apothecaries, Mr. Bacot, and myself: Dr. R. D. Thomson and Mr. Glaisher were appointed to conduct inquiries in the direction of chemistry and meteorology. Dr. Hassall applied the microscope to the investigation of the secretions and fluids of cholera patients, as well as to the examination of the air and the waters of London.

The special reports gave a fuller account of the proportional numbers of different forms of this disease, of the mortality of cases, of their duration, and of the effects of remedies, than had been given before. The report of the scientific committee showed that nearly all the Thames waters in use were foul, as the companies took them from the tidal part of the river, which had for some years been the receptacle of the sewers in communication with a large proportion of the waterclosets of London.† The waters contained impurities in variable proportions at different dates: on one day Dr. Thomson found 23, on another 73 grains of foreign matter in a gallon of water supplied by the Southwark company, then drawing its supply from the Thames at Battersea. The impurities in the waters of Lambeth, taken from the Thames above Teddington Lock, ranged from 12 to 18 grains by weight in two samples.‡ The final report of the scientific committee proved conclusively the extensive influence of water as a medium for the diffusion of the disease in its fatal forms. The zymotic theory was established, and Dr. Snow's view that the cholera-stuff was distributed in all its activity through water was confirmed. The special report of Dr. Fraser, T. Hughes, and Mr. Ludlow inculpated the Broad-street pump to some extent in the terrible outbreak of the St. James' district. But the subject was further and more conclusively investigated by a committee, aided by Dr. Snow and by the Rev. H. Whitehead.§

Thus, by the year 1866, from the observations of the three great plagues, we had learnt enough of the causation of cholera to justify us in believing that in London it could be confined within narrow limits,—in the first place, by preventing any

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* Report may be procured at Longmans.

† See page lvii.

‡ Report of the Scientific Committee, p. 42.

§ Report on Cholera in St. James's by a Committee, consisting of Dr. E. Lankester, *Chairman*; H. Bidgood; Dr. R. King; J. Marshall, *Reporter*; Rev. H. Whitehead; J. York, *Secretary*. Published by Churchill, 1855. The special Reports of Dr. Snow and Rev. H. Whitehead are printed in the Appendix. See also two papers by Rev. H. Whitehead in Macmillan's Magazine, December 1865 and July 1866.

extensive distribution of the cholera-stuff through water, as the companies, in compliance with the Water Act of 1852, had, it was believed, since 1854 carried out all their purifying filtering works; and in the second place, by the organization of Health Officers, who could secure attention to the early treatment of premonitory diarrhœa, and to the destruction by disinfectants of the cholera flux. How the actual facts turned out is shown in the Weekly Returns of the year, extracts from which are reprinted in the Appendix, pp. 295–302. Since those publications appeared four public inquiries have been instituted into the water supply of East London, and into other circumstances affecting the outbreak. The first inquiry was by the River Commission, over which Mr. Rawlinson presided; and here Mr. Greaves, the engineer of the East London Company, first admitted that the water of the open reservoirs had been distributed over the area supplied from Old Ford. At the instance of the inhabitants of East London, the Board of Trade instituted an inquiry, which was ably conducted by Captain Tyler, R.E., during a period extending from November 27th, 1866, to May 27th, 1867. And further evidence is supplied by Captain Tyler respecting the water of the East London reservoirs at Old Ford. The East London Company, in a very proper spirit, met the charge, and admitted their dangerous proximity to the Lea, by applying to Parliament for extensive powers to improve and augment their water by a large outlay of capital. And the Committee on the bill, under their chairman, Mr. Ayrton, the zealous member for the Tower Hamlets, also inquired into the operation of the Metropolis Water Act of 1852, and in an interesting report made some important practical recommendations.* All the London Water Companies were represented before the Committee by eminent counsel; and the cause of the East London Company was skilfully defended by Dr. Letheby, in the character of a scientific witness. The Royal Commission on Water Supply has taken evidence, but has not yet reported. The medical officer of the Privy Council has discussed the subject; and Mr. Radcliffe has conducted a careful independent inquiry into the causation of the explosion in East London. I refer to his report for a great many interesting details, and for an explanation or a confutation of some of the fallacies set afloat. This report, the report of the *Lancet* Commission, and some articles in the *Medical Times and Gazette*, should also be consulted.

Thus in the year that has followed the outbreak in East London the subject has been amply discussed under all its aspects. The waters of the Company, their reservoirs, their works, and their servants, have been examined before several tribunals; and it has all been done at leisure after the epidemic had subsided. But the Registrar-General had to speak in the midst of the tempest, and on his words at the moment the fate of the ship to some extent depended. "On the "recent outbreak of cholera in the east of London," says the Parliamentary Committee, "it was ascribed by the Registrar-General to the bad quality of the water "supplied by the East London Waterworks Company to a part of the east of "London." This was a serious charge; and the question was enshrouded in difficulties; but it will be evident that the elements of a judgment existed in the accumulated experience of the previous epidemics, in the known laws of the disease, and in the facts of the case looked at comprehensively. In a subsequent paper I have given in a narrative form an account of the steps taken at this office to unravel the mysteries of the catastrophe, in which four thousand five hundred persons perished in East London. It will be seen there how much valuable aid was given by Professor Frankland. I propose now, when the storm is over, and with all the ascertained facts before us, to describe briefly the epidemic in London, and to investigate the causes of its irregular diffusion. The lesson to be learnt is of deep interest to this country and to all nations.

I.—CHOLERA IN LONDON.

1. *Origin and Causes of the Disease.*

Asiatic cholera had hovered over Europe in the year 1865. In the autumn a few victims of the disease died in England. Epidemic cases then occurred both

* Report of Select Committee on East London Water Bills. Session of 1867.

in Portsmouth and in Southampton.* At Epping, in Esssex, the Groombridge family, the medical attendant, and a woman who laid out their servant, were killed by cholera in the last days of September and the first days of October. Nothing remarkable was observed in London until the year following, on Wednesday, July 11th, when five deaths by cholera occurred; on the 12th and on the two following days 11, 20, and 15 persons died. Life was then fiercely assailed by the disease in its quick form: the deaths ran up from 14 on Sunday to 105 on Saturday July 21st; on Tuesday July 31st the deaths were 191, on Wednesday 188, or including the deaths in West Ham and Stratford, 205; they then declined.

Proceeding in weeks from Sunday, July 1st, the deaths by cholera in the five weeks that ended on August 4th were 11, 63, 481, 1097, 1178. Then dividing London, including West Ham and Stratford, into two portions: in that supplied by seven water companies (Grand Junction, West Middlesex, Chelsea, Southwark, and Lambeth from the Thames, Kent from chalk wells, New River from wells and Lea River,) the deaths by cholera were 10, 25, 61, 142, 196; but in the sub-districts supplied wholly or partially by the East London Water Company the deaths in the contemporaneous five weeks were 1, 38, 420, 955, and 982. Thus in the first week the East London field had *one* death, the rest of London had *ten* deaths; in the fourth week the deaths were 142 in the rest of London, and in the East London field 955 deaths from cholera alone. Several of the earlier deaths by cholera in other districts happened to persons who had come or been sent from the East London field. Each death by cholera implied two attacks about two days before death. And for every attack by cholera there were about four attacks by diarrhœa, approaching more or less in character to cholera. As the epidemic rose so it declined more rapidly in the East than in the other regions of London.

The total deaths in London, with West Ham and Stratford, were 5973 by cholera, 3197 by diarrhœa (about 800 referable to the epidemic), 9170 by the two maladies. It will be observed in the tables that, although unquestionable cases of the disease occurred in every sub-district of London, and in some the number of deaths was not inconsiderable, the enormous disparity between the earlier ravages of the epidemic in the eastern water-field and the rest of London was never effaced.

I now proceed to consider the causes of the disparity, and to supply the induction to justify the charge which was made in the Weekly Return, with a view of stopping the plague at its source.

It may be stated first, simply as hypothesis, that the cholera is propagated epidemically by a material substance, analogous in its nature to the substances which produce, under given circumstances, small-pox, cow-pox, syphilis, erysipelas. This matter may be called *cholrine*,† for the same reasons as certain substances were designated sugar long before the chemical constitution of any kind of sugar had been determined, or before that substance had been obtained pure. Dr. Snow advanced the view in 1849 that the evacuations containing this matter, distributed by contact or through water, were the sole means of propagating the cholera; which, on the cellular theory, he held was propagated by cholera-cells. Dr. Richardson contends that the cholera-matter is an "alkaloidal organic poison, "which, soluble in water, but admitting of deposit on desiccation, passes easily "from one person to another under the agency" of certain peculiar physical states.‡ It is a fact well established in the practice of vaccination that the specific matter of cow-pox after insertion is developed into full activity day by day in the pustule, and then loses its qualities, so as no longer to take effect even under the most favourable conditions. In this respect the stuff is like an organism: it is produced by pre-existing forms out of other matter prepared for its reception; it is developed, produces its like, and decays. Brittain, Swayne, and Budd, indeed, held in 1849 that they had discovered the cause of cholera in a fungus§: Dr. Buchanan and

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* *See* Annual Report of 1865, p. 163.

† Registrar-General's 4th Annual Report, page 200; 1842. The matter of *dysentery* is there called *enterine*, of *cholera*, *cholerine*, which I now propose to write *cholrine*, to avoid any ambiguity.

‡ *See* Dr. Richardson on Theory of Propagation of Cholera.—Transactions of Epidemiological Society, Vol. II., Part II., page 432.

§ Report to Registrar-General, Cholera Epidemic, p. lxxvi.

Mr. Simon, the medical officer of the Privy Council,* have given an interesting account of recent researches in this direction by Hallier, pointing to the action of urocystis, and by Pacini to vibrional molecules in the intestinal canal, as its specific exciter.

Pettenkofer, who first drew attention to the sanitary importance of the subsoil water line (*Grundwasser*), which rises and falls more or less in different years, showed that in Germany the localities which have their water-line nearest to the surface had suffered most from cholera; and that the epidemic coincided with the rise and subsidence of the water in the soil.† Cholera in Bavaria, he says, prevailed epidemically only in places having a porous soil, with water never more than from five to fifty feet below the surface. It should be borne in mind that in many of these Bavarian towns water is drawn from wells by pumps or otherwise. The excretions of cholera patients give the germ, the soil develops it, says Pettenkofer. This is founded partly upon the interesting experiments of Thiersch, which have been repeated by Dr. Saunderson, who has shown conclusively that paper saturated in cholera flux, and dried, when eaten produces the disease in a transmissible form in mice. The fresh flux the first day after exposure in the air is almost inert, on the second day it grows more active, on the third it is at its maximum of activity, is less and less active on the fourth and fifth, inert on the sixth day of transformation. Of 148 mice experimented on, 95 showed no symptoms, 53 were affected, 31 died. The successful experiments were made between 9th September and 10th October, when the mean temperature was 56°; a second series between 3d and 13th November, when the mean temperature was 49°, failed.‡

This is thus far confirmatory of the hypothesis that the epidemic is propagated by cholera matter, which it may be said is not very well characterized by the stereotyped words "rice-water evacuations." In its pure form, after agitation, the cholera flux has the appearance of thin cream, from which flocculent matter subsides after the lapse of some hours, leaving a supernatant milky liquid. *One* volume was mingled for me by Professor Frankland with *ten* volumes of distilled water in a long glass tube: the flocculi subsided much more readily, leaving an opalescent liquid above. *One volume* to *one hundred volumes* of water in a long tube presented the same appearances, but in a less marked degree. Mixed in 500 volumes of water the opalescence was retained after the liquid had been passed through filter paper. Opalescence is a characteristic feature of the *cholrine*, even as it exists in a liquor holding less oxidizable organic matter than the filtered London waters; and in these minute quantities it cannot at present be detected by chemical analysis. If the matter is organized it is necessarily suspended in water and cannot be in solution. §

Numerous facts prove that cholera is communicated to a certain proportion of the women washing the clothes of cholera patients; and I showed that the parts of London near the warm infected Thames suffered in an unusual degree during the epidemic of 1849; ‖ hence it is not improbable that *cholrine* is to some extent carried up from warm liquids by watery vapour.

The cholera matter is often yielded by children, and even by adults, suffering from diarrhœa, and not afflicted by the characteristic symptoms of Asiatic cholera. ¶ This property it has in common with scarlatina, syphilis, small-pox, and other zymotic diseases, where the mildest types communicate to other bodies diseases in their most malignant forms.

The cholera flux is of low specific gravity (1008), and thus poured on the

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* Ninth Report of Medical Officer of Privy Council.

† A clear account of Pettenkofer's doctrine is given by Dr. Weber in Transactions of Epidemiological Society, Vol. II., Part II., page 404. *See also* Letter from Professor Pettenkofer in Appendix, p. 280.

‡ Ninth Report of Medical Officer of Privy Council, page 452.

§ *See* Professor Frankland's interesting account of cholera flux. I procured this matter for the sake of studying its comportment when mixed with water in glass tubes. The liquids in the hot weather have undergone little change since the tubes were sealed, 26th October 1866, except that the cholera liquid is browner, and that the flocculent matter in the hot weather rose to the top of the water in the tube containing one-tenth of cholrine. 11th September 1867.

‖ Cholera Report, pp. lviii–lxi.

¶ Virchow's Handbuch der Speciellen Pathologie und Therapie, 2 Band, 2 Abth., page 332. The article of Griesenger on Cholera gives all the German learning in a well-digested form.

surface of water sinks very slowly;* but in the end it gradually falls towards the bottom of the vessel, leaving slight traces in the upper stratum, and containing increasing quantities as the bottom is approached. It is important to bear this physical property in mind. For cholera flux dropping on the surface of the Broad-street well would be pumped up in proportions varying with their stage of descent, and on falling to the bottom might leave the upper water clear. I mention this simply by way of illustrating the effect of the purely physical properties of the cholera flux on the doses of it in the same quantity of water at different hours of the day, or of successive days. For the same reason the waters of contaminated reservoirs vary in zymotic strength from hour to hour.

It may appear at first sight impossible that the cholera flux of one or more patients should produce any effects in the waters of a river like the Thames. But living molecules endowed with the powers of endless multiplication are inconceivably minute, and may be counted by millions in a drop of water. Pacini, an excellent microscopic observer, has found that the germs of vibrions (*molecule vibrionali*) are less than $\frac{1}{25000}$ of an inch in diameter†; and placed in immediate juxtaposition a cubic inch would contain $(25000)^3 = 15{,}625{,}000{,}000{,}000$ germs. Allowing for interspaces, it is evident that a cubic inch might hold millions of cholera particles, and one cholera patient might disseminate in water millions of millions of zymotic molecules. A litre of blood contains, according to the determinations of Vierordt, 5069 *millions* of corpuscles.‡ The water of a city is less in bulk than its atmosphere; and disease-molecules, if freely distributed through both elements, will be rarer in air than in water. If we judge from analogy, a certain quantity of the cholera matter is necessary to render its effect at all probable; as germs of disease are as profusely expended by nature as seeds of plants. §

The infection-power of cholera liquid is essentially transitory: it is developed in given circumstances in its intenser form, and in a community as well as in an individual,—in India as well as in England,—it grows as well as declines by a law of its own: it is epidemic only for a time and by periods of years. It has its seed-time and its harvest in each locality; and the air or the water which on one day is poisonous may a few days afterwards be harmless. There is thus an essential difference between zymotic venom and a metallic poison like arsenic.

In its weakest form *cholrine* produces diarrhœa in a great number of persons; but in every population a large number of people appear to resist its influence. They are insusceptible. The cases of attacks of the same person twice in this as in some other zymotic diseases are rare.

2. *Localization of Cholera in East London.*

We may now discuss the question of the unequal diffusion of cholera over London in the last epidemic. It may be assumed that the cholera in its Asiatic form was brought into England in 1866; and the argument will not be affected if the first cases originated on the banks of the Lea, and not on the shores of the Ganges. It may be further taken as proved that it is propagated by the cholera flux; and let

* *Rice-water Evacuations.*—Cholera flux is of low specific gravity: taking pure water as 1000, it is given by Dr. Robert D. Thomson as 1008; that of blood serum being 1028 in the healthy, while in two cholera cases it was 1042 and 1058 respectively. The most abundant matters present are flocculent bodies, which impart the characteristic aspect to the fluid. Dr. Hassall says this liquor, after being set aside for some time, let fall a deposit varying from a fourth to a sixth of its bulk, consisting, as seen under the microscope, of innumerable mucous corpuscles, globules of oil, and myriads of vibrions in every drop of every sample of rice water examined.—*Appendix to Report of the Committee for Scientific Inquiries on the Cholera Epidemic of* 1854, pp. 285–293.

† Appendix to 9th Report of Medical Officer of Privy Council, page 519; Pacini, Sulla Causa Specifica del Col. Asiatic, 1865; and the work Della Natura del Col. As., 1866.

‡ Carpenter's Physiology, 6th Edition, page 155.

§ "Newport adds the important fact, established by numerous experiments, that when a very small number of spermatozoa are applied to the ova of Batrachians, they are only partially impregnated and the embryo is never fully developed . . . . . With respect to plants nearly the same results were obtained by Kölreuter and Gärtner. This last careful observer found, after making successive trials on a malva with more and more pollen-grains, that even thirty grains did not fertilize a single seed; but when forty grains were applied to the stigma a few seeds of small size were formed. The pollen grains of mirabilis are extraordinarily large, and the ovarium

those who doubt this accept the principle for the moment as hypothesis, which the subsequent crucial facts will at once either establish or dispel.

Then the elements of the disease must either have been diffused (1) by personal contact ; (2) by translation through the air ; (3) or by dissemination in vapour of sewers ; or (4) by the various waters.

Now the evidence that cholera can be communicated in these ways by cholrine is conclusive. Instances of a cholera patient brought to a distant house and communicating forthwith the disease to an inmate are too numerous to be mere coincidences ; as the chances by the doctrines of probabilities against such numerous coincidences are inconceivably great. But it is evident that as the population of every district of London is in free communication with every other district, and is constantly interchanging its residents on both sides of the river, so by this mode of communication cases would be, as indeed they were to a limited extent, freely distributed all over London. The same might be said of the air : any gas generated in any point of London is by the law of gaseous diffusion speedily distributed through the atmosphere ; and matters in suspension are distributed by the winds, which are thus described during the first four weeks, extending from July 8th to August 4th, which saw the rise and decline of cholera : variable ; N.E. and E.N.E. ; variable; W. and W.N.W. The winds were not still ; but blew in various directions over London at the rate of eight miles an hour during the first three weeks, and then with double that velocity. If they carried cholera on their wings they must necessarily have shed its poison over all London : the action of the winds could not have been confined to the small area of East London. In India the cholera matter is scattered by the natives on the surface of the earth ; and may be either washed into the tanks or be dispersed in clouds of dust.* But in a town of waterclosets and privies the diffusion of dry cholera dust must be exceedingly circumscribed.

In the watercloset system the cholera flux in vapour, if it is not sometimes generated, is sometimes distributed in sewers, and is driven into the dwellings of the people. An instance of diffusion in sewer vapour at Southampton is given by Professor Parkes in his masterly paper.† Professor Parkes in the same paper shows that the foul water of the Peninsular steamer "Poonah" proved much more virulent than sewer vapour. And it is evident that the amount of zymotic matter evaporated from cholera flux, and entering the system through air, must be inconsiderable as compared with the amount that may enter through a water supply contaminated with sewage.‡ All over London the sewage exhalations went on during the summer of 1866, and produced certain effects. It happened, too, that several districts in the group so heavily visited by cholera lie in the particular region which then derived no advantage from the contemplated low-level sewer. But too much importance must not be attached to this circumstance. The whole of the region on the Thames from Chelsea to the city of London inclusive is in the same predicament ; and there the mortality by cholera in the present epidemic was low ; in the Chelsea water-field, for example, the deaths by cholera did not exceed 4 in 10,000, nor is the rate exceeded by the average mortality of the whole region along the proposed low-level sewer except

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contains only a single ovule ; and these circumstances led Naudin to make the following interesting experiments : a flower was fertilized by three grains and succeeded perfectly ; twelve flowers were fertilized by two grains, and seventeen flowers by a single grain, and of these one flower alone in each lot perfected its seed ; and it deserves especial notice that the plants produced by these two seeds never attained their proper dimensions, and bore flowers of remarkably small size. From these facts we clearly see that the quantity of the peculiar formative matter which is contained within the spermatozoa and pollen-grains is an all-important element in the act of fertilisation, not only in the full development of the seed, but in the vigour of the plant produced from such seed."

[*The Variation of Animals and Plants under Domestication.* By Charles Darwin, M.A., F.R.S. Vol. II., pp. 363–64.]

* *See* Fick's letter on Zürich outbreak.

† Appendix to Ninth Report of Medical Officer of Privy Council, pp. 244–253.

‡ Dr. Hassall remarks that the sporules of some fungi are aërial and repel water, but *vibrions* are true aquatic productions : he found no *vibrions* in the water distilled from rice-water flux at a low temperature.—Appendix to Board of Health Report of Committee for Scientific Inquiries, page 305.

in the East London water-field, where the mortality by cholera was at the rate of 72 deaths in 10,000 living! Again, West Ham with Stratford-le-Bow has an independent drainage system of its own; and over this region, where the same water went, the same dreadful mortality prevailed.

The cause of the mortality of cholera in London, whether on the north or the south of the river, up to the rate of 5 in 10,000, it may be admitted on all hands is explained by the diffusion of the cholera-stuff through personal intercourse, sewers, and the slight contamination of the waters either of wells or of the Thames and of the Lea after filtration by the water companies. All those companies had before 1866 professedly carried out extensive works for taking their waters from better sources, for filtering it, for storing it, for distributing it, in conformity with the provisions of the Metropolis Water Companies Act of 1852; and their works had been pronounced very good by three engineers appointed by the President of the Board of Health. "The requirements," said the three engineers, "set forth in "the Metropolis Water Act, 1852, have in all essential respects been fully and "satisfactorily complied with by the several companies." *

The East London water company's works are described in the Engineers' report: in 1850 it had six open reservoirs, one at Lea bridge, one at Stamford Hill, and four at Old Ford; in 1855 the new filter beds at Lea bridge were completed; the filtered water was brought, in a four-feet iron pipe, to Old Ford, into two oval reservoirs, which, used formerly as subsiding reservoirs, were now covered over with brick arches and earth. "*The other reservoirs of the company near Old Ford and that* "*at Stamford Hill are*," say the reporters, "*now thrown out of use.* * * * "The large depositing reservoirs upon which they had to rely for clearness of the "water have *now been abandoned, and all communication between them and the* "*mains has been cut off.*" † In the reporters' map the small covered reservoirs of $2\frac{1}{2}$ acres is engraved; the two open reservoirs of 9 acres, east of the Lea, are suppressed in the map, on the ground probably above alleged, that "they were thrown out of use." These open ponds do not figure in the elaborate water map of R. W. Mylne, C.E., published in 1856. The open reservoirs contain water admitted to be unfiltered; and Mr. Greaves the engineer, speaking for the company, in his letter to the *Times*, dated August 1st, 1866, made this statement: "The facts "are * * that the canal having been since 1853 *disused for all purposes of* "*supply, is only maintained as a drain from the filter to a lower part of the* "*river; that not a drop of unfiltered water has for several years past been* "*supplied by the company for any purpose.*"‡

This was perplexing; but the company, by taking the unfiltered water from the open reservoirs, violated an Act of Parliament, and on the ground, perhaps, that they were not bound to criminate themselves, they, in the words of their engineer, besides pleading "not guilty," boldly proclaimed their innocence on August 1st. Shortly afterwards Mr. Greaves, however, admitted candidly, that the open reservoirs of unfiltered water could be drawn on; and by the report of Professor Frankland (August 25th) goes a step further. "Communication," Professor Frankland says, "can be established between these reservoirs and the pumping wells "supplying the public, but Mr. Greaves assured me that *it was never done, except* "*in case of emergency.*"§ In his examination before the Pollution of Rivers Commission on December 10th, Mr. Greaves advances another step, and states, that "a small quantity of water was taken out of one of the open reservoirs this "spring;" "he had not the date;" "probably June was the latest date," but he could not say definitely. Further revelations were made by the workmen under examination by Captain Tyler; and the story is at length thus told by officers of the company:—

The foreman of the company died quite suddenly of apoplexy early in this year (1866). In appointing a new man, in giving him discretionary instruction as to how he was to manipulate the water, "I described," says Mr. Greaves, "this "possibility [of drawing on the open ponds] as something which he must keep

* Report to Right Hon. W. Cowper, M.P., President of Board of Health, on "Metropolis Water Supply," 1856, by H. Austin, W. Ranger, and A. L. Dickens, Superintending Inspectors, p. 101.
† Ibid, pp. 65, 67.
‡ See Appendix, p. 92.
§ See Appendix, p. 124.

" in mind, rather than suffer an accident, and so I suppose he may have acted in " that sense." He, Mr. Greaves, kept these open ponds in reserve, as the question of quantity was important, "to meet such necessities as might arise." *

The Lea, Mr. Beardmore asserts, was full of water in 1866; how then could the supply be in any way deficient in July? This is explained to some extent by Mr. Maine, the manager of the works at Lea Bridge. The rapidity of filtration is very variable; and in the month of July every year † a slimy matter is rapidly deposited on the sand, blocking up its pores, and stopping this filtration altogether. In August this slimy matter grows, and no sooner produces green confervoid fibres than the power of the filters is restored; the water flows freely.

The foreman of the works, in his evidence, says that he considered the water in the open reservoirs available as a reserve in the event of the water getting low in the covered reservoir, to prevent the damage of the engine with the higher suction. *He kept no notes*, but he believed that he allowed the water to run from the open to the covered reservoir not more than three times during the year 1866; at the latter end of March, at the latter end of June, *and some time in the early part of July*. The sluice was never opened after cholera broke out; he is certain of that. *He had no fear of its doing harm.*‡

A carpenter, twenty-four years at Old Ford, appears to have been the only man who worked the sluice between the open and the closed reservoirs. He did other jobs, but that was his specialty. He opened that sluice *frequently* in 1864, *frequently* in 1865, and three times (!) in 1866. He describes in three cases what he did. In March he was at the engine house: the engine began to draw air; and he was ordered by the engineer of the company to open the sluice. He left it open two hours. In June he was about the yard, when the *engine driver* called to him, and " ordered him to let him have some water." He complied by command of the foreman. About *two* P.M. early in July, and this may have been the first fatal day, he opened the sluice again, and left it open for about the same period of the day. " He considered the water in the open reservoir to be very good, " and had often drunk it."‡

When this statement is compared with that in Mr. Greaves's letter,§ and when it is borne in mind that these dependent men were not giving evidence on oath, that the opening of the sluice would be precisely one of those acts of which no record was desired, we can scarcely expect a more explicit statement. It is enough to have in evidence, that immediately before the outbreak in July the foul water of the reservoirs was pumped over the parts of East London where cholera was epidemic.

Again, there was another channel for the entrance of the foul water of the Lea directly into the covered reservoirs supplying the pumps. Professor Frankland sagaciously remarked, that the bottom of these reservoirs, within a few yards of the river, is 16 feet beneath the low ground, which is here only just above the level of spring tides. When the tide was high, and the water of the reservoir was low, the permeation of the water through the gravelly bottom into the reservoir was on hydraulic principles inevitable. Captain Tyler describes graphically how he put this to the proof, and established the fact, by wading over the bottom. The reservoir was on Sunday February 24th, at his instance, pumped, in 36 hours, as low as possible; the bottom was found foul; but the water at last came in faster than it could be pumped out by the powerful engine. The patience of the waiting company was exhausted; the water still came in.

Cholera flux, with the other excremental matters in the channel of the Lea, thus must have found its way from the reservoirs to the pump wells of the company at Old Ford.

Mr. Greaves himself could not perhaps describe precisely what took place in July; but this is substantially what occurred:—The Lea at Old Ford was much more polluted in the summer of 1866 than it was in 1854; for, besides the sewers emptying into it on the side of East London, the whole sewage of Stratford and West Ham on the Essex side has since 1861 been discharged into the Bow

* See Extract from Mr. Greaves's Evidence in Appendix, pp. 100–101.
† See Professor Frankland's Report, Appendix, p. 123.
‡ Appendix, p. 105.
§ Appendix, p. 92.

Creek arm of the river at the iron bridge. This sewage is washed up and down the stream by the ebb and flow of the tide twice daily between and in close proximity to the open and the storage reservoirs of the company. The storage reservoir, full, holds 6,000,000 gallons of water in the morning; in the day 8,000,000 gallons flow into it by the iron pipe from Lea Bridge; and as the pumps distribute 11,000,000 gallons in the day, 3,000,000 gallons are left in the reservoir at the close of the day, to be augmented to 6,000,000 in the night when the distributing pumps cease working. But one day, early in July, probably on Monday or Tuesday July 9th or 10th, at 2 o'clock in the afternoon, the storage reservoir was at the lowest ebb, and the dregs of the water were drawn on; the well was scantily filled; the pump gave unmistakeable signs of distress; the engine-driver called out for water; and then the old carpenter opened the sluice, and let in the contents of the northern stagnant pond, with its bottom pervious alike to the waters of the Lea and to the waters of its sister reservoir, which had been recently refilled by soakage from the Lea, and was slightly turbid and milky on the 9th of August.* How often this was repeated in July it is impossible to tell, as the engineer did not even know that the pond water had been used at all in that month, and the old carpenter's memory, minute in some respects, reproduced facts too imperfectly to form a basis for a negative argument. If the scanty supply of water was due to slimy obstructions of the Lea Bridge filter bed, Mr. Maine tells us that the slime lasts till its germination in August. Again, if the supply from Lea Bridge in July *was less than in May* the East London Company *must have drawn on its open reservoirs*, for in their return they give the quantities supplied at 2,167,885 gallons *a day more in July* than *in May*. They distributed 636,000,000 gallons of water in July; where did it all come from?

The lowness of the water level in the storage reservoir would during the same month let in impurities from the Lea every evening.

Several cases of cholera and choleraic diarrhœa had occurred over London in May, and on 27th June, at 12 Priory-street, Bromley, one poor Hedges, a labourer, and his wife, both of the age of 46 years, died of "cholera Asiatica," the former after 15 hours, the latter after 12 hours illness. Their cases are minutely described by Mr. Radcliffe, who traces the discharge into the watercloset of 12 Priory-street, and thence 300 yards down the sewer to its opening into the Lea at Bow Bridge, half a mile below the Old Ford reservoirs.† He attaches great importance to these first cases; and they undoubtedly sufficed to pour into the sewers and waters millions of zymotic molecules, which day by day grew more and more frequent in the Lea by every hour's choleraic discharges on both sides of the river. On Wednesday, 11th July, the first four deaths of the explosion occurred, one in each of four distinct sub-districts; and allowing for duration and incubation, it is not improbable that the four persons took the poison early in the week. Nine deaths occurred on the 12th in *seven* of the East London sub-districts wide apart. On Wednesday the 18th, were 59 deaths, singly, or sometimes in clusters of 8 or 9 deaths in 16 sub-districts of the East London waterfields; a few deaths dropped in here and there in a sub-district of the other waterfields; but this mass of death in East London was due evidently to some superadded agency. It operated mainly in every district supplied by the Old Ford pumps; that is, in Bow, Bromley, Poplar, Limehouse, Mile-End-Old-Town, St. George-in-the-East, Whitechapel, parts of Bethnal Green and West Ham, which Captain Tyler tells us would in the ordinary way be supplied "on the greater part of week days from Old Ford."‡

The East London field is supplied by the company from pumps at two different sources, three miles apart: (1) from the Lea Bridge pumps drawing their water direct from filter beds, and beyond the range of tidal sewage contamination, and (2) from the Old Ford pumps.

At Old Ford there are houses with five pumps and steam-engines of 640 horse-power; at Lea Bridge two engines of 300 horse-power. The power in the gross is equal to the delivery of 38,000,000 gallons of water daily. The actual supply during

* See Professor Frankland's Report in Appendix, p. 125. Extract from Letter of Mr. J. Hutchings, who passed by the East London ponds at Old Ford nearly every day during the year 1866.

† Appendix to Ninth Report of Medical Officer of Privy Council, p. 285.

‡ Report on the Quantity and Quality of the East London Water Supply. Parliamentary Paper, No. 339, Session of 1867, p. 16.

the year 1866 was 19,380,739 gallons daily.* Of this, Captain Tyler says, 11,000,000 gallons are delivered daily from Old Ford, and the rest (8,380,739) from Lea Bridge. With some variation, this is the order of the work :—the engines at Old Ford are started at 5½ in the morning and stopped at 7½ P.M.; and from 7½ in the evening till 5½ A.M. of the next day the water supply "is entirely produced from the Lea Bridge station."† "The Old Ford engines do not," says Captain Tyler, "work at "night *or on Sundays.*" "The water from Lea Bridge at those times supplies "the whole district [water field] passing by Old Ford, and even to the Essex part "of the district."‡ Three hundred miles of street are traversed by the company's pipes: the pipes of six inches and upwards, called by the engineer 'mains,' are 147 miles long; while the smaller 'service pipes,' some constantly charged, the others turned on once a day, are 328 miles long. §

The effect of all this is, that the Lea Bridge waters usually meet the Old Ford waters at a fluctuating line running from Victoria Park, through Bethnal Green, onwards to Spitalfields. Far south of this line the Lea Bridge waters pass on Sunday, and even early in the morning, but only in very rare instances could the Old Ford waters be carried into Hackney north of that line.

It was precisely in the region of the Old Ford waterfield that cholera raged. There, in three months, it killed little less than 4,000 men, women, and children; while in the Lea Bridge field, and in all the other waterfields of London, the epidemic was kept within such narrow limits of fatality as would be accounted for by diffusion through sewers, direct contact with cholera matter in various ways, and the slightly contaminated filtered river waters of the other companies.

It must be evident that the dose of cholera matter in a given quantity of the water supplied from Old Ford would vary indefinitely in different localities; for example, assume that the North Woolwich main was filled by water pumped from the covered reservoir *before* 2 *o'clock* on the fatal afternoon of July, when the old carpenter confesses that he let in the open pond water, or that it was filled on Sunday with the water of Lea Bridge, and in either case the water of the main would be comparatively pure. In fact as the composition of the water in the supply reservoir would vary from day to day and from hour to hour as the level of the water got lower, and as the tide of the river happened to be in or out, it is evident that the composition of the water in the supply pipes at any given moment would vary to an inconceivable extent.

But the cholera matter, after it leaves the body, undergoes changes of which some may render it more, others less and less, active from day to day; and, moreover, this flux holds in suspension active matter heavier than water; hence it is probable that in an aggregate of several districts thrown together, to get rid of accidental disturbances, the effect of the cholera flux will be least in elevated and in remote districts supplied by mains constantly filled. The cholera flux in a six-inch iron pipe, rising for a mile to an elevation of a hundred feet, would comport itself very much as we see it in a glass tube; thus, if the flux was equally distributed from the reservoir over the field of a company varying in elevation, the quantity of *cholrine* in a given quantity of water, like the quantity of cholera in a given population consuming that water, would vary with the elevation. The cholrine might also vary with the distance of the point of discharge, as the velocity of water and the quantity of matter it carries in suspension change under most complicated hydraulic laws, to say nothing of the laws of the changes affecting cholrine itself.

3. *Cholera in the several Waterfields.*

I now proceed to call attention to the mortality from cholera in the various waterfields of London.‖ As their areas correspond with none of the other recognized divisions of London, the 135 sub-districts have been distributed into 15 groups, under the various heads corresponding as nearly as possible with the waterfields. It will be seen that while there is a certain mortality from cholera in

* Appendix to Report of Select Committee on East London Water Bills, Session of 1867, pp. 266, 269.
† Evidence of Mr. Greaves before Rivers Commission, Q. 384, page 11.
‡ Captain Tyler's Report (Parliamentary Paper, p. 16).
§ Appendix to Report of Select Committee on East London Water Bills, p. 267.
‖ Table 33 (Appendix, p. 83).

every condition, the excess above this standard is constantly in proportion to the impurities of the water during the epidemic period.

London is now supplied with water by *eight* companies. South of the Thames it is supplied by *three* companies; the Lambeth and the Southwark companies taking their waters from the Thames; the Kent drawing its waters, the officers say, from wells, and not as formerly from the Ravensbourne. *London*, north of the Thames, is supplied by *five* companies, the Chelsea, the Grand Junction, and the West Middlesex taking their waters from the Thames, the East London from the Lea, the New River from the Lea mainly, and from wells. The area which each company respectively supplies I call its water-field, and London is consequently divided into eight such fields. In some cases the water-fields of two or three companies are intermingled at their edges, and do not coincide precisely with the registration districts. Pumps exist to some extent, and draw water from shallow wells. By taking the sub-districts included in each water-field we get, however, eight areas, each of which is supplied almost exclusively by one of the eight companies, and where the mortality by cholera in three epidemics can be determined with sufficient exactness. Then we have a group of the sub-districts supplied conjointly by the New River and the East London companies, some streets of each sub-district getting water from one company, other streets getting water from the other company; and so it is in the case of other companies. Thus 15 groups of sub-districts have been formed; each of 8 supplied by a single company, and each of 7 by two companies.

The proportion of deaths by cholera to 10,000 inhabitants in 1866 will show the relative fatality of the disease. Thus the deaths by cholera in the field of the Chelsea company were in the proportion of 4; in that of the West Middlesex 4; in that of the Grand Junction 3; nor do the proportions differ from those above given to any extent in the sub-districts supplied conjointly by any two of the companies, as is shown in the Table. The rate of mortality in the group supplied by the West Middlesex Company and the New River is necessarily corrected, for of the 48 deaths there by cholera 36 took place in *University College Hospital*, among patients brought from all the sub-districts in its vicinity. After a correction for these imported cases, the proportion is reduced to the average. The deaths in the water-fields of the three companies, including all the three sub-districts which they supplied jointly with the New River, amounted to 266 by cholera, 687 by diarrhœa, among a population of about 739,279, giving 4 in 10,000 as the death-toll by cholera, and 9 as the death-toll by diarrhœa, which included a certain proportion of choleraic cases.

The fatal cause, and the means employed to hedge it in, produced a very uniform result over the first seven groups of Table 33; and upon taking the 27 western sub-districts of which they consist, covering an area of 15,020 acres, and extending from Fulham on the Thames to Charing Cross and Hampstead, the differences of cholera death in the sub-districts are not of any significance.*

The water-field of the *New River* is extensive; it covers the large part of London lying along the Thames from Hungerford Bridge over the city of London down to St. Katherine's Dock, and extends northwards to Stoke Newington and Highgate. This company supplies exclusively 39 sub-districts on an area of 8,755 acres, inhabited by about 834,617 people. The deaths in this region were 661 by cholera, 846 by diarrhœa. The deaths by cholera were in the proportion of 8 to 10,000 inhabitants, by diarrhœa 10. The mortality by cholera was more than double that of the western water-fields; but by diarrhœa there was only a slight excess; indeed, the deaths were proportionally less than in the West Middlesex water-field.

The water-field of the *East London* Company covers all the area of London on the river Lea, and extends to Stratford and West Ham, which are not yet in London. The deaths in the 22 sub-districts supplied by this company were 3,947 by cholera, 813 by diarrhœa; the deaths by cholera were thus 72, by diarrhœa 15, in every 10,000 inhabitants. This dreadful mortality by cholera was *nine* times as great as in the New River sub-districts, and *twenty* times as great as in the north-western sub-districts. In seven populous sub-districts supplied jointly

* Table 34 (Appendix, p. 84.)

by the East London company and the New River the deaths were in the proportion of 34 by cholera, 11 by diarrhœa.

And it will be remarked that the mortality by cholera was excessive in every one of the 29 sub-districts supplied by this company wholly or partially from the Old Ford reservoir, except Stamford Hill, which is said by the officers to have got its water from Old Ford.*

Crossing over the Thames, the whole of South London lies before us. There the three high sub-districts of Sydenham, Norwood, and Streatham lost out of every 10,000 inhabitants 3 by cholera; they were supplied by the Lambeth and Southwark companies. The deaths in the exclusive field of the Southwark company were 7, and in that of the Kent company 15; the cholera deaths in the 17 sub-districts supplied conjointly by the Southwark and the Lambeth company were 6 in 10,000 inhabitants; and 6 in Peckham, which is supplied by these companies in conjunction with the Kent company.

In the whole of South London the cholera deaths were 8 in 10,000 inhabitants, which stands in strong contrast to the 72 deaths to an equal population in East London.

It is then evident that in the year 1866 the epidemic cholera matter (*cholrine*) found its way into every district of London; that its quantity varied, and was limited in every district within narrow limits, except in the water-field of the East London company, where the cholera deaths also varied from place to place, but were in nearly every locality so excessive as to leave no doubt that an excess of *cholrine* was distributed over that field.

That neither less poverty, depression of soil, nor density of population suffice to account for the diminished prevalence of the epidemic in South London is evident on comparing the cholera deaths of the same sub-districts in the year 1849 and in 1854.

Confining our attention to South London, there is no reason to believe that the poverty of the districts was greater in 1849 and in 1854 than it was in 1866; the density of population was less, the depression of the soil was the same, and yet in 1849 the cholera deaths to 10,000 inhabitants were 121; in 1854 the cholera deaths were 94; and, as we have seen, in 1866 they fell to 8. The cholera deaths to 10,000 fell at once in the four sub-districts supplied exclusively by the Lambeth company from 93 in the year 1849 to 17 in the year 1854; in the sub-districts supplied jointly by the Lambeth and the Southwark companies from 138 to 95; in the sub-districts supplied by the Southwark alone the proportions rose from 135 to 154. Some deterioration in 1854 is noteworthy in the Chelsea water-field, but there is a noteable amelioration in the water-fields of the New River and the East London. In the water-field of the Grand Junction company, the fatality of cholera greatly increased in 1854; and that not only in the Golden-square sub-district in the vicinity of Broad-street pump, but in Kensington town, and St. John, Paddington. The mortality by cholera in the Chelsea and the West Middlesex water-fields was higher in 1854 than in 1849; and the waters of the upper Thames had grown impurer.

The companies were appealed to (see Appendix, pp. 297–301), and several of them improved their waters materially before the Act of 1852 came into operation; but in the beginning of the year 1853 the Lambeth company, quitting its source of supply at Hungerford Bridge, where the Thames was foully polluted with London sewage, drew its water from Thames Ditton above Teddington Lock and beyond the reach of London sewage, but even then apparently exposed to the pollution of the drainage of Thames Ditton.† Still the whole character of the Lambeth water was changed; it could no longer be contaminated by the cholera flux of London, and the result was astonishing. As the Southwark water then remained the same, while the Lambeth water was changed, the operation of other causes remaining the same in the two intermingled fields, the phenomena were analyzed, and the vast differences in the mortality of the people living in the two fields were evidently due to the differences of the water.

The reasoning may be put in this form: the excess of the mortality (x) by

* Mr. Greaves in his evidence before the Rivers Commissioners says: "The Stamford Hill district I am able to supply either from Lea Bridge or from Old Ford. . . The Lea Bridge water-wheel is now (Dec. 10, 1866) working to Stamford Hill, but for some years past I was entirely supplying Stamford Hill from Old Ford." (Rivers Commission, 2nd Report, Vol. II., Evidence, p. 11.)

† This may be inferred from a passage of the Engineers' Report to the Right Hon. W. Cowper, p. 50.

cholera in the Southwark and the Lambeth water-fields in 1849 and 1854 was produced by one or other of the possible causes all existing in 1849, represented by *a, b, c, d, e, z*; in the second period, as well as the first, all the possible causes remained unchanged, except the possible cause *z*, which varied, and with it varied *x* so as to diminish as *z* diminished; therefore *z* was the cause of *x*. If the enumeration of possible causes is complete, and the assumption that the forces of *a b c d e* are substantially unchanged, it is difficult to resist the conclusion that *z* was the cause of *x*. The obvious possible causes are exposure to infection (*a*), bad drains (*b*), crowding (*c*), poverty (*e*), imperfect medical relief (*f*), impure water *z:* none of these, as far as it is known, differed, as far as Lambeth is concerned, in 1849 and in 1854, except the water (*z*), which was very impure in 1849, much purer in 1854. Again, all these causes, except *z*, were substantially the same in the Southwark and the Lambeth water-fields in the year 1854; but then the water in the Southwark water-field became worse, and there *x* increased, while in the adjacent Lambeth field the reverse happened.

In the interval between the year 1854 and the year 1866 the water of all the eight companies was taken from points higher up the rivers, and filtered, and following this, in 1866, cholera in every water-field was fatal to comparatively few when it visited London under nearly the same epidemic circumstances, and, as far as could be judged from continental experience, with undiminished virulence, except in the water-field of East London. *See coloured map No. 2. at end of the report.*

The East London company itself had succeeded by filtration* and other means in reducing the cholera mortality, which was 59 in 1849, to 34 in 1854; and the deaths by diarrhœa remained nearly stationary. In the years after 1854 the waters of the Lea grew every year fouler by the discharges of the sewers on its west bank, and by the drainage of West Ham into its eastern margin; a work designed by an eminent engineer, that has gradually extended since it was first opened in the autumn of 1861,† and now (1867) pours the contents of the water-closets of 10,000 houses into this tidal tributary of the Thames,‡ above its loop at the iron bridge, only a mile and a half below the water reservoirs of the *East London* Company. A large part of the sewage is discharged by gravitation, but about 4,600,000 gallons were pumped daily into the river in the year 1866. "The effect of the sewer outlets," says Mr. Beardmore, the able engineer of the Lea Trust, "is no "doubt to keep the tidal water *in a foul state, especially during the summer and "autumn months, when there is not an excess of water in the Lea.*" § The river is as foul, in the opinion of Mr. Marshall, as the West Ham sewage. "It looks "as foul, and certainly no sensible impression is produced on the river Lea that I "could ever detect, even when we are pumping into it at all times of the tide. A "large area of bank is exposed every tide; it is covered with a slimy deposit of "mud of a most offensive appearance, and certainly with no agreeable smell." "In "hot weather what kind of sensation have you when walking near that mud?—I "always have the sensation that I should like to be somewhere else." ‖ "We "found it expedient during the last summer (1866) *to wash out the sewers.* I "believe that we should *not have had occasion to do so except to please the people "on account of the cholera.*"

West Ham is out of London, so, although the great metropolitan sewer passes over its main sewer at Abbey Mills pumping station, the Lea, instead of deriving any advantage from that circumstance, thus grew liable to further pollution by the discharge into its waters of the overflow of the metropolitan great sewer in times of storm.

The East London Company had apparently no defence against the tidal waters

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* Before 1852 the East London Company employed no means of filtration, but relied upon its large depositing reservoirs to which reference has been made. By June 1854, that is, before the height of the London epidemic of that year, *half of their filtering beds* were in operation. See Engineers' Report to the Right Hon. W. Cowper, p. 67.

† First contract let in 1858. J. Meeson.

‡ J. G. B. Marshall, C.E., Engineer to Board of Health, West Ham. Evidence before River Commission, River Lea, 2d Report, Vol. II., Evidence p. 128.

§ Letter dated November 1, 1867.

‖ Evidence of Mr. Marshall, C.E., Engineer to West Ham Local Board. Rivers Commission River Lea, Vol. II., 2d Report, p. 126.

encompassing its reservoirs round about, and growing fouler and fouler every year after 1861 ; thus at Old Ford it lost in 1866 the advantages it gained by filtration at Lea Bridge, besides being exposed to the temptation of resorting to the vast stagnant infected ponds in close proximity to the Lea. The cholera deaths from 34 in 10,000 in 1854 rose to 72 in 1866, while the cholera and diarrhœa deaths in the same epidemics rose from 51 to 87.

4. *Inequalities of the Cholera Mortality within the several Parts of the Waterfields.*

As the number of deaths from cholera in London, including West Ham and Stratford, was 5973, while the number of inhabited houses was about 398,701, it follows that there was *one* death from cholera to 67 houses ; and as it happened in a certain indefinite number of instances that more than *one* death from cholera happened in *one* house, it follows that there must have been more than the above implied proportion of houses (66 out of 67) in which no death from cholera occurred.

This is an average proportion ; but if the whole of London was distributed in 5973 several sections, each of 67 houses, it would frequently happen to an inquirer to find successive sections in each of which several deaths had occurred, and several consecutive sections in which no single death had occurred. The irregularities would be such as are observed in games of chance, for this reason, that the *cholrine*, no matter how distributed, is dealt out irregularly, and in various doses, in various states of activity, to individuals, who are all in exceedingly variable degrees susceptible or non-susceptible of the zymotic action, and differ in the greatest extremes in their command of remedies in both the premonitory and the advanced stages of the malady.

There are 37 districts in London ; and as each district contains a variable number of the groups of 67 houses, it is obvious that on comparing the deaths to the houses, or to the population in the several districts, the results will approximate more or less to the average as the population becomes more numerous, unless there is some disturbing cause. The same reasoning applies to the sub-districts, of which there are 135 in London ; but as the numbers are smaller, the accidental divergences will extend over a wider range. Descending to streets, the differences will be still greater ; and there will be streets in which no death by cholera occurs, as there will be others in which the deaths will be numerous ; precisely as at whist, the honours may fall to one hand, although each player, except the dealer, has an equal chance of obtaining his share. The difference is exaggerated in the case of cholera, as one case begets another, especially in dirty dwellings, or in dwellings opening into sewers charged with cholera matter. Where the honours at play find their way almost invariably into one hand it is pretty evident that the laws of chance are set aside by some overruling agent ; so if the deaths by cholera occur in immense disproportion in sub-district after sub-district supplied by one water company, the inference is irresistible that there the fatal cards do not fall by chance, but are dealt out by some sure though invisible hand.

To understand the case, it must be taken into account that a death by cholera is one of a series of phenomena going on in large numbers of people simultaneously ; and that as a general rule as many patients recover as die from an attack of cholera in its algid form, while as many as 98 in 100 recover from diarrhœa of some severity.

The mortality in 1854, according to the returns to the scientific committee was at the rate of 48·335 in 100 cases of cholera ; so 5973 deaths implied that about 12,358 persons had been attacked. Besides this, 3197 persons died in that year of diarrhœa ; and after deducting the current 2374 deaths by diarrhœa, about 800 may be ascribed to the direct agency of the cholera matter, from which, upon the data supplied by the same authority,* it may be inferred that more than 48,928 persons were decidedly affected by a diarrhœa of a choleraic character. The number of cases of cholera, and of its correlative diarrhœa was 61,286 ; which

* The average deaths in 1855–64 was 2374. Cases of diarrhœa to 1 death 61·161 = $\frac{5321}{87}$. See Report of Scientific Committee on the Cholera epidemic of 1854, p. 92.

must have been distributed over less than 61,286 houses, one, two, or more cases having occurred in the same house. Consequently as the total number of houses was 398,701, the number of inhabited houses in which no *death* was registered from cholera or choleraic diarrhœa must have exceeded 392,728, and the number of houses in which no *case* of cholera or choleraic diarrhœa occurred must have exceeded 337,415=398,701−61,286. The affected dwellings and the free in fatal districts will necessarily be found in groups; hence perfect uniformity of distribution in streets is out of the question. To show how much the disease was diffused, I have taken Poplar; and it will be remarked how very generally the streets and named places of the sub-district were attacked. This Poplar sub-district contained, on 1185 acres, 5868 inhabited houses in 1861, and probably 7050 in 1866, occupied by a population of 52,180. The proportion here was of one death by cholera to every 16 houses, or of 64 to every 1000 houses; consequently in every 1000 houses there must on an average have been more than 936 in which no fatal case of cholera occurred, the proportions varying from place to place. Looking at the irregularities alone, it will be seen that the diffusion of the disease in so many streets is remarkable. In a few streets no death was registered, and in some, such as the East India Road, the numbers were below the average of the parish.

The list of deaths (pp. 85–6) in streets has been taken from the register books, and as the names were not always settled, nor the streets well defined, there may be displacements. A few streets too have less than their due number of deaths, owing to about 27 of the patients having been sent to the London Hospital, which at first kept no addresses. Poplar extends over the Isle of Dogs, on which many new houses and streets not yet laid down in maps have been built.

5. *Some Statistical Fallacies.*

One fallacy necessarily makes a strong impression upon the mind. House after house supplied with East London water can be taken in which no death, or even case of cholera, occurred; and here the reasoning takes this form:—These houses were supplied with the East London water during the epidemic; they were not visited by cholera; therefore the East London water was not the cause of cholera. This fallacy turns on the use of the word "water" in two totally different senses. No one for a moment pretends that pure "water" can be the cause of cholera: it is some matter in that "water," the word serving to designate in chemistry a compound of oxygen and hydrogen, but in common usage a fluid consisting of the most various compounds, inorganic and organic, in the state of germ, of full life, or of death; and compounds too which must necessarily, from the nature of the water supply, be unequally distributed in the waters; in one house in inconceivably small quantities, in other houses in large doses, in one house among susceptible and in other houses among insusceptible people. To show that a portion of this water is taken with impunity, and still less to show that the people in certain houses in East London did not die of cholera, is no proof whatever that the cholera leaven was not present and fatal in other portions of the East London water supplied to other houses.

Eels, as we have seen, were found in the water of a certain number of houses in East London. To argue that in hundreds of other houses no eels were found, and that therefore the company never distributed eels in the district, would be absurd. The fallacy of such reasoning is transparent. It assumes the form,—if no eels are found in the waters of a certain number of houses none exist in the waters of any houses. As the eels are limited in number they cannot be distributed universally, and the fact that they were discovered in one house and not another would depend on laws and circumstances so intricate as to make the ascertained distribution anomalous, but not necessarily more anomalous than the distribution of the lower forms of organized matter to which the phenomena of cholera in man are due.

If in a large number of drawings from a series of urns A, *one black* ball is drawn to 161 *white balls* on an average, and if in another series of urns B, *eight black balls* are drawn to 154 *white balls* it is naturally inferred that the proportion of black balls is greater in the series B than it is in the series A, and it is no valid objection to this inference to allege either that white balls are drawn in excessive proportions from

one or more of the series B, or that black balls are drawn in excessive proportions from *one or more of the series* of urns A. We know by the calculus of probabilities that such runs of white or black will happen, and we know also from the nature of the case as well as from the facts admitted by the advocates of the company, and the laws regulating the flow of fluids in pipes, and of matter suspended in that fluid, that similar inequalities in the distribution of cholera matter must occur.

As on an average in 18 out of 19 houses in East London no death from cholera happened, it is certain that in the fatal districts not only houses but entire streets can be selected where no death from cholera occurred. So in Poplar, no death appears to have been registered in Gates-street, Evans-street, Wades-place, John-street, Jeremiah-street, Sarah-street, Newby-place, Church-street, Bedford-street. Upon being referred to, Dr. Bain says these are either short streets with few houses, or streets of houses generally good and well aired. The East-India-road suffered slightly. Upon the other hand 3 deaths by cholera occurred in Oriental-street, consisting of better houses than those above named, and occupied by respectable inhabitants. The deaths in High-street were 9, Kerby-street 5, Lion-street 4, Augusta-street 6, Park-street 6, Pennyfields 6, Sabbarton-street 7, Suffolk-street 7, Wells-street 6. In the table of the streets the greatest varieties are observed. (pp. 85–6.)

It must be borne in mind that some fatal cases of cholera, originating in the streets of Poplar, terminated and were registered at the London Hospital or elsewhere out of the district.

The fact that no death by cholera in a particular street occurred is at once accounted for upon the supposition, quite compatible with the principle of distribution in water, that fatal doses of cholera matter were not distributed in that street, or if distributed did not come in contact with the mucous membranes, or if they did come in contact fell on them when they were insusceptible, or, finally, were extinguished by early treatment before they could prove fatal. The converse facts account with equal facility for the occurrence of many fatal cases in particular streets or houses where the morbid matter was besides multiplied and diffused among the inmates.

Two portions of East London have been selected as places exempt from fatal cases of cholera. The one is over the border, and includes North Woolwich; it is supplied through a main, constantly full, from the Old Ford station. The region is partly in West Ham partly in Woolwich, and lies north of the Thames. It is on a marsh, with foul, open drains, and the inhabitants look in as bad or in a worse condition than the inhabitants of Poplar. "In Plaistow Marsh," Mr. Knowles, the intelligent surgeon, writes, "the streets that suffered most during the epidemic "were Burnham-street, Wooldham-street, Roscoe-street, Rathbone-street, and the "streets leading from Rathbone-street to Cherry Island. In *Silvertown* there were "very few cases of cholera, one close to Graving Dock Tavern and a few cases in "Winchester-street. In Andrew-street there was none to my knowledge, but there "were many cases of diarrhœa in Silvertown during July and August; the men "at the Albert Iron Works, which are supplied with water on the constant system "from the main by meter, suffered much from the complaint, and invariably attri-"buted it to the water they drank. In proportion to the inhabitants diarrhœa was "most prevalent in Silvertown, and cholera on Plaistow Marsh. At the Albert Iron "Works and at other large works astringent mixtures were kept, and given to the "men directly they complained of diarrhœa. A few houses have a constant "supply of water on the kitchen, but in most houses they have cisterns. Plaistow "Marsh is drained by the West Ham sewers. At Silvertown there is no drainage; "the sewage from the houses flows into open ditches and mixes with the water that "cattle drink. In hot weather the ditches are very offensive."*

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* Letter of H. Knowles, Esq., 2 Barking Road, Canning Town.

Ague and fever prevailed in North Woolwich when I visited the district with Mr. Knowles, and this is evidently very much due to the neglected drainage. The following letter was addressed to the West Ham Local Board of Health by Messrs. Campbell, Johnstone, and Co. of the Albert Works in June 26, 1867, and signalizes a great evil which should be remedied:

"Our workmen complain to us very much of the prevalence of ague and fever, and the oldest "inhabitants state that it arises through the water being let into the ditches for the cattle. Our

As the direct distance from the Old Ford reservoir to North Woolwich is above four miles, and the water appears to travel along one low arterial main, which is kept always full, it is evident that if suspended cholera matter undergoes any change it will be modified before it reaches North Woolwich, and will necessarily be diluted as the heavier molecules fall down on the way. The main leading up to Stamford-hill (about 3½ miles) will by gravitation be prevented from conveying all the suspended matter of a heavier specific gravity than water up to the height of that reservoir. But such a sudden influx of the pond water of Old Ford as is described by the witnesses would be injected at once with some velocity into the near empty pipes, yielding water on the intermittent system: and here one of the many advantages of the constant system of supply is evident; under it fresh zymotic matter is less likely to be thrown into people's dwellings at a distance.

In the two remoter regions the epidemic took the milder form of diarrhœa; and this may be due, either to the accidental diversion of the matter from their mains, or from its greater dilution and age.

The greater part of the City of London, including three districts, is supplied with water by the New River Company, and the mortality from cholera was at the rate of 10* in 10,000 inhabitants. But in one district, the East London of the City, 34 deaths by cholera happened in 2160 London district houses supplied by the New River Company, while only two deaths happened in one of 162 houses supplied by the East London water. And therefore it is argued that cholera matter was not distributed by the water of the East London Company in any part of its waterfield; the New River itself being "above suspicion," and the East London being absolutely harmless, since only *two* people died in 162 houses! Now as it happens there was only *one* death to 159 houses in the other waterfields of London, so that even here the East London Company's houses had double their proportion; and the New River Company, taking its water from the Lea, is so far from being "above suspicion," that it must have supplied a certain though small amount of choleraic matter, which again must have been unequally distributed in its pipes. The mortality by cholera in the New River waterfield is greatest in the Eastern districts, adjacent to the East London waterfield, and in the eastern parts of the City; and, moreover, it turns out that the New River Company has the power to pump an unlimited quantity of water from the impurest point of the Thames below Blackfriars Bridge, and so distribute it in the City by "separate mains," "for sewer uses."† Mr. Muir, the engineer, "can state that no water is now being taken "from the Thames by the New River Company, or has been for many years, but "they have that power still." This is a consolatory assurance; but it will be more satisfactory, after the experience of 1866, to learn that this power no longer exists.

Mr. Liddle shows in his valuable report that in Whitechapel among 9224 persons supplied by the New River Company the deaths were 30; that is, 33 per 10,000; while in the rest of the district supplied with East London water the deaths were about 536, or in the proportion of 78 per 10,000.‡ Mr. Liddle gives the distribution of the 30 deaths in the 57 streets supplied by the New River; showing in each of the 14 streets one death from cholera, in one street two deaths, in each of two streets three deaths; in one street, Crown-court, Blue-anchor-yard, eight deaths; in 39 streets *no* deaths. By his estimate 14 of the 30 deaths occurred six days after the disease first appeared in the Whitechapel district in the courts of Blue-anchor-yard, among 966 people earning a precarious living on the banks of the river, and crowded on ground equal to a square of about 40 yards to the side. The mortality on this small plot was at the rate of 145 in 10,000.

"workmen wish us to write to you to see what you can do with the Dagenham Commissioners "towards improving the health of the immediate neighbourhood, as they consider that their health "should be studied in preference to the cattle. We may add that the water in the ditches, from "the want of proper drainage for the houses, cannot be good for the cattle."

The Board in reply said the matter was under the control of the Havering and Dagenham Level Commissioners, but that steps had been taken to cleanse the ditches.

I learn now, through Messrs. Meyrick and Gedge, that the West Ham Board has very properly undertaken to drain this devoted district. June 1868.

* Ten deaths in the Temporary Cholera Hospital, New Street, (locally situated in the sub-district of St. Botolph), are transferred to other districts. See Appendix, p. 68.

† Report of Committee on East London Water Bills, June 27th, 1867. App. p. 255; and at p. 6, Mr. Muir's evidence, No. 124 and 127.

‡ Report on Epidemic Cholera in Whitechapel, pp. 37–40.

Then the City has on Bow Common a workhouse drawing its water from a deep well; among 617 souls in the workhouse no case of cholera occurred, but in the detached infirmary, having in its wards 148 patients, 19 old people died of cholera in the four days, July 24th to 27th, and eight in the seven days following, chiefly old women. The cholera was prevalent all around; the dejections saturated the sewage; and the first woman attacked entered the house with diarrhœa, which ceased, but at the end of seven days was followed by sudden cholera collapse; the explosion immediately took place among a small knot of old paupers in the south wards of the infirmary. The workhouse itself enjoyed an immunity.* Again, in the East London workhouse at Homerton only one death from cholera was recorded. The workhouse in Homerton unquestionably gets its water from Lea Bridge and not from Old Ford. The exemption of the Limehouse pauper school, where the master and the medical officer made excellent arrangements for the early treatment of the young patients, and allowed the free use of water supplied from the main of the East London Company, is also cited.

It is sufficient to re-state the argument to refute the inferences; the cholera matter, varying in activity, was distributed all over London in varying proportions; it has the property of propagating itself under favouring conditions; it can be conveyed from person to person by water and by other agencies. In the districts supplied by seven water companies *one* death by cholera occurred on an average in 159 houses; in the same number of houses supplied by the East London company from Old Ford *eight* deaths by cholera happened on an average. A similar relation between this special impurity of the water and the mortality when cholera is epidemic has been observed repeatedly. The argument applies to workhouses as well as to houses. To cite a case in which the inmates of one or more workhouses are attacked by cholera, as they might be, without receiving the infection through water, and to cite other cases in which the inmates of workhouses supplied with East London water escaped, is to cite examples of the general law; as all that is to be accounted for is the excess of seven deaths, or sometimes less, and often more, in the several sub-districts that got their water generally, but not always, from the Old Ford pumps, which sometimes supplied fresh, and sometimes foul water.

The bold assertion, that "there was no coincidence of time" in the outbreak of cholera in the districts supplied from Old Ford, that "a month elapsed in several "districts and no outbreak appeared," † is disposed of by the Table 24, p. 56–57 of Appendix. The comparison of the propagating cholera-poison with arsenic which does not reproduce its like is entirely illusory; but if arsenic had been distributed with the water of the Old Ford pond, it would not have reached all the districts simultaneously.

The pretence that the districts supplied respectively from Old Ford and from Lea Bridge were absolutely undistinguishable is dissipated by Captain Tyler's lucid Report. And the assertion is unfounded that the conclusions drawn from the experience of South London in 1854 are open to doubt, because "it has been found "since that no one knew what water was given to the houses of any particular "district," for the two water companies of Lambeth and Southwark gave from their own books the names of the streets and the numbers of the houses which they respectively supplied, while the deaths in the houses supplied by each company, both in 1849 and in 1854, were abstracted from the books at the General Register office. This was decisive. Dr. Snow describes how he decided, from the chemical character of the water, all doubtful cases in his series of observations.

The argument founded on the coincidence of the area of water supply from Old Ford with the high rate of mortality by cholera is thus ingeniously met by Dr. Letheby. He says in his evidence,‡ "I might make an exact comparison of a "similar kind; I might say there are two gas companies supplying the East end "of London, and it is a remarkable fact that in the district supplied by the Com-"mercial Company cholera has existed, and in another district, supplied by the "City of London Company, the cholera has not existed. There is just the same "amount of coincidence and parallelism between these two cases as between the "water companies." The coincidence in question is not the same; for all the

* See Mr. Radcliffe's Report in Appendix to 9th Report of Medical Officer of Privy Council, pp. 312–17.

† Evidence of Select Committee on East London Water Bills, p. 426; and Report on the Cholera epidemic of 1866, by H. Letheby, Esq., M.B., p. 33.

‡ Report and evidence of Select Committee on East London Water Bills, p. 429.

parishes which suffered excessively from cholera, and were supplied with the waters of Old Ford, were not supplied with gas by the Commercial Company.* But let that pass. And to test the parallelism, take the hypothesis, that the Commercial gas did diffuse cholera over Poplar, and see what the hypothesis implies. It implies that the specific poison finds its way in epidemics into the company's retorts or into its reservoirs; that it travels like gas through pipes; that it is indestructible in the flames through which it is diffused with the products of combustion. But there is no evidence that coal gas, or that any of its poisonous impurities, will produce cholera; that any cholera dejections could get into the Commercial Company's pipes; that cholera matter, more than small-pox matter, is indestructible by flame. All zymotic matter, on the contrary, it is believed, is rendered inert by exposure to a high temperature, and is absolutely destroyed by flame. It would be as rational to assume that live eels as that this matter could be distributed quick through flames. The hypothesis is on the face of it absurd, and is at once rejected. Not so the hypothesis of diffusion by water, which carries any living organic matter, and has incontrovertibly been the channel of cholera diffusion in numerous instances.

6. *The Hospitals.*

The *London Hospital* is in the midst of the East London water-field supplied from Old Ford; and Dr. Letheby in his evidence before the Parliamentary Committee made this striking statement respecting this hospital, his "own hospital:" "There were about 487 people residing, excluding the cholera patients, and they "were all taking the water exactly as it is delivered *from the main, without any* "*filtering process* whatever, and NOT A SINGLE INSTANCE OF CHOLERA OCCURRED." As the patients are visited every day it is certain that the first symptoms of diarrhœa would be treated with the skill for which the staff of this hospital is distinguished; and Dr. Jackson, the resident medical officer, tells us in his General Report that active measures were taken to prevent contagion in the hospital. The cholera dejections were received in vessels containing carbolic acid, and buried in the ground. The linen was passed through a solution of chloride of lime, and washed with carbolic soap. The carbolic powder was sprinkled freely in all the wards to such an extent that the nurses complained, and said it produced headache and sore-throat. These precautions might account for the exemption of the inmates if it had existed. But there is a conflict of evidence. Dr. Letheby affirms that "not one" inmate, "not one" attendant, was affected by cholera. Mr. Bathurst Dove, in the official hospital report, on the other hand, not only states, but gives the explicit details of *seven cases* among the attendants, of whom *five died;* and of *one patient*, a child, that died. Thus out of the number taken at 487 resident 6 died or 123 in 10,000; and out of the 130 attendants 5 died, so the mortality was in the proportion of 385 in 10,000. The laundry woman who died was *one* of 10 and lived out of the hospital; of the 6 nurses, &c. attacked 3 are said to have slept out of the hospital, but all lived day and night within the East London waterfield. As this is a question of fact it is useless to proceed further in the reasoning. That the reader may have an opportunity of judging for himself, I subjoin verbatim copies of the evidence on both sides.†

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* St. George-in-the-East, St. Paul Shadwell, St. John Wapping, West Ham and Stratford sub-districts, are not supplied by this company. Letter of Secretary, date 14th September 1867.

† [Evidence of H. Letheby, Esq., M.B., before Select Committee of House of Commons on East London Water Bills, 23 May 1867.]

Q. 640. *Mr. Clerk.*] This water has been used, I believe, for a great many years in the London Hospital?—It has been used ever since I have known the hospital, and I think that is pretty nearly a quarter of a century. It was used during the whole of the cholera time, when the hospital was full of cholera patients, and when there were nearly 900‡ people in the hospital; and *there was not*

‡ Probably a misprint: the average number resident was 487; viz., patients 357, attendants 130, during the whole year (*Report*). The ordinary patients Mr. Mackenzie, the house surgeon, says were fewer in the months of July, August, and September, because new patients were afraid to apply on account of cholera.

The first case of cholera in the London Hospital was admitted on the 10th July. The patient, a German woman, had come over from Holland as servant to a cattle-dealer on the 6th July; she died on the 11th July. One case came in on the 13th, one on the 15th, two on the 17th, three on the 18th, four on the 19th, eight on the 20th. The numbers increased rapidly, and three wards with 138 beds were set apart for the reception of cholera patients. The largest number at one time in the hospital either for cholera or diarrhœa was 114. 509 cholera patients, strictly so called, were admitted in the seven weeks from 10th July to 30th August; 281 died, and 228 recovered. The mortality of cases decreased week by week from 85 per cent. in the first to 37 per cent. in the seventh week.*

For the purposes of reasoning on the liability of patients and attendants in the hospitals of other waterfields, I applied for information to the proper authorities who have kindly supplied the facts for the year 1866.

Dr. Southey states that 136 cholera patients were treated in Bartholomew's, where 44 died. The average number of patients in hospital were 550; two afflicted with cancer were attacked by cholera and died. The average number of nurses and other attendants was 105, of whom three were attacked and none died. The medical staff consisted of 22 persons; none died.

Mr. Custance, secretary of Middlesex Hospital, states that 22 cholera patients were admitted, 10 died; of 220 patients on an average resident, none were attacked, none died; of 59 nurses and other attendants, none were attacked, none died; so of the 27 medical and resident officers.

Dr. Steele supplies an interesting experience of Guy's Hospital. Fifty-five cholera patients were admitted and 25 died. Of 496 patients on an average none were attacked by cholera; of 94 nurses and attendants *one* was attacked and died. The medical staff, consisting of six physicians and one resident medical officer, were all in occasional attendance; so were eight or ten students.

In 1854 the cholera patients admitted were 92. Nineteen persons, including attendants and ordinary patients, were attacked by cholera in hospital; of the total number of cholera cases 65 ended in death. An eminent member of the staff died of cholera. The hospital was supplied with the Southwark water which was impure in 1854; in the year 1866, and for the last 10 years, it has obtained water from an artesian well.

7. *Rise and Decline of Cholera.*

Cholera in an individual man goes commonly through a regular series of development; commences with diarrhœa, grows hourly more violent until the crisis is past, and then, if death intervene not, subsides slowly in consecutive fever, lingering

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a single instance of cholera in the hospital, except those who were brought in as affected by the disease.

Q. 641. But none of the ordinary inmates of the hospital were affected by cholera?—*Not one.*

Q. 642. *And not one of the attendants?—Not one.* In the hospital I think there were about 487 people residing, excluding the cholera patients, and they were all taking the water exactly as it is delivered from the main, without any filtering process whatever, and not a single instance of cholera occurred.

Dr. Letheby gave similar evidence before the Royal Commission on Water Supply.

The following extract is from the Clinical Lectures and Reports by the Medical and Surgical Staff of the London Hospital, Vol. III., 1866, pp. 460–462.

The paper is by Mr. Bathurst Dove, and it is entitled "Notes of Six Cases of Cholera which occurred in Nurses or Inmates of the Hospital.

The second paragraph gives a summary of the results:

"Out of somewhat under 130 persons engaged in attending the cholera patients, and washing "the sheeting, &c. from the cholera wards, *seven were attacked by cholera, of these five died.* In "addition, *one patient, a child,* occupying a room adjoining one in which there were cholera cases, "*died of it.* Three others had tolerably severe diarrhœa, and one had an attack of pain in the "abdomen, with cramps in the legs, without diarrhœa."

* Dr. Jackson, pp. 436–7 of Hospital Report.

until the danger is over, and the patient is restored to health. This is a type of the course which the epidemic takes in a community. The rapidity both of growth and decline here, however, depends on the means of diffusion, as well as on the activity of the diffused *cholrine*. High temperature has a sensible effect. The duration of the epidemic also depends on the magnitude of the community; thus it goes through a house in less time than through a great institution; in less time through a small town than through a large city. It may in this respect be compared with a conflagration, which spreads rapidly through houses put in communication with each other by inflammable materials, and dies out sooner in a small than in a great city, where the embers smoulder for a long time, and, unless extinguished, are liable to break out in successive eruptions.

The course of the London epidemic in the year 1849 is that which it follows naturally when cholera flux gets access by sewers to the rivers, and unfiltered waters are systematically distributed on the intermittent system of supply. That epidemic began in the latter part of the year 1848, and subsided in the early part of the year 1849, to break out again in June, and to proceed in its ravages with increasing severity until in the week of September (2d — 8th) it killed 2140 persons; the deaths after that date fell weekly, until the last week of November, when only one death was recorded.

The epidemic of 1853–4 differed in some respects, as it was more fatal in the first and less fatal in the second year than the epidemic of 1848–9. The eruption began in July 1854, culminated in the same week of September as in 1849, when the deaths by cholera were 2069, and then fell to 3 in the last week of November.

Here is a synopsis of the deaths in the two epidemic years of 1849 and 1854, during two periods of the year.

DEATHS BY CHOLERA IN ALL LONDON.

Population.	Years.	In 70 Days, extending from 27th May to 4th August.	In 119 Days, extending from 5th August to 3d November.	Proportion of Deaths in Two Periods.
	1849 - -	3,341	10,239	1 to 3
	1854 - -	614	10,125	1 to 17
	Sum -	3,955	20,364	1 to 5

The numbers agree in showing a large excess of deaths in the second period; and on referring to the daily returns, it will be seen that when the cholera flux was freely poured into the Thames and Lea as sewage, to be pumped up and circulated again in water in every street by the companies, the mortality followed a regular law of increase and decline. The power of propagation of cholera matter in the mortal form in the end became spent; it was no longer able to vanquish the specific vitality in the population left.

The epidemic of 1866 would have subsided ultimately in that year, in conformity with the general zymotic law, but here a disturbing cause interfered; the water supply partially altered between the years 1849 and 1854 was completely changed in the next interval; so the quantity of cholera matter distributed was reduced to a minimum in 1866 by the general improvement of the water, and presented in both periods a diminution of death-rate in all waterfields except that of the East London Company, where a different law prevailed.

DEATHS BY CHOLERA IN 1866.

Waterfields.	In 70 Days, extending from 27th May to 4th August.	In 119 Days, extending from 5th August to 3d November.	Proportion.
Waterfields of New River and of Thames Companies - - - -	313	1,266	1 to 4
Waterfield of *East London* Company—-			
Exclusive of West Ham - -	2,265	1,633	1 to $\frac{3}{4}$
Inclusive of West Ham - - -	2,539	1,747	1 to $\frac{2}{3}$
The deaths in all London, exclusive of West Ham - - - -	2,578	2,899	1 to $1\frac{1}{8}$

If the deaths by cholera in the second period had borne the same proportion to those in the first period as in the two previous epidemics, the deaths in the second period of 119 days would have amounted to 13,274 ; and in the 189 days to 15,852. But the plague was stayed, and the actual deaths, exclusive of West Ham, were 5477, or 10,375 less than the calculated number.

The treatment of the early stages of cholera, and the destruction of choleraic matter by chemical agents, had probably a considerable share in reducing the mortality of 1866 in the New River and the Thames waterfields ; but it will be noticed that there the relative number of deaths in the second period was as before fourfold the deaths in the first period. This proportion was not altered. In another cause then the excess on the first and the defect in the second period over the East London waterfield must be sought. That excess has been previously traced to the distribution of impure water from their Old Ford reservoirs in the first period ; and the diminution in the second period is probably due to the efforts made by the engineer of the company to set his supply right, so soon as his attention was called to the source of the dread calamity, which, hanging like a black cloud over the city, threatened not only East London, but the whole metropolis with an overwhelming plague

The weekly deaths from cholera in East London and West Ham increased in four weeks from July 8th to August 4th in this fashion,—41, 438, 1002, and 1046. Now, under the same law of increase the deaths by cholera in the two following weeks would have become 1058 and 2237, and so on in an ascending series, when the actual deaths by cholera were 664, 341, and so on in a descending series ; thus far following a law of the same nature as had been observed in former years. The curves are shown in the diagrams at the end of the report.

The deaths in declining followed a special law in East London and West Ham. The deaths in the seven successive weeks from July 29th to September 15th were 1046, 664, 341, 169, 117, 81, 79. The fall was first 37 per cent., then 49, then 50, then 31, then 31, and finally only 2 per cent. ; the mortality scarcely declined at all further for four weeks. While the deaths in East London were decreasing, the deaths in the rest of London were nearly constant ; and actually increased when the deaths in East London were stationary. The epidemic in the rest of London followed the usual law where the distribution through water is regular ; while in East London there was an explosive eruption, such as would arise from the sudden distribution of an excessive quantity of strong cholera water for a short period.

Further light is thrown upon the course of the epidemic by examining the daily return of deaths. Thus in East London and West Ham the deaths in the seven days from July 26th to August 1st were 157, 130, 160, 154, 144, 178, and 173 ;* that last day Wednesday, August 1st, was the day on which the weekly Table, published in the newspapers, referred to the state of the East London waters ; on that day Mr. Greaves came to the General Register Office. The deaths rose no

* Appendix, p. 40, Table 21.

more ; on Thursday, August 2d, the numbers were 162 ; so for three days the cholera death-rate, as it were, stood still ; then there was a sudden fall in the four following days to 122 deaths on Friday, 113 deaths on Saturday, 127 deaths on Sunday, 117 deaths on Monday, August 6th ; a further fall followed on the seven next days, and the deaths were 87, 98, 94, 70, 71, 72, and 48 on Monday, August 13th. See Appendix, Table 21, p. 40.

These are the days on which the deaths occurred, and not the days on which they were registered ; the numbers differ therefore from those in the weekly tables, where it was only possible to include the current registered deaths. And again it must be borne in mind that the term of fatal cases is brief. Forty-two per cent of the fatal cases terminate in less than 24 hours, 67 per cent. in less than 48 hours.* Thus 42 per cent., or 73 of the 173 cases fatal on Wednesday, must have been attacked on Tuesday or Wednesday; and 68 of the 162 cases fatal on Thursday must have been attacked on Wednesday or Thursday ; and 51 of the 122 cases fatal on Friday must have been attacked on Thursday or Friday ; and on that day, the third after the warning, the cases, instead of increasing, sensibly declined. The diminution was unequivocal. There is reason to believe that the period of incubation is as brief as the term of attack in fatal cases of cholera ; the cholrine often acts as suddenly as any of the poisons.† And this is implied by the occurrence in the East London instance. But there is a parallel case in which the supply of contaminated water was admitted before a commission of inquiry, and the date at which the contaminated supply ceased is positively known.

8. *The parallel case of Newcastle-upon-Tyne.*

Dr. Robinson wrote to inform the Board of Health on *Friday*, September 2d, 1853, that a woman, aged 24, had died at Newcastle-upon-Tyne of cholera "last night." She had come by steamer from Bill Quay, a village situated on the south bank of the Tyne in Gateshead, three miles below Newcastle, where she was attacked on Monday by diarrhœa.

On *Thursday* he had found cases of diarrhœa unusually severe ; and anticipated that an epidemic might be productive of a fearful loss of life.‡

* Table IX. (third series, p. 116) of Report of Committee of Scientific Inquiry shows that of 3600 cases of cholera, 1744 were fatal ; and of these 734 died on first day, 428 on second, 186 on third, 106 on fourth day.

† See Snow on Cholera. Griesinger on Cholera, in Virchow's Handbuch, cites cases where the patients were attacked in less than 24 hours after exposure. It is well known that the Broad-street explosion was traced to a pump, which drew its waters from a well into which the dejections of a child found their way by a circuitous route. The child was attacked on Monday, 28th August, when the dejections were abundant, but ceased on Wednesday 30th August 1854. The child died on Saturday 2d September. The dates of attacks and deaths in the region of the pump are thus given by Dr. Snow :—

1854.	Attacks.	Deaths.
August 28, Monday -	Child attacked.	
„ 29, Tuesday -	1	1
„ 30, Wednesday -	8	2
„ 31, Thursday -	56	3
September 1, Friday -	143	70
„ 2, Saturday -	116	127
„ 3, Sunday -	54	76
„ 4, Monday -	46	71
„ 5, Tuesday -	36	45
„ 6, Wednesday -	20	37
„ 7, Thursday -	28	32
„ 8, Friday -	12	30

Report on Cholera Outbreak, St. James, Westminster, in 1854, *pp.* 159–161, *and p.* 117. See "Cholera Gazette," pp. 2–3, 1832 ; Bengal Report on Cholera, pp. 22–3 ; Briquet on Cholera, in "Mémoires de l'Académie Impériale de Médecine." Vol. 28 ; Part 1.

‡ Report of Commission on Outbreak of Cholera at Newcastle-upon-Tyne, 1853. Letter of Dr. Robinson, p. 73.

An earlier case of cholera was observed at this Bill Quay: a boy, 10 years old, the son of a coke-burner, was attacked on August 27th, and after seven days illness died, as certified, of "English cholera" on September 3d; his sister Hannah, aged 3 years, died on September 1st, after 30 hours illness, and his mother, aged 40 years, died also on that day after 12 hours illness, of cholera. Dr. Robinson's patient, Mary Tait, was attacked on August 29th by diarrhœa, on 31st by cholera; in the interval she sailed up the Tyne. Martha Oxley, aged 21 years, the wife of a boat-builder, was attacked on August 28th, and died on September 2d, of Asiatic cholera. Hers was the first attack so certified. John Falcus, a mariner, aged 56 years, was attacked on August 30th, and died on September 3d.

The first 12 cases are given below.* It will be noticed that a child died of cholera at Elswick itself on September 3d.

A female died on August 31st; and one male with 2 females died on September 1st; 3 females died on September 2d; the deaths then became 5, 5, 9, 7, 8 in the next five days; on September 8th, 18; September 9th, 22; September 10th, 27: the Board of Health on Friday the 9th had directed Mr. Grainger to proceed from London to Newcastle, and on Saturday he announced by telegraph "cholera is epidemic in Newcastle." It was truly so, and on both the rising banks of the Tyne in Gateshead as well as in Newcastle the epidemic raged. On September 11th the deaths were 39. The disease, Mr. Grainger reports on this day, has appeared in all parts of the town, in different degrees of intensity; diarrhœa is attacking all classes, high and low; there is a general feeling of apprehension; several persons die seven or eight hours after appearing to be in health; many fall into relapse, and of them very few recover. The guardians are zealous, and the mayor is anxious to assist in all measures; but up to this time no house-to-house visitation has been instituted. On the 12th 58 persons die. Mr. Grainger writes: the epidemic is by no means confined to the poor; many of the better classes have been attacked; I have just seen two such cases, one a shopkeeper in good circumstances, and living in a principal street; he was dying. The second, a child who had somewhat rallied. They presented all the characters of malignant cholera. The general malaria arising out of the miserable parts of Newcastle overhangs, he says, the whole town, and penetrates every dwelling. The deaths on September 13th were 71. The local measures made no impression; for on went the plague. A multitude of cases are detected, writes Mr. Grainger; the surgeons are besieged day and night; it is impossible to keep an account of all the attacks. On September 14th all accounts show him that the epidemic is in no way diminished; there has been a great development of the disease during the last 24 hours. I

* First cases of epidemic Cholera in Newcastle-upon-Tyne and Gateshead in 1853.

30th August; 3 Lisle-street, St. Andrew's, Newcastle—George Ellison, aged 70 years, gentleman, English cholera, 12 hours. Certified.

31st August; Victoria-street, Gateshead—Mary Tait, aged 34 years, wife of labourer, cholera, 2 days. Certified.

1st September; Forth-street, St. John's, Newcastle—Robert Forster, aged 52 years, cartman, cholera Asiatica, 12 hours. Certified.

1st September; Bill Quay, Heworth, Gateshead—Elizabeth Handy, aged 40 years, wife of coke-burner, cholera, 12 hours. Certified.

1st September; Bill Quay, Heworth, Gateshead—Hannah Handy, aged 3 years, daughter of coke-burner, cholera, 30 hours. Certified.

2d September; Bill Quay, Heworth, Gateshead—Jane Innes, aged 13 years, daughter of ship-wright, cholera.

2d September; High-street, Gateshead—Hannah Skipsey, aged 79 years, widow of banksman, cholera. Certified.

2d September; Buxton-street, All Saints, Newcastle—Martha Oxley, aged 21 years, wife of boat-builder, Asiatic cholera, 5 days. Certified.

3d September; New-road, All Saints, Newcastle—John Falcus, aged 56 years, mariner, Asiatic cholera, 4 days. Certified.

3d September; Buxton-street, All Saints, Newcastle—Martha Nixon, aged 53 years, wife of black-smith, Asiatic cholera, 24 hours. Certified.

3d September; Judson-place, Elswick, Newcastle—James Frederick Forster, aged 1½ year, son of ironfounder, English cholera. Certified.

3d September; Bill Quay, Heworth, Gateshead—Michael Handy, aged 10 years, son of coke-burner, English cholera, 7 days. Certified.

have to-day seen, he writes, some physicians in large private practice. They state there is an enormous amount of diarrhœa, pain at epigastrium, and other premonitory symptoms among all ranks. The return from Gateshead shows a decided increase of cases. The deaths in the two districts were 123 on this day. Had it not been for prompt medical aid a much larger sacrifice of life would have occurred.

Mr. Grainger advises the use of tents; there is much alarm among the people. On September 15th authority is given to the medical officers to call in the aid of any number of private practitioners they deem necessary. The deaths in 24 hours are 140. Considerable gloom pervades the town, increased ever and anon by the tolling of the funeral bell. In the course of the day lime was dusted over many of the streets.* As in Poland and Germany so this outbreak is severer here than it ever was in 1831–2. Committees of the Town Council and Guardians meet. On September 16th the deaths were 146; two of the full churchyards are closed; there are two cemeteries, one having ten acres, with the means of getting six more if needed; this, Mr. Grainger is assured, has plenty of room for interments.

The dreadful apprehensions of the people were by no means exaggerated. The population of the two districts was only 144,067 at that time; and the customary deaths were 11 daily from all causes;† and now the deaths from one strange terrific cause were 146 in one day, 286 in two days. That would make 1000 a week, or in the year 52,000 deaths, equal to one third part of the living, without any regard to the gathering terror which was looming in the dark before them.

But deliverance was at hand. On Monday (12th) Mr. Newton at the evening meeting of the guardians referred to the water supply; on Wednesday evening (14th) Dr. Robinson declared that the impurities in the water were a predisposing cause, and that it was absolutely necessary to get water from a purer source than the Tyne. Mr. Furness exhibited a bottle of the water of a most noxious quality, and several guardians complained of the unwholesome supply. Mr. Grainger made no charge against the company, but said if the Tyne water containing the sewage was distributed, the sooner a remedy was applied the better for the town. In 1849 it was a well ascertained fact, in a number of instances where water had been fouled by the sewage, it had been "a predisposing and aggravating cause of the epidemic." I quote Mr. Grainger's words, as they reflect at that date very accurately the uncertain state of medical theory, which gave a tone of indecision in action. An urgent letter was addressed forthwith to the directors of the Whittle Dean Water Company by the guardians and by the mayor. Upon September 15th, at 11 o'clock in the morning, the man Miller got orders from the company to stop the engine at Elswick, where water was pumped from the Tyne; he opened the fire and let it out gently. The water pumped on that day from the river into the tank or filter was not distributed. The water of the Pont, a comparatively pure stream, was turned into the reservoir on September 15th;‡ and the Tyne water diluted in the reservoirs was distributed on the 16th, when the deaths were 146; on the next three days the deaths by cholera fell to 118, 121, 122; on this Monday at noon Mr. Grainger left the town; Dr. Gavin had arrived on the previous Saturday, September 17th. For three days following the deaths fell to 102, 89, 90; for the three days, September 23d—25th, to 75, 63, 81; for September 26th—28th, to 43, 46, 27; on September 29th to 23, and on the last day of September to 16. This was fifteen days after the supply of the choleraic sewage had been cut off. The deaths rapidly subsided; and no death occurred on October 26th or 27th. On November 23d the last death happened. In four months the deaths by cholera were 1924. Of 1527 slain, 37 were (according to Dr. Gavin) gentlemen, 316 tradesmen, 701 artisans, 434 labourers, 37 paupers, 2 prisoners.

The history of the water supply of this town is instructive. A water company was established in 1698 to supply water from the springs round the town, and its monopoly was broken up by the concession of the right to another company in

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* Report of Commission on Cholera at Newcastle. Evidence, p. 70.

† The deaths in the 10 years 1851–60 were 4126 annually, 11·3 daily.

‡ Compare Questions 5519 with 5566, 5567, in Evidence before Commission.

1834 to supply the town with water only from the Tyne. This water was eventually proclaimed bad; in 1845 the Whittle Dean Water Company got its first Act under which it brought water from a drainage area of 3600 acres, 12 miles from Newcastle, in October 1848. It had a reservoir capable of holding 215 million gallons, and its daily consumption was *one million* gallons. The supply of water from Whittle Dean in 1849 was abundant, and the demand increased; it amounted to a million and a half gallons a day at the end of the year. The lowest quantity in the reservoir was 100 *million* gallons. This epidemic year the mortality by cholera was not so high in Newcastle as in other towns; it was at the rate of 42 to 10,000 living in Newcastle and Gateshead. The town was congratulated by Dr. Headlam on its comparative immunity. In the next year (1850) a drought followed, and the Whittle Dean supply failed; the company then resorted to the source heretofore condemned by its projectors, but at the same time prudently purchased. For 99 days, from July 23d to October 31st, they pumped water from the Tyne at the rate of about 850,000 gallons a day; the water after subsidence in two beds was filtered through a bed of 10,000 feet area. No cholera ensued; and the mortality from all causes in that year (23 per 1000) was below the average (26). The company in 1851 enlarged their drainage area to 4600 acres, and acquired the overflow of the Pont, which was brought down by a cut about March. The reservoirs were full in May. The supply of water was abundant in the rainy 1852. In May 1853 the company began to supply the manufacturers down the river; and the estimated daily amount abstracted from the reservoirs was 3,000,000 gallons; while only 2½ *million* gallons went down to the town. So early as May and June the slip of water was suspected, and the officers of the company estimated the loss at half a million gallons daily through the bottom of the Arthur's Hill reservoir. What could they do? they had engaged to supply 2½ million gallons of water daily. They had the old resource. They pumped again from the Tyne 50 million gallons, or about 700,000 gallons a day, commencing on July 5th, and ending on the morning of September 15th, when cholera was at its height.

The shallow Tyne is a tidal river, and the tide rising from 11 feet to 15 feet carries the sewage up by Elswick, where the culvert of the company took up the water. The tide flows from 4½ to 5 hours, and ebbs from 7 to 7½ hours. The sewage of the town no doubt is flowing past Elswick two hours after low water when the water was taken for analysis by Dr. Thomson, and found to contain organic matter. The company supplied Miller, their man at the engine, with a tide table, charged him to commence pumping four hours after high water, and to go on for 2½ hours while the river was still running down, so as to cease pumping a little before low water. Whether this instruction was strictly carried out or not it is impossible to say, as the town authorities kept no look-out, but left the affair absolutely in the hands of the company. The water was pumped into two tanks for subsidence, then passed through the old and for a time disused filter 100 feet square, whence it was pumped up to the Arthur's Hill reservoirs, and mingled with the waters from purer sources before delivery.

The company supplied a population of 63,055* people out of 144,067 in the two districts with water in the year 1853; their supply reached directly only 7875 people in 1845.

It is worthy of remark, however, that the Tyne water was supplied for 99 days in 1850, and for 55 days in 1853, without any perceptible effect on the diseases of the people, who during both years were immersed hourly in an atmosphere of

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* Evidence of Mr. Main (Q. 5768) before Cholera Commission, p. 359. In answer to an inquiry of the Registrar-General in February last, Mr. Main stated that the number of inhabitants supplied directly, without reckoning those supplied from public pants or fountains, was 62,740 in 1849, 91,350 in 1853, and 160,305 in 1866. The population of Newcastle and Gateshead was 137,237 in the year 1851, and 170,377 in 1861; the mean annual increase 3314. Gateshead *district* contains some outside parishes, with a population of 25,822.

corruption, as Newcastle was then behind nearly all English towns in the first elements of civilization. The commission gives a computation showing that two thirds of the population of Newcastle (exclusive of Gateshead) had no private privies, and describes the dirt in the streets and cellars as revolting; the street sweepings were charged with excrements which the rain swept down the steep slopes into the Tyne.* By the year 1853 only 1421 out of 9453 houses had waterclosets; in 1852 the Corporation converted six large public privies into waterclosets. Mr. Main complained of that as a very large source of consumption; they felt it sensibly during the year 1853. All this suffices to show that cholera flux would be readily carried into the Tyne in July, and it would become denser in the water as it was reduced to its dregs in the reservoirs by the end of August, when the quantity in store was continually diminishing. The very means of cleansing the town polluted the river; for the authorities commenced, when rumours of cholera reached them, washing out and flushing sewers on August 8th occasionally, and then every day when cholera broke out, so that the means of diffusion were perfectly organized. Yet in July only 2 deaths from common cholera were registered; in August 5 deaths were registered; the deaths from diarrhœa were about 3 a week in July, and about 10 weekly in August, when in the latter days an increase of diarrhœa marked the origin of the epidemic cholera.

The witnesses differed about the quality of the water, but it evidently varied in different parts.† Some pronounced it "bad," "very bad;" some deposed that it had a "disagreeable taste;" others swore that it had an "offensive smell;" while others declared that they had never observed anything beyond peaty discoloration, or turbidity from clay or sand. The water from some of the wells, it is stated, became offensive during the outbreak. A large proportion of the population in the end suffered from diarrhœa or cholera, and the waters as well as the air were charged. The people themselves took up the notion so common in plagues, and here so true, that the poison was in the water, as is shown by the answer to the following question addressed to Mr. Rayne, nine years surgeon to the police force in Newcastle:

"Question 3280. With reference to the colour, I believe it was turbid?—Yes; on September 12th, between the Sunday night at 12 o'clock and 6 o'clock on the Monday morning, I saw 5 people die. I was, perhaps, at 20 cases or more of cholera between seven at night and that time in the morning. Mr. Simon is aware of the dreadful degree of thirst in cholera patients. They asked me what they were to drink. I said, 'Cold water is the best thing.' They said, 'We cannot drink the water; we are poisoned with the water.' And when it came from the tap it was perfectly true; it was in a shocking state. I could compare it to nothing but porter in colour." Again on Mr. Grainger suggesting to the mayor that the dirty holes of Sandgate should be cleansed out by the jet and hose, some gentlemen present said: "To-morrow, then, we shall drink that water again, supplied by the water company." (Q. 579.)

The remarkable fact for which I have cited this important case is to show how immediately the deaths from cholera declined when the distribution of the Tyne water ceased as its precise date is in evidence. To establish the parallel between this Newcastle outbreak and that in East London it is sufficient to resume the facts briefly. I must first observe, however, that the mortality from cholera was in Newcastle at the annual rate in 10,000 living of 134‡; while during the two days of its utmost intensity (September 15th and 16th) it was at the rate of 3625; while in the East London waterfield these rates were respectively 72 for the year, and 1105 for the two days (July 31st and August 1st) of highest intensity.

The impurity of the water was undoubtedly greater, and the sanitary condition less favourable, in Newcastle than even in East London.

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* Report, pp. xviii to xxv.

† Report, § 84, p. xxv.

‡ In the year 1849 the cholera mortality for that year was 42 in 10,000 living.

In the suddenness and the generality of the outbreak all over the two water-fields, Newcastle and East London, agree. All the various classes of people and all parts of the locality were attacked with an intensity varying to a great extent.

The water was pumped before the outbreak at Newcastle from reservoirs lowered unusually, and replenished from the tidal stream of the Tyne, which was the common receptacle of the dejections. The water was pumped by the East London Company from reservoirs which were in immediate communication with the Lea river at a time when it was charged with the sewage and cholera dejections of West Ham and East London.

The sewers and streets in both places were flushed and washed into the rivers at the height of the outbreak.

At Newcastle we know that the infusion of Tyne water ceased on September 15th; and although the water in the reservoirs and mains previously contaminated was distributed on the 16th, and was partially distributed on the 17th and the following days, the mortality instead of rising fell suddenly from 146 on the 16th to 118 on the 17th of September. The Newcastle water was supplied from two reservoirs—virtually one—on the constant system; the East London supplied water from two distant stations,—the filter beds, and the contaminated ponds and reservoir; so here the engineer could act with equal or perhaps greater promptitude by cutting off the supply from the ponds, and filling the small reservoir with pure water. On Wednesday, August 1st, when the deaths by cholera in East London and West Ham were 161, the deaths only fell on the first day after to 148, on the second day after to 117. So the effect here was equally or perhaps more prompt in East London than it had been in Newcastle.

It is known that the engineer at Newcastle ceased pumping from an impure source on September 15th, 1853; and it is assumed that on August 1st, 1866, the East London engineer did the same. Now by making these days the centre of a group of deaths in three days we find that the deaths, when the water was impurest, were 409 in Newcastle, 467 in East London; and if the hypothesis holds as to East London, then the numbers should decline by a similar law in both populations. *This law the numbers obey.*

The number of deaths by cholera run thus:—

	Newcastle.	East London.	
3 days, September 14th, 15th, 16th	409	467,	3 days, July 30th, 31st, August 1st.
„ „ 17th, 18th, 19th	361	367	„ August 2d, 3d, 4th.
„ „ 20th, 21st, 22d	281	292	„ „ 5th, 6th, 7th.
„ „ 23d, 24th, 25th	219	233	„ „ 8th, 9th, 10th.

If we change the initial central days to September 16th and to August 1st respectively, and so on, the relative proportions are not much altered; they become for Newcastle 404, 345, 254, and 187; for East London 476, 328, 265, and 215. The three last numbers for Newcastle, when the law of decline was in full operation, decrease in geometrical progression, while in East London the decline was also at a uniform rate in geometrical progression. The law may be compared with that which regulates the elimination of any contamination from a vessel of water;* but it involves various elements, which influence the result.

While Newcastle and Gateshead, intimately united by the bridge, lie some 12 miles up the Tyne, the districts of Tynemouth (including North Shields) and South Shields lie on both sides of the lower part of the river to its mouth. Their general sanitary condition in 1853 was as bad as that of Newcastle; and it could scarcely be worse. The water was indifferent; but it was not drawn from the Tyne. The population 104,750 in number was in intimate connexion with the 144,067 living in the Newcastle and Gateshead districts; epidemic cases occurred, but in the four successive days (September 14th—18th), when the mortality was so terrible in Newcastle, the deaths in Tynemouth and South Shields were 0, 2, 5, 5, and 1, and in no single day during the month of September exceeded 8 daily; the disease was diffused more slowly, and in the middle of October (22d) the deaths by cholera were 18, which the numbers never exceeded. The mortality by cholera in Newcastle and Gateshead for the

* See Problem on p. 136.

year was 134, for Tynemouth and South Shields 24, in 10,000 inhabitants. Here the Newcastle waterfield bore the same relation to Tynemouth and South Shields as the East London waterfield bore to the rest of London, except that in the northern districts, the mortality was higher, and differed less proportionally in the two fields than it did in the metropolis, where the mortality by cholera in the East London waterfields was at the rate of 72 in 10,000, while it was 8 in the rest of London.

These two great experiments yield analogous results. The parallel is complete. And it may now be laid down as an established law that water into which cholera dejections find their way produces cases of cholera all over the district in which it is distributed for a certain period of time; and that if the distribution is in any way cut short, the deaths from cholera begin to decline within about three days of the date at which the distribution is stopped.

9. *Indirect Diffusion of Cholera by Water.*

As water conveys cholera matter which multiplies and reproduces itself in the population, it often opens fresh fountains of disease, which extend their operations beyond the direct limits of the water supply, either through the medium of well water, or personal contamination, or linen or sewer vapors.

The Broad-street outbreak is an illustration. The first deaths were traced to the pump well, which was in communication with the house No. 40, where an infant died of diarrhœa and sickness (probably cholera) immediately before the outbreak. How the cholera matter first reached the child or the street could not be discovered, but it was probably conveyed thither by the water of the Grand Junction Company, which, containing ammonia and very likely cholrine in comparatively weak solution at that time, was evidently of worse quality than it was in 1849; for Hammersmith and some of the other sub-districts suffered severely in 1854.* Thus we can conceive that the introduction of a few germs into one house of a district may, through water, be the cause, as in this instance, of more than 616 deaths.

Another instance of indirect diffusion is afforded by the experiment with the Southwark and the Lambeth water in conterminous streets in 1854; the proportion of cholera deaths in the houses supplied by the Southwark Company were to those supplied by the Lambeth Company in the first four weeks as 20 to 1 (or 286 to 14); in the first *seven* weeks ending August 26th as 13 to 1 (or 1263 to 98); and in the whole year 1854 as 6 to 1 (or 3476 to 611).† So that

* Report on Cholera Outbreak in St. James Westminster, 1854, pp. 73 and 159. See also Table 27, pp. 62–65 of Appendix hereto.

† See Snow on Cholera, pp. 79–85. Also subjoined Table and Board of Health Report on Cholera and impure water (1856), p. 21.

NINE SURREY DISTRICTS OF LONDON.

Houses supplied by	Estimated Population, 1854.*	Deaths from Cholera.			
		8th July to 5th Aug.	6th Aug. to 26th Aug.	27th Aug. to end of Year.	Total.
(*a*) Lambeth Company - - -	155,987	14	84	513	611
(*b*) Southwark Company - -	249,326	286	977	2,213	3,476
(*c*) Wells and other sources - -	106,122	34	119	1,283	1,436
(*t*) TOTAL - -	511,435	334	1,180	4,009	5,523

	Deaths from Cholera to 10,000 living.			
	First Stage.	*Second* Stage.	*Third* Stage.	All Stages of Epidemic.
Southwark water, drawn from Battersea and containing London sewage - - - -	115	392	888	1,395
Wells and other sources - - - -	32	112	1,209	1,353
Purer Lambeth water, drawn from Thames beyond sewage range - - - - - -	9	54	330	393

* Population assumed to be in the proportion of the houses (inhabited and uninhabited) as returned by the two companies. The residues supplied from wells and from other sources was deduced by deducting the sums of (*a*) and (*b*) from (*t*).

the people supplied by the purer water must in the end have been affected by their proximity to their neighbours getting contaminated water. The same kind of facts were observed on the borders of the New River and the East London field; and in Newcastle, where the houses supplied by the Whittle Dean Company were in juxtaposition with those supplied from wells.

The tolerably complete drainage of South London in 1866, by carrying off the cholera flux, was undoubtedly one of the causes of the diminished mortality of that region; and the imperfect drainage of East London contributed its quota to the general excess.

10. *Water Supply of London.*

The water supply is so intimately connected with the health of London, and with its epidemics, that it is desirable to present such a general view of the system as can be drawn either from the reports of parliamentary committees or from direct inquiries. This has been done; and the results in a condensed form will be found in the Appendix, pp. 260-274. These works possess great interest, not only to the inhabitants of London but to the world at large, which nowhere now presents a spectacle of such magnitude; although it was perhaps surpassed in the aqueducts of ancient Rome.

The water companies, according to their own returns, supplied London with 95,406,731 imperial gallons of water daily on an average through the year 1866; this is equivalent in quantity to a fourth or fifth part of the waters flowing down the Thames at Hampton during dry seasons. It is about 34,847 *million gallons* a year.

The daily supply is equivalent to 433,476 cubic metres—the annual supply to 158,323,700 cubic metres,—which differs little in weight from so many tons. The water was delivered in 440,288 houses or other establishments; which received one with another about *a ton of water* daily.

As the water rates—or rents, as they are returned by the eight companies,—amounted to 799,536*l.* a year, the cost to the consumer was less than five farthings per cubic metre, or per metric ton; the annual cost to each person 5*s.* 3*d.* per head for 52 cubic metres, or 52 metric tons of water.

The magnitude of the supply of water will be evident if we compare it with the supply of coal, the other heaviest article of household consumption. According to Mr. Scott's statistics, the coal brought to London by sea, canal, and railway was 6,013,266 tons in the year; and this is by weight to each person annually about $1\frac{3}{4}$ tons, or 73 lbs. weekly, and $10\frac{1}{2}$ lbs. daily.* If the cost of a ton of coal is set down as 26*s.* 8*d.*, and the cost at the pit's mouth at 6*s.* 8*d.*, one pound sterling of the price, consisting of cost of carriage and profits, may be taken as strictly comparable with the price of water, after deducting the small payments of the companies to the river conservators or proprietors. A ton of coal costs, therefore, for conveyance from the source about 200 times as much as a ton of water.

It is true that the coal is carried from greater distances; but it is also true that the price of water, low as it is, is a monopoly price. The engineer who constructed the magnificent waterworks of Glasgow and Manchester has given an estimate, deduced from extensive observation, showing that 300,000,000 gallons, =1,363,036 cubic metres, of pure water can be brought 183 miles from the mountains of Wales, and delivered in the houses of London, at high pressure under the constant supply system, at a cost of about 1,190,000*l.* a year, and that is at the price of $2\frac{3}{10}$ *farthings* a ton. Nearly half of this too he devotes to the payment of the dividend and interest on the capital of the existing companies. The cost of the works would be about 11,000,000*l.* sterling. The estimate is for six millions of population, and for three times the quantities supplied now.

* The population in the Metropolitan police area was 3,521,267; it does not precisely correspond with the coal area.

But, if the entire works had to be erected now, the *present quantity of water* could be supplied direct from Wales at the price of about *three farthings a ton* by this estimate : and the cost for each person on the present quantity of a ton of water a week would be three farthings a week—three shillings and three-pence a year. Allowing for casualties of every kind the cost could not exceed one penny a ton, or a penny a week for each person.

The seven London Water Companies, excluding the Kent for the moment, draw more than one half of their waters from the Thames, and rather less than half from the Lea. The New River, the oldest of the companies, brings the greater part of its water in a stream from the Lea between Hertford and Ware to 21 capacious reservoirs, where it is stored ; afterwards the water is filtered through five feet of sand and gravel in 11 filtering beds at three stations ; it is 82 feet above Trinity high-water mark at the New River Head ; whence it is pumped by steam-power into higher reservoirs after filtration, and thence distributed, at different heights, to the respective houses, on the intermittent system ; filtration was first employed in 1855. The East London is lower down the Lea. The Thames Companies all pumped their waters from the tidal stream which received the London sewage in 1849 ; since 1855–6 they have all drawn their water higher up the river, beyond the tidal range—from 2 miles (Chelsea Company) to 5½ miles above Teddington Lock. The whole of the London water passes through the pumps, and is raised by powerful steam engines, with a force—reckoning dead-lift and friction—represented by a lift say of 30 metres for the waters of the Lea and 60 or more for the waters of the Thames, making 45 metres or more as the average lift. This work sends the waters not only into the houses, but up one or more stories.

The companies at the present day in carriage alone perform work daily equivalent to about 20 million metric tons lifted a metre high. It is the work of an innumerable host of water carriers. The low cost of the distribution is due to the application of steam, and the use made of the hydrostatic properties of water.

Mr. Bateman, in his scheme, draws to a still greater extent on the exhaustless forces of nature. The sun lifts the waters of the ocean in vapours which are precipitated in floods on the cold rocks of the Welsh hills ; on the heights the engineer catches the falling fluid under Cader Idris and Plynlimmon ; stores the affluent streams in lake reservoirs at various elevations, of which the lowest is 450 feet above Trinity high-water mark. Two acqueducts form a junction at Montgomery ; thence the fresh stream descends, crosses the Severn by Bridgnorth, and is led by Warwick and Watford to Stanmore, Middlesex, into vast service-reservoirs at least 250 feet above Trinity high-water mark. All the work is done without any pumping at all ; the water is carried to London by gravitation—by the forces of the earth itself ; and further, in such reservoirs at that elevation the water holds a store of power sufficient not only to carry it to nearly every house in and around London, but to perform work of various kinds, and to render unnecessary the steam and other fire-engines now used in the extinction of the fires of the Metropolis. As cost depends on the amount of human labour expended, and as in this case the whole of the labour is confined to the construction of works, reservoirs, aqueducts, tubes, it enables the engineer to bring pure fresh water from Wales to every house in London at as low a price as has been already specified, after purchasing the land and even satisfying equitably all vested interests. It is a work for all time and for an Eternal City.

As this fresh mountain water may be kept free from pollution it requires no filtration ; it conveys neither cholera matter, nor fever germs, nor any other zymotic substance generated in the bodies of men or cattle. The organic matter, ranging from 1 to 3 in 100,000 parts of the water, is innoxious ; the hardness is under 3 degrees of Prof. Frankland's scale.

Mr. Hemans and Mr. Hassard have shown that the waters of the lakes of Cumberland and Westmorland can be carried through artificial channels to London. Mr. Dale, in his report, vindicates the claim on these sources for the Lancashire and Yorkshire towns. Mr. Fulton shows how 230 million gallons of pure water can by gravitation be brought from the sources of the Wye to Barnet at a

cost of 9,000,000*l.* Mr. Bailey Denton, in an interesting letter to Lord Derby, advances a proposal for the supply of the metropolis from the higher sources of the Thames in conjunction with the storage of surplus waters. The Thames, says the Parliamentary Committee, yields a daily average in the dry season of 500 million gallons; whilst the maximum flow in time of flood exceeds 25,000 million gallons;* should more water be required, they add, it could be got "by "storing up in reservoirs in the valley of the Thames a portion of the flood water, "which now yields in a single day a sufficient supply for a whole year."

The fall of rain on the area of London within the police area, two feet deep over 687 square miles, is equivalent to 653 million gallons—nearly 3 million metric tons—daily, on an average of years; and on a London house of ordinary size the rainfall is equivalent to 20 gallons a day.† There are various proposals to collect parts of this rain and the rain in the Thames valley as it falls pure on glass, or on slate, or on gathering grounds; and some of the proposals are quite feasible. It has also been proposed to distribute in separate pipes the pure rain-water for "drinking and cooking," and the present Thames water for all ordinary purposes.‡

The safe inference from all the evidence that has been accumulated is that the population of London will not be limited by the lack of water. The supply of water of the best quality can always be commanded in these islands through the providential powers of nature.

The only question that arises is as to the quantity and the quality of the water with which the population should be satisfied. The daily consumption in London is at the rate of 32 gallons a head; from which 6 gallons may be struck as the consumption in road watering and manufactures. There is a certain consumption by animals of various kinds;§ and the washing of carriages is a considerable item in some districts. The waterclosets are large consumers; it has been estimated that 10 gallons a head is actually taken by the system now in operation.‖ The residue is taken for cleaning the house, for cleansing sinks, and for washing up the services in daily use at table, for cooking, for ablution, for baths, and for washing linen; much is wasted. The amount of water actually drunk in the crude state is inconsiderable. The daily allowance in Government transports is 3 quarts a day of filtered water for each person out of the tropics, and 4 quarts or one gallon in the tropics, for all purposes. Under ordinary circumstances there is no stipulated allowance in Her Majesty's navy; the reduced allowance may be a gallon, half a gallon, or even under great straits a pint a day to each person. The maximum daily consumption of liquids drunk by men, women, and children all round cannot exceed a gallon a day in hot weather. It is evident then, that while it is of the utmost importance that the drinking water should be pure, it would be exceedingly unsafe to supply people in their homes with 26 gallons a day of contaminated water if even all the water they drank was perfectly pure. Who, acquainted with the subject, can for a moment suppose it safe to take a bath, to wash the hands, to cook, to wash china services, to wash linen, in river waters containing matter so diffusible as cholera or fever germs. The mere contiguity of the Lambeth houses to the Southwark houses supplied with diluted sewage in the water was evidently attended with danger, how much more dangerous then would be the actual presence in the house of contaminated river waters meeting the inmate at every hour of the day in some shape or other? The diffusion of such matter in the dry dusty

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* Report of Select Committee on East London Water Bills, Session of 1867. P. viii. In the Report on "Supply of Water to London from the sources of the River Severn," November 1865, J. F. Bateman, C.E., F.R.S., states that during September 1865 the quantity of water flowing down the Thames at Hampton was carefully measured, and found to be 300,000,000 gallons, or 1,363,036 cubic metres.

† I set down for this mere illustration the average covered area at 600 square feet, on the authority of Mr. Williams, who has conducted some official inquiries as to the condition of London houses.

‡ "A new idea for the water supply of towns," by A. S. Ormsby, C.E.

§ A horse drinks 8 to 12 gallons daily, and ought to have 4 more for washing. ("Practical Hygiene," by Dr. Parkes, p. 3.)

‖ By the estimate of the engineers of 6 water companies, 23 out of 56 million gallons, or 40 per cent. of the water for domestic service, is consumed in waterclosets. The New River sets down two thirds of the domestic supply to this head.

streets during hot weather might be regarded with some apprehension. The conception of the supply of two kinds of water—the one pure the other impure—could only be entertained if there was no alternative, but such an alternative in London evidently exists.

As much water runs to waste apparently, the actual consumption might be reduced: upon the other hand extensions of its use are expected from various sources. The workmen of London rarely take baths of any kind; and the same may be said indeed of a large part of the population. Population has been distributed into three classes: (1) those who bathe daily; (2) those who very rarely bathe, but wash the hands and face daily; and (3) those who never wash at all, or wash rarely. The linen of all classes sympathizes with the skin; and the consumption of water will necessarily increase as members of the third class pass into the second, and members of the second into the first class. The intelligent artizan now covered with a grimy coat of dust and dirt in manufactories would be glad to pass through such a purifying shower of warm water as could be easily supplied wherever steam engines and large fires are found. Again, many water-closets at present get little water; and so long as these machines remain in use many gallons of water are required not only to keep houses but sewers sweet, and to carry sewage down to the natural drainage channels. There is no ground, therefore, for believing that the daily demand of 32 gallons of water per head of population will diminish, nay, it may increase to the same dimensions as in Glasgow.

Now, one thing is worthy of great weight; for all purposes of ablution, for tea-making, for washing, for manufacturing purposes, for steam boilers, and for every conceivable use, except one, it is universally admitted that soft is preferable to hard water. Soft water gives a silken softness to the skin, while hard water hardens and roughens the epidermis, to which it fastens soapy impurities. Dr. Frankland shows* that 212 lbs. of good hard soap are destroyed by 100,000 lbs. of the best Thames water in washing before any useful detergent effect is produced; the same amount of the Kent Company's chalk water destroys 265 lbs. of hard soap; the waters of Glasgow destroy only 4 lbs.; the waters of the Welsh streams referred to, about 2 lbs., according to the determination of Dr. Robert Dundas Thomson, F.R.S.† There is no dispute about the superiority of soft water so far as 31 gallons of the daily supply go. The debate arises on the residual gallon, or half gallon, or quart, or pint, which is drunk in the crude state as cold water. Pure chalk water, hard as it is, contains certain lime and other salts with carbonic acid in solution, which make it, according to some authorities, not only a more agreeable beverage than the fresh water of a mountain stream but more salubrious. It supplies ingredients which are required for the bones, say they, while its adversaries point to stone and other diseases incident to the dwellers in calcareous formations. Lists of towns getting hard or soft water are cited to show that the mortality is higher or lower in support of either side; and notably the mortality of Glasgow and of Manchester are adduced by one party to prove that the mortality since the introduction of soft water is still much higher than the mortality of London, while by another party, in evidence of the effects of soft water, their former sufferings and their recent exemptions from cholera are noted.

If ancient popularity could settle the question, the sparkling waters of city pumps near churchyards, charged with carbonic acid and nitrates, would bear the bell, not only from the fresh water of mountain streams and the waters of the Thames, but from the waters of chalk formations by some so much applauded.

The precise effect of hard waters uncontaminated with sewage and of fresh soft water on health has not yet been determined; it is a difficult scientific problem, which requires careful analysis by statists and chemists.

The choice, however, does not lie practically between soft and hard waters for drink. It is quite certain that fresh soft water is an agreeable salubrious drink; and that hard water, like any mineral water, can be medicated in every house so as to render its composition suitable to various tastes; to add chalk, carbonic acid, and even cooling nitrates or nitrites is an easy task, and the composition might be

* See his excellent paper "On the proposed water supply for the Metropolis" [p. 13.], read before the Royal Institution of Great Britain, April 3d, 1868.

† Bateman on Metropolis Water Supply, p. 30.

varied with any kind of mineral impregnation, it being certain that the same doses would not suit every constitution.

The choice in the present case lies practically between the Thames or the Lea Waters, carefully filtered by the existing London Coupanies, and fresh soft water.

Now we are bound to give these companies credit for having, since 1849, made great efforts to get their waters from the Thames and the Lea of the best qualities. They have, as a general rule, done their utmost to comply with the Water Act of 1852 in all its requirements. There is this patent fact, that the Thames Companies, instead of drawing their supplies from the Thames at London Bridge or Hungerford Bridge, or Battersea or Hammersmith, have, by going above Teddington Lock, got fairly rid of the foul waters seething with the sewage of three millions of people. From that danger London is happily delivered. The first Rivers Commission—Mr. Rawlinson, Mr. Harrison, and Professor Way—has done excellent service in showing how the Thames and the Lea may be protected from the direct sewage of the hundreds of thousands of people living in the valleys of the Thames and the Lea, above the intake of the existing water supply.* The water is filtered; and it is probable that the companies may consent, in conformity with the general wish, to supply their clients with water on the constant system, of which, before Mr. Ayrton's Committee, they enumerated the difficulties without pronouncing them insuperable. The mitigated form of the cholera epidemic in every part except in the region that suffered from the disastrous accident in East London, is satisfactory evidence of an unquestionable amelioration.

But so long as the watercloset system is in use in the upper valley, the Thames water below can never be free from appreciable accidental contamination: some organic matter is oxydized in running streams, but as ova of worms, spores, zymotic germs, developed, some of them, as Pasteur has shown in the absence of oxygen, are not destroyed by oxygen, they will inevitably, in epidemic and epizootic seasons, be brought down and distributed by the water. They cannot in some of their forms be kept out; and I agree with Sir Benjamin Brodie that it is "simply impossible" to remove all noxious qualities† in short runs of river water. The probable effects of the land on sewage, as well as the fixity of some organic compounds, are authentically expressed by this witness in his answer to Professor Way.

Q. 1497. Do you apprehend that if sewage was applied to a sufficient area of land, the liquid running off would be equally likely to foul the river?—Speaking not from my own experience, but from such information as I possess, I should say that it undoubtedly would not be equally likely. I do not think that it could be asserted that all injurious matter was removed from the water by placing it on the land, but certainly it must be very much diminished; there is very much more chance of getting rid of it by that means than by throwing the sewage into the river. With regard to the oxydation, we know that to destroy organic matter the most powerful oxydizing agents are required; we must boil it with nitric acid and chloric acid and the most perfect chemical agents. To think to get rid of the organic matter by exposure to the air for a short time is absurd; when once the matter was brought into a liquid condition on to the land the oxydizing action would be very much more rapid upon it, because there would be a very much larger surface exposed to the action.

The description by the Commissioners of the pollution of the Thames produces a painful impression,‡ which is diminished but by no means removed by the proposal to distribute the sewage by irrigation over fields, previous to its discharge into the stream. "Sewage water," they say, "if passed over a sufficient "area of grass land, passes off, bright, tasteless, and without smell." That is true, when the process is performed with the utmost care under favourable circumstances; but the process is unfortunately subject to a thousand accidents through every day of the year, as they have clearly themselves shown; and the water, though clear and bright in a stream, may be animated by countless legions of invisible molecules most destructive to human life. Mr. Bailey Denton, Engineer

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* The population in 1861 of the Lea valley, above the intake of the New River Company, was 73,526; above the intake of the East London Company, 153,030; while the population of the Thames above the intakes was 888,088. This population must now exceed eleven hundred thousand.

† Evidence in 1st Report of Pollution of Rivers Commission, Q. 1483–1502.

‡ 1st Report of Pollution of Rivers Commission, pp. 12–18.

to the Land Drainage Company, who understands this subject, after fortifying his opinions by the testimony of Dr. Odling, and of Dr. Voelcker, the agricultural chemist, goes on to say: "those who are practically acquainted with land and "the working of irrigation know that unless the soil is of a very free character, "with a quick natural drainage, or, being more retentive, is closely underdrained, "there are times when the land becomes saturated to the surface, and when any "additional liquid poured upon it will flow over the surface into the nearest "ditches, and by them be conducted into the rivers in an unchanged condition." He states also, that the soil being saturated, allows the ingredients to pass through it in winter, when vegetation is dormant, unclarified; he dwells on the difficulties of irrigation all the year round; and concludes that "practical objections go far "to satisfy practical men that the sewage of towns and populous places cannot "be rendered harmless, though it may be made profitable."*

Accepting the existing reign of the water-closet, the sewage-irrigation remedy for rivers as sources of water-supply is a policy of despair.

With the rapidly increasing population of this country, we have arrived at a pass from which there is but one evident escape: the pure waters, which are the very life-blood of cities, must be sought in the hills or river-heads, and be brought where they are required by those admirable and wonderful engineering operations which Providence has placed at our disposal; and England, the native home of canals and railways, is sure of success in obtaining aqueducts to rival and to surpass, in utility as well as grandeur, those of imperial Rome. Here is no question of a transitory passion, or of ministering to a passing want, but to an eternal necessity of our nature. By a whole host of terrible diseases God forbids the consumption of contaminated waters.

REVISED ESTIMATES by Mr. BATEMAN, C.E., for SUPPLY of LONDON with WATER, on the CONSTANT SYSTEM and on HIGH PRESSURE.

1. Estimate for supply of 300 million gallons of fresh water from Wales to 6,000,000 people in and around London. Required capital, 11,000,000*l.*; interest of same at 4 per cent., 440,000*l.*; dividends to existing companies, 450,000*l.*; working expenses, 300,000*l.*; aggregate annual expenditure 1,190,000*l.* As a set off there are deductions for sale of superfluous property of company, and sale of water on line of aqueduct for trading and other purposes.
2. Estimate for *aqueduct* to supply daily 220 *million* gallons, for reservoirs and pipes to supply 130 million gallons daily, 8,600,000*l.*; annual expenditure for interest, 344,000*l.*; existing dividends of companies, 450,000*l.*; working expenses, 230,000*l.*; aggregate expenses, 1,024,000*l.* Then 300,000*l.* are written off for annual value of surplus property of companies and profits of sale of water on the line of aqueduct and beyond Metropolitan area.
3. It appears further that, if no waterworks existed in London, 100 million gallons of fresh water a day could be supplied from the same sources for an annual expenditure of 470,000*l.*, covering interest of capital (4 per cent. on 8,000,000*l.*) and working expenses at an annual charge of 150,000*l.*:

	£
Aqueducts and reservoirs, &c. -	6,500,000
Pipes to houses - - -	1,500,000
	£ 8,000,000

The estimate may be put in another form, which will probably be more intelligible to the non-professional reader. The dividends of the eight companies for the year 1866 were by their own returns 432,371*l.*; the market value of their shares, by Crossley's list, Feb. 8, 1868, taking the New River (not quoted) at 20 years' purchase, and the highest quotations for the rest, was 8,220,400*l.* They have contracted loans, &c. returned at 2,367,144*l.*, the interest of which is deducted before the dividends are declared. With the dividends the interest would make the annual clear revenue about 538,729*l.*, or about 5 per

* Letter to Earl of Derby on Water Question, pp. 4–8.

cent. on the share capital and loans engaged in the works, and amounting to 10,587,544*l.*

The able staff of engineers of the existing companies would no doubt be retained, but set down as compensations for contingent losses of office from consolidation of work and for other contingencies, 179,600*l.* Then the capital to purchase the companies' shares, &c. would be 8,400,000*l.*; and the capital on Mr. Bateman's smaller scheme (for 130 million gallons daily) would be 8,600,000*l.*: the total capital to be raised in the course of five or six years would be 17,000,000*l.*, secured on the water-rents of London. This is exclusive of the existing loans, &c. amounting to 2,367,144*l.*

If 17,000,000*l.* had to be raised by the Metropolitan Board it would cost, at 5 per cent., 850,000*l.*; at 4 per cent., 680,000*l.*; at 3½ per cent., which is a higher rate than consols or railways in the aggregate now pay, it would yield 595,000*l.* a year; and the security would be found to be perfect. The cost of working is set down at 150,000*l.*; which, without any of the sets-off, taking interest of capital at 800,000*l.*, would make the annual cost 950,000*l.* With the set-off only of annual value of 50,000*l.* for sale of superfluous works, the annual charge would be 900,000*l.* for 130 million gallons of sound soft water daily delivered at high pressure on the constant system; while the water-rents for 96,000,000 gallons of hard water subject to sewer contamination liable to increase, delivered on the intermittent system generally, were 799,536*l.* in 1866.

The soft pure water, looking to all its economic uses, would certainly be worth twice as much as hard river water, if both were sold in the open market. And if Mr. Bateman's estimates are right, the old water could not long compete with the new water in London with any chance of keeping its ground; but the struggle would be disastrous, and the companies deserve compensation for their great services to the community under the great difficulties that have sprung up from the pollution of rivers. Some of their works might perhaps be maintained as a reserve against contingencies. The present prices are monopoly prices in an article of as great necessity as bread, or greater, and could not be sustained for ever; but the only course, as competition cannot be brought into the field, is for London within the police district to take the supply of water into its own hands. Such a fine stream of water as has been referred to would enhance the relative value of all the land for ever within the area of supply, and would thus be for the especial advantage not so much of the occupiers as of the leaseholders and ground landlords of the 440,000 acres of building land within a circle having a radius of fifteen miles from Charing Cross. At 600*l.* an acre the rateable property in 1861 was worth 264,000,000*l.*; and this was rapidly increasing. The annual value of the rateable property on 77,997 acres within the Weekly Tables was 16,600,682*l.* in 1867; and this alone, at 18 years' purchase, would be worth 300 million pounds sterling. The annual value on which the police rate was assesssd in the year 1866 was 16,217,302*l.*, in the year 1867 it was 16,600,682*l.* Now the expenditure on a pure water supply would necessarily, instead of lessening, enhance the value, as it would be reproductive.

Then the capital advantage of the supply by gravitation consists in this, that the expense does not increase in any proportion to the quantity of water consumed; for 8,600,000*l.* Mr. Bateman brings 130 million gallons of water daily to London, for 11,000,000*l.* he brings 300 million gallons a day; and the increase of the subsequent and of the working expenses is comparatively inconsiderable; simple gravitation does the work.

II.—CHOLERA FIELDS.

Cholera was felt all over the kingdom, and while the deaths by the disease in London were 5596, the deaths in the other ten divisions of England and Wales were 8782. The population of the ten divisions is six times the population of London, and at the London rate the deaths by cholera would have amounted to 33,576. The mortality in the ten divisions was at the rate of 5 in 10,000 against 18 in London.

The disease was only fatal to any considerable extent in certain regions, which may be called cholera fields, as here the centres of activity were all in direct communication with each other, and were surrounded by free border-lands.

1. *London Cholera Field.*

East London was the centre of this field, which extended over West Ham, and with little severity to Romford and Rochford, including Southend in Essex; to Brentford and Edmonton along the Brent and the Lea; down the Thames and round the coast of Kent to Dartford, Gravesend, Hoo, Malling, Faversham, Milton, Sheppey, Thanet, Eastry, Dover, and Elham; up the Medway to Chatham, Rochester, and Maidstone; up the Thames to Richmond and Kingston, and across Surrey to Croydon and Godstone, where some navvies and their families at Oxted, on a new railway line, suffered severely.

The epidemic was much less fatal in the border-land of this field than it was in either 1849 or in 1854; the deaths were not by a fifth part so numerous as in 1849. The notes contain some interesting information. The water pollution in a Margate lodging-house and its effects are well described.

2. *Portsmouth Cholera Field.*

Portsmouth, Southampton, and Newport in the Isle of Wight, are the centres of this field, which runs along the Southampton waters, up the Medina, and against Spithead. The deaths by cholera in the districts of Southampton, Portsea Island, Alverstoke, Fareham, and the Isle of Wight, were 382; and what is to be regretted is, that the ravages of the epidemic were much more fatal in 1866 than they were in 1854. Southampton, it may be inferred from the Report of Professor Parkes, has adopted precautions which may protect it for the future; and no time should be lost for assisting, and compelling, if necessary, the authorities of Portsmouth to reform altogether their sanitary arrangements, on which in time of war the health of the British fleets and the safety of the kingdom may depend. Salisbury, which is connected with this field by the Avon, affords a striking illustration of the results of sanitary measures; the deaths by cholera in this district of 9039 inhabitants were 165, 15, and 2 in the three last epidemics. The water supply and the drainage were improved in the interval.*

The mortality in nearly all the districts of the South-eastern, Eastern, and the South Midland Counties was very low, and the mild precautions to prevent the diffusion of the plague were successful.

The prevalence of cholera in the Isle of Wight is undoubtedly due to the bad water supply. The state of things described in the note under Newport † is neither creditable to the intelligence nor to the public spirit of the authorities. This small town, which ought to be healthy, has for many years been notoriously the reverse, for it has been the nursery of the various kinds of zymotic disease.

3. *Exeter Cholera Field.*

It is very gratifying to find that Plymouth, which had been a great cholera field in 1849, is so no longer; and has thus been more successful than its rival at Portsmouth. Unfortunately Devon has, however, still its cholera field. Exeter and the three neighbouring districts of St. Thomas, Newton Abbott, and Totnes

* See Communication from A. B. Middleton, Esq., M.R.C.S., in Appendix, p. 218.
† Appendix, p. 214.

lost 427 lives by cholera. Dr. Shapter will probably continue his sanitary history of Exeter, and tell the world of what errors in hygiene this beautiful city has been the victim. The partial and fatal outbreak of cholera in the Paignton sub-district of Totnes is well described by Dr. Pridham.* He explains the various circumstances which contributed to the dissemination of the disease. Stoke Gabriel, on the east bank of the Dart river, has an impervious substratum of slate and greenstone; and the rain-fall of the surrounding hills descends through watercourses which receive the impure surface drainage of the fields and the village in their course. The impurities accumulated in the dry weather of 1866 were afterwards washed down by the rain, and thus zymotic matters were disseminated.

4. *Bristol Cholera Field.*

This is another extinct volcano. The deaths by cholera in the Bristol, Clifton, and Bedminster districts amounted to 1435 in the year 1849, and to 51 in the year 1866. The measures carried into effect under the guidance of Mr. Davies, the admirable health officer of Bristol, are well described in the Report of the Health Committee:† and Dr. W. Budd, whose clear intelligence has contributed to the adoption of disinfection of the flux in cholera, and in typhoid fever has also described the measures adopted at Bristol in an excellent paper.‡

5. *Wolverhampton Cholera Field.*

Here again cholera, which in five districts (Wolverhampton, Walsall, West Bromwich, Dudley, and Stourbridge) slew 2527 people in the epidemic of 1849, was foiled. The deaths ascribed to cholera were 25 in the epidemic of 1866. In the potteries the change was equally great. The deaths by cholera in Newcastle-under-Lyme, Wolstanton, and Stoke-upon-Trent were 423 in the first, 10 in the last epidemic. A fresh water supply has been carried into South Staffordshire, and their success hitherto will, we may hope, encourage this energetic people to adopt such measures as will render the whole of the once fatal black region sweet and salubrious, if not fair to look upon, although even in this direction much may be done.

6. *Liverpool Cholera Field.*

Liverpool itself was the centre, and in the two districts of Liverpool and West Derby 1989 persons died of cholera. Judicious measures of disinfection were carried out under the supervision of Dr. Trench, who has described the epidemic in his annual report.§ Had these active steps not been taken, the mortality by cholera would undoubtedly have been greater; as it was, the death-rate was not a third of that of 1849, but it was unfortunately higher than the mortality in 1854.

Districts.	Deaths by Cholera to 10,000 Persons living.		
	1849.	1854.	1866.
Liverpool - - -	163	41	54
West Derby - -	80	12	18
Wirral - - - }	26	7	28
Birkenhead - - }			11
Manchester - -	39	1	2
Salford - - -	28	3	2

* Appendix, p. 220.
† Appendix, p. 224.
‡ See Paper in *British Medical Journal* of 13th April 1867.
§ Appendix, p. 229.

Dr. Trench describes the judicious and humane measures adopted in dealing with the German emigrants; and very properly denounces the dreadful consequences of drunken wakes over cholera corpses.

It is impossible not to connect the differences in the mortality by cholera in Manchester and Liverpool in some way with the differences in the water supply of the two populations.

Dr. Baylis in Birkenhead very effectively combated the disease, and the mortality there was kept down as low as 11 in 10,000, while it was 28 in the rest of the Wirrall district.

Wigan is supplied with water of a good quality by the corporation, yet the deaths by cholera in the district were 137, and more numerous than in any other district of Lancashire, except Liverpool and West Derby. Wigan district includes five outlying sub-districts, where 79 of the deaths occurred, chiefly among colliers, who are negligent and often dirty in their habits. There were 58 deaths in the Wigan sub-district, and the families of coal-miners and weavers were the principal sufferers. Prior to the outbreak in Wigan, as elsewhere when the water supply is not compulsory, the people in parts of the town continued to draw from wells all their water, which upon analysis was condemned, and the wells were subsequently closed. The progress of the epidemic is described in the notes.*

474 deaths from cholera occurred all over the other populous districts of Lancashire, where sanitary arrangements have been hitherto in an unsatisfactory state.

7. *Hull Cholera Field.*

Cholera, which raged with dreadful severity in this region in 1849, found no footing here in 1866; and the deaths by cholera in Hull and Sculcoates were only 21, in all Yorkshire 358. The few cases in Hull are described in the notes, and occurred under peculiar circumstances. The water supply, now derived almost entirely from natural springs and artesian wells, is not liable to contamination. In the epidemic of 1849 cholera killed 1178 persons in Hull; the water supply was drawn then directly from the tidal river polluted with sewage. In conjunction with the health officer, excellent preliminary arrangements were made in Leeds, where 1439 persons died of cholera in the epidemic of 1849, and 48 in 1854, and 14 in 1866.

8. *Tynemouth Cholera Field.*

Here cholera reappeared with some rigour at Tynemouth, where 167 fatal cases occurred. The water supply here again was to blame, but the whole of the particulars have not transpired; it is stated that the North Shields Water Company pumped a part of the supply from the Preston colliery, and that suspicion attaches to the Preston reservoir. The remarkable explosion of cholera in 1853 at Newcastle has been already described; then Tynemouth, which had lost 815 of its inhabitants by cholera in 1849, suffered little in 1853. At Sunderland, where the disease was once so fatal, 92 deaths occurred, and in all the county of Durham the deaths were 353. The water supply of the colliery districts of the county is generally bad, and the sanitary arrangements of the colliers' dwellings, and (to use an Indian term) the conservancy, is in a high degree unsatisfactory. The Washington Coal Company, it is gratifying to say, deserves honourable mention; since the epidemic they have liberally supplied all their cottages with water from the colliery. It would be well if all the other great colliery companies and firms would go and do likewise.

9. *South Wales Cholera Field.*

This was described under the name of the Merthyr Tydfil field in the cholera Report for 1849, and justly so, for Merthyr Tydfil was then the great centre of the Welsh attack, and the mortality there was the highest in the kingdom. It was at the rate of 251 deaths to 10,000 inhabitants; in 1854 the rate fell to 59, and in 1866 to 22. Merthyr Tydfil was in the most deplorable condition in 1849, and Sir Henry T. de la Beche, after noticing that the situation was open, airy, and

* Appendix, p. 233.

500 feet above the docks at Cardiff, says this camp of industry was entirely undrained, and that from "the scarcity of privies," some parts of the town were completely covered with defilements, soiling the air and polluting the shallow wells from which the people drank. The place has been greatly improved; but bad habits are not easily broken; still much evil remained in 1866; the germs of cholera found, says Mr. Dyke,* "places where all the necessary elements abounded, "in which they could propagate themselves in infinite mulitudes, for everywhere "human excrements were to be seen or smelt." Notwithstanding these subsisting evils, the mortality was less than a tenth of the mortality in 1849. During the interval an able health officer has been appointed. And now the water supply both of Merthyr Tydfil and Aberdare are pronounced satisfactory. "The water used "for all domestic purposes by all the inhabitants of the town * * * * is "derived directly from the lesser Taff river, five miles north of the town, dis-"charged from the main supply-pipe into two uncovered receivers at Penybryn, "thence it passed into uncovered filtering basins, and then into the covered re-"servoirs from which Merthyr and Dowlais are supplied. It is true the position "of these open receivers and filtering beds on the sloping hill side above Penydarren "renders them liable to receive from the winds that blow over them whatever of "the seeds of disease may be conveyed through the air; yet it is scarcely possible "to imagine such should have been the case in this epidemic, when we remember "the sparseness of the first cases, spread over a widely extended surface of hill "and dale."

Mr. Dyke subsequently states that "in August a number of persons used water "from wells which, being situated near old and deep cesspools, were contaminated "by sewage. As to the pernicious influence of such a water, Mr. Allday states that "he was in attendance upon a tradesman who was affected with and died of "cholera; his wife and son were also ill of the disease, but recovered. This family "used the water of a well which, upon inquiry at the time, Mr. Allday ascertained "became most offensive when kept for 24 hours."

It is noticed that in parts of Wales, privies not being generally in use, accumulations of the same kind as in India strew the soil, and in cases of typhoid fever, of diarrhœa, or of cholera, the disease dust is either blown about in dry seasons, or is washed into the wells, ponds, or streams in wet weather. As the population increases the quantity of this stuff increases; and even when it is minute in quantity in the water distributed to multitudes of people, the chance of infection, however small as regards an individual, grows considerable when multiplied by thousands.

The three districts of Swansea, Neath, and Llanelly suffered severely from the epidemic; and the mortality in the three regions was at the respective rates in 10,000 of 88, 79, and 76. The region lies round the rivers Tawe and Burry, which flow into Swansea Bay on the one hand and Carmarthen Bay on the other. The population is engaged in mining and smelting chiefly, but it is partially maritime. The health officer for the borough of Swansea, Mr. Davies,† reports especially on the area extending over the three sub-districts of Llansamlet in Neath, where nearly the whole of the deaths occurred among the mining population; of Llangafelach and of Swansea. Females suffered most in Llangafelach among the families of the mining and metal-working population; there the epidemic broke out on May 27th, and ravaged Morriston, where the sanitary condition of the extra municipal part was very defective. "The cesspool system was general, but on the sides of the hill above Morriston, where the epidemic was most severe, there was a great want of even privy accommodation; the houses thinly scattered about, but sometimes in short rows, were of a poor description. Another feature in this district deserving of notice is the almost entire absence of grass vegetation in consequence of copper smoke, and as a result the absence of the compensating advantage it would have afforded when refuse was thrown on the surface of the ground around the dwellings. Within the municipal boundary there was a supply of water from the new Swansea waterworks, and the deaths from cholera within and without the borough boundary in the Llangafelach sub-district were as follows:

Within the borough	-	51 deaths.
Outside „	-	100 deaths."

* Appendix, p. 243.
† Appendix, p. 246.

The service reservoir of the new water supply of Swansea is on the hill above Morriston, 291 feet above the tide level; and the water is drawn from a river fed by springs rising in a gathering ground of mountains occupied by a few cotter farmers.

A haulier had died of cholera in Fleet-street, Swansea, on May 14th.

A death occurred on July 9th, but the Swansea outbreak began on July 23d, nearly a month earlier than the outbreak in Merthyr Tydfil. It had begun previously in the Morriston Valley above Swansea, and no doubt diarrhœa from the cholera matter extensively prevailed over the whole region. The son, age 3, daughter, age 1, and the wife of a tinplate refiner, age 32, died of cholera (she in 12 hours) on the 20th, 21st, and 23d respectively at Tyrprendy; one case had occurred before on May 27th, and five cases in June about the same region. The old supply of water open to suspicion was cut off on July 28th by order of the health officer, shortly after the outbreak; and it was assumed that the new supply from the hills was faultless. The new supply was completed in 1867, and if the cotters are removed from the gathering ground it will probably supply unexceptionable water.

The health officer remarks on the imperfect drainage of the Irish quarter, which suffered exceptionally, as Church-street, St. Giles, formerly did in London.

Llanelly suffered very severely; in the district the deaths by cholera were 232. Dr. Thomas * describes the water supply and the drainage as equally defective:—

"The only special causes present in all the localities were decomposing animal "and vegetable matters, the evacuations of man and animals, polluting the air and "the water too. To the neglect of a systematic and thorough removal of these "manures into the earth, particularly the excrements of man, I am disposed to "attribute the heavy epidemic of cholera that visited this place, and to the same "causes the common presence of typhoid fever over the whole district.

"The river water was suspected as a cause in the attacks at Felin Foel, as well "as at Penygar, a small place containing about 50 inhabitants, who also up to this "time had used the river water, and to prevent the people using it several cart-"loads of lime were thrown into it above the village; whether from this circum-"stance or not I cannot say, but the attacks sensibly decreased in number and "severity immediately thereon."

Mr. James Rogers, M.R.C.S., of Swansea, describes vividly the defects of water supply and of drainage in the sub-districts of Neath.† The houses are especially defective. In the worst parts, he says, from his experience, whatever the epidemic is, it persistently sticks to the place; scarlatina, measles, whooping-cough, small-pox, each rages in its turn.

The privy is undoubtedly an advance in civilization even in its imperfect stage, as it prevents the contamination of the streams; but it is usually a nuisance without the application of dry earth, which disinfects and prepares the soil for the food of vegetation. Wales, it is clear, wants a series of sermons by the disciples of the Rev. H. Moule on the divine law which, in its principle, has never been abrogated, but is part of the eternal law of nature, and is enforced, when violated, by the sacrifice of thousands of lives. Wales is an example. This law of purity has, for a religious people like the Welsh, the highest religious sanction: "For the Lord thy God walketh in the midst of thy camp * * "therefore shall thy camp be holy."‡

10. *Cholera in the Ten Great Cities.*

Deaths from cholera occurred in every one of the ten great cities of England; but the mortality was high in none of them except in Liverpool, and in London, or rather the East end of London.

In the epidemic of 1848–49 the mortality was high in every one of these ten cities, except Birmingham, and perhaps Sheffield.

In the epidemic of 1853–54 the mortality was still at heavy but reduced rates in London and Liverpool. Newcastle-upon-Tyne suffered excessively in 1853, for reasons which are assigned elsewhere.

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* Appendix, p. 248.
† Appendix, p. 244.
‡ Deuteronomy 23; v. 14.

11. *Cholera in the Eleven Divisions of England.*

The mortality of all England was at the rate of 7 deaths by cholera in 10,000 persons living.

In the three Midland Divisions, the South Midland, North Midland, and West Midland Divisions, the deaths by cholera were at the rate of 1 in 10,000; in Yorkshire 2, in the South-western Division 3, in the South-eastern and the Eastern Divisions 4, in the Northern Division 5, in the North-western Division (Lancashire and Cheshire) 9, in London 18, in the Welsh Division (Wales with Monmouthshire) 18 in every 10,000.

What a strong contrast this presents in every Division to the higher mortality of the epidemic of 1849. It was only in Wales that the disease was to any extent more fatal in 1866 than it was in 1854.*

12. *Mortality from Cholera in the United Kingdom.*

The deaths in the United Kingdom were about 17,793; and the mortality by the disease in the year 1866 was at the rate of 6 deaths in every 10,000 inhabitants.

The reduction of mortality by the epidemic is not due to any diminution in the force of the cholera virus, as may be inferred from the severity of its ravages in neighbouring kingdoms.

	Estimated Population 1866.	Deaths registered from Cholera in 1866.	Deaths from Cholera to 10,000 of Population.
United Kingdom - -	29,946,058	17,793	6
England and Wales - - -	21,210,020	14,378	7
Scotland* - - - -	3,153,413	1,000	3
Ireland* - - - -	5,582,625	2,415	4

* Estimate for Scotland supplied by Dr. Stark; registered numbers for Ireland by Dr. Burke.

III.—SCIENTIFIC ELEMENTS OF CHOLERA.

1. *Elevation.*

Cholera was very unequally distributed over England. 14,378 people were slain by the disease in 641 districts; and of that number 10,889 fell in 37 districts of London, and in 24 other town districts; 3489 in 342 districts; while in 238 districts no death from cholera was recorded.

All the districts, with the exceptions of Wigan and Merthyr Tydfil, were seaport towns, or districts in their immediate neighbourhood; the populations were dense, and were nearly all dwelling on the lower alluvial soils of the kingdom. These correlations have been observed in all the epidemics. The exceptions are accounted for by such peculiar circumstances as the mortality around the Broad-street pump in 1854, and in St. Giles's, London, in 1849, where either the people were excessively dirty and crowded, or took in water large doses of cholera matter in a very active state.

To get a clear idea of the operation of elevation it is necessary to exclude the notion that the mere fact that people live a few feet above the sea level has in itself any direct influence on health. It is the indirect influence of elevation on the air and water of a place that produces the surprising effects observed.

* Table 4. in Appendix, p. 16.

The zymotic matter being organized lives irregularly distributed in air or in water. It is in suspension either in the atmosphere or in the waters; and as it is necessarily under the influence of gravitation, it is as a general rule in larger quantities in the lower than it is in the higher strata. Pasteur has proved this by experiment as far as the atmosphere is concerned. He deposited at the Academy of Sciences 73 flasks, each holding a quarter of a litre; they were carefully prepared so as to exclude air, and were one third part full of limpid yeast water, susceptible in the highest degree of the influence of ferments. Twenty flasks were opened in the open country at the foot of the Jura; 20 were opened on the Jura at the height of 850 metres, and 20 were opened at Montanvert near the *Mer de glace* at an elevation of 2000 metres. Of the 20 opened on Montanvert, only 1 sustained any alteration from the air admitted; of the 20 receiving air on the top of the Jura, 5 were affected; and of the 20 opened on the plain, 8 were thrown into fermentation. The greatest precautions were taken and are required in these experiments.* He only closed the other 13 flasks, opened on the heights, after having left them in the air of the bedroom of the little inn at *Montanvert* for the night; in 10 of the 13 infusoria were found. Thus the atmosphere is in some parts pure; in other parts it is pervaded by mists of living matter; and the density of these mists increases near the earth, as would be indeed the case in the unorganized water globules of clouds, if they were not in the lower strata volatilized by the heat of the earth into transparent vapor.

The law regulating the distribution of cholera matter in water is very easily shown by mixing the cholera flux with 10 times, 100 times, 500 times its bulk of distilled water in glass tubes a metre long†; after agitation the liquid is opalescent, and grows denser and more opaque as the bottom is approached, where there is a flocculent deposit if the proportion of cholrine is considerable. (See p. xiv.)

Now the waters of London form a continuous communicating sheet resting on the London clay under gravel and other ground, and as the houses and the water sheet rise from the river brink up to Hampstead and Norwood, all round the London basin, it is pretty certain that sewage matters finding their way into that water exist in greater proportions in the underground water of the low than in the underground water of the high districts. The wells of the undrained low level of South London were excessively impure in 1849 and in 1854; since those dates the soil has been drained, and that is equivalent to elevating it.

The mains and pipes of the waterworks form a subsoil network all over the London area; each company has its centre of supply, but in 1849 and even in 1854 their subdivisions may be treated as parts of one great homogeneous system for the present purpose. Then round the Thames at the bottom of the basin, to get definite ideas, take an area under 20 feet of elevation; a second area of 20 and under 40 feet of elevation; a third of 40 and under 60 feet; a fourth of 60 and under 80 feet; a fifth of 80 feet and upwards, all permeated by water mains and pipes filled by steam power, with the waters of the Thames and of the Lea containing various sewage ferments, and among others the cholera ferment in suspension; then it is plain that if the proportions of the cholera ferment in water as in air vary in the various belts it will be densest in the lowest belts, and the mortality it occasions will increase in descending on every successive terrace of the metropolis. This was observed both in the epidemic of 1849 and in that of 1854.

The greater the quantity of cholrine in a given quantity of water, the greater is the inequality in its distribution; thus with one part of cholera flux in ten of a water solution a considerable quantity of the matter falls to the bottom; with the strength of 1 in 100 or a portion of 1 in 1000 nearly the whole matter remains after shaking pretty evenly in suspension as far as the eye can judge.

There was a direct relation between the elevation of the ground and the mortality of cholera when the waters were saturated largely with sewage, and in 1854 a

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* Pasteur, Annales des Sciences Naturelles, 4e série, Zoologie, tome xvi., pp. 76–8.

† For displaying the distribution of suspended matter in tubes, sewage water or Thames water at the old intakes of the water companies may be used.

similar relation obtained in the fields of the several water companies so far as they could be distinguished.

In 1866 it becomes necessary to separate the supplies of the several companies, and it is seen that when this is done the same general law prevails. The mortality in the East London sub-districts was at the rate of 103 in 10,000 living at elevations below 20 feet; it was 71 at the elevation 20–40 feet; 20 at 40–60 feet, and 4 at 60–80 feet above Trinity high-water mark.

In measuring elevation the height should be taken above the level from which the water is lifted, but in 1849 I took the elevations from the ground. The mortality was inversely as the elevation; thus let e be any elevation and e' any higher elevation of the house ground, c' being the mortality by cholera at the higher, and c the mortality by cholera at the lower elevation, then $e + a : e' + a :: c' : c = \frac{e' + a}{e + a} \cdot c'$ expresses the general relation between the mortality by cholera and elevation above the Thames. a is a constant quantity, and was in 1849 taken as 13. Thus at $e' = 90$ feet we had $c' = 22$ and $c = \frac{90 + 13}{e + 13} \times 22 = \frac{2266}{e + 13}$ gave the series of mortalities for the elevations 70, 50, 30, 10, 0 feet; at 27, 34, 53, 99, and 174 deaths from cholera in 10,000, which agreed very closely with the observed mortality at those elevations, namely, 27, 34, 65, 102, and 177.* The same law prevailed in the epidemic of 1854.

The general results are subjoined, as an opportunity will, we may hope, never recur of measuring the effects of cholrine diluted in water on two or three millions of people living at such regulated elevations above a tidal river.

DEATHS from CHOLERA in the Year 1866 to 10,000 Persons living, at different Elevations in the Fields of the WATER COMPANIES.

COMPANIES furnishing the greater part of the WATER SUPPLY.	ELEVATION IN FEET ABOVE TRINITY HIGH-WATER MARK.								
	Under 3 Feet.	3–10	10–20	Under 20	20–40	40–60	60–80	80 and upwards.	All Elevations.
Thames Companies :—									
Grand Junction, West Middlesex, & Chelsea	(1)* 6·93	(4)* 7·54	(6) 2·53	(11) 4·53	(1) 2·25	(2) 3·08	(8) 2·93	(5) 3·48	(27) 3·6
Southwark and Lambeth	(16) 6·78	(8) 5·76	(2) 5·30	(26) 6·40	(1) 1·71	(1) 2·57	(2) 2·44	(2) 3·10	(32) 5·1
From River Lea :—									
New River - - -	—	—	(1) 56·68	(1) 56·68	(8) 10·72	(16) 11·56	(13) 7·87	(4) 3·98	(42) 8·7
East London - - -	(1) 171·30	(2) 95·08	(3) 101·64	(6) 103·06	(13) 71·30	(4) 20·34	(1) 3·65	—	(24) 70·1
From the Ravensbourne and Wells :—									
Kent - - - -	—	(2) 38·86	(3) 12·26	(5) 19·33	—	(1) 1·49	(3) 13·34	(1) —	(10) 15·1

Note.—The facts from which these results are calculated are given in Table 31 (see Appendix, p. 79.) for each Sub-district arranged in the order of its elevation, and grouped according to its water supply.

* The small figures of this Table represent the number of sub-districts at each elevation supplied by the respective companies.

In the New River sub-districts the mortality ran down from 57 to 11, to 12, and to 8 on the four successive twenty feet vertical terraces, and as low as 4 at the elevations over 80 feet.

In the Grand Junction, West Middlesex, and Chelsea fields the mortality was at the rate of 5 in 10,000 at levels below 20 feet, and it was uniformly 2 or 3 in 10,000 at all the higher levels, that is, it was uniformly low as might be expected where there was very little effect from the waters.

In the field of the Southwark and Lambeth companies supplying South London

* See Cholera Report for year 1849, pp. lxi–lxviii.

the mortality was 6 in 10,000 at elevations under 20 feet, and 2 or 3 at the higher elevations.

The field of the Kent company presented some suspicious circumstances during the epidemic; and it now appears that their reservoirs are in "dangerous proximity" to the foul waters of the Ravensbourne, and being below its level are in such hydraulic conditions as to render occasional contamination not only possible but probable. This will account to a certain extent for the high rates of mortality observed there in the advanced state of the epidemic in Woolwich and Deptford. In this field the influence of elevation was also felt. The mortality was at the rate of 19 in 10,000 below 20 feet, while above it was 13 in 3 sub-districts.

If we conceive that the water in one vertical column A contains ten times as much of the *cholrine* as the water of another column B, it is evident that the lower sections of B may only contain as much of the stuff as the higher sections of A; so the mortality at different elevations would be the same under such circumstances.

The sub-districts of London are arranged in Table 28. in the order of their elevation; and it will be noticed that in the epidemic of 1849, when the waters were generally contaminated, the mortality was regulated by elevation; the same law was observed in 1854; and in 1866, after throwing the sub-districts into water-fields, as there was a striking difference in the quality of the waters, the law is still found to prevail. The mortalities of the sub-districts, after careful correction for deaths in hospitals, are classed and compared in Table 27.

2. *Distance.*

The cholera flux in suspension undergoes changes as well in water in closed pipes as in open rivers, dependent to some extent on the quantity of matter, on the amount of oxygen present, on the temperature and on the time elapsing from the separation of the cholera corpuscles from the mucous surfaces.

The great explosions of cholera in England have arisen from the use of the water of tidal rivers into which the recent sewage of large populations had been poured; the temperature of the water ranging at the time from 15° to 21° Centigrade (or 60° to 70° Fahrenheit). At these temperatures certain bodies take up the oxygen of the water, and then the ferments living in the absence of oxygen, such as the cholera corpuscle probably is, have free course as long as subsistence remains; they then perish unless they are previously incorporated by other bodies.

London (1849–54–66), Newcastle (1853), Hull* (1849) are striking examples of the direct and quick administration of diluted cholera water, and the same examples in 1866 serve to show that the upper waters of the Lea, Thames, Tyne, and Humber lose much of their noxious energy by flowing a certain number of miles down their channels.

The highest districts of London are generally, but not always, at the greatest distances from the intake of the waters of the companies, so that before delivery the matter travels further, and is exposed for a longer time to the operation of such changes in energy as have been investigated by Thiersch and Dr. Saunderson. The experience of North Woolwich in 1866 confirms this view.

3. *Density.*

It may be stated generally that the cholera is most fatal in densely peopled districts, and where it finds its way into a school, a prison, a workhouse, or a barrack under bad sanitary conditions it is generally fatal in proportion as the inmates are crowded.

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* The new waterworks established in 1844 took their supply from the river Hull, $2\frac{3}{4}$ miles above its junction with the Humber. Half the sewage flowed into the Humber, and the other half of the sewage flowed into the Hull, and was carried up beyond the waterworks by the tide twice a day. The supply was taken when the tide was down. In the year 1849 the deaths in Hull and Sculcoates were 1,834, at the rate of 200 deaths to 10,000 inhabitants. Of the deaths 45 occurred in July, 405 in August, 1,307 in September, and 70 in October. On the 6th of September 97 persons died.—Snow on Cholera, p. 100–1; and Reg. Gen. Cholera Report, 1849, p. cxlviii.

But the water-supply and the elevation together have hitherto masked the effects of density in London, and if 9 of the densest districts containing from 197 to 258 persons on an acre are placed by the side of 9 of the sparsest districts containing from 5 to 34 inhabitants to an acre it will be observed that the mortality was highest in the thinly peopled districts both in 1849 and in 1854, the scale being accidentally turned in 1866 by St. George-in-the-East. This is explained by the other columns of the subjoined Table; six of the last nine districts got the worst water of the Thames, the Lea, and the Ravensbourne, or, as in Rotherhithe, drew water from the tidal ditches and foul wells. The ground was often undrained, whereas there was a partial drainage of the higher dense districts.

When cholera matter is distributed by water as it was in St. James's in the year 1854 among a dense population the consequences are rendered the more appalling.

Initial of Water Companies.	Elevation.	Districts.	1866. Persons to an Acre.	Deaths by Cholera to 10,000. 1849.	1854.	1866.
		Densest Districts:—				
N.R.	51	St. Luke	258	34	10	15
N.R., E.	40	East London	246	45	23	14
N.R.	50	Strand	238	35	22	6
N.R.	53	Holborn	217	35	6	7
N.R.	68	St. Giles	213	53	22	10
N.R., E.	48	Shoreditch	212	76	23	11
G.J., N.R.	58	St. James, Westminster	208	16	142	5
S.L.	0	St. George, Southwark	204	164	121	1
E.	21	St. George-in-the-East	197	42	36	97
—	43	Mean	221	56	45	18
—	43	Mean	21	71	59	17
		Least Dense Districts:—				
E.	8	Poplar	34	71	42	89
S., L.	0	Rotherhithe	33	205	165	9
G.J., W.M., C.	40	Kensington	31	24	38	4
K., S.	27	Greenwich	27	75	49	20
N.R., E.	53	Hackney	25	25	15	11
S., L.	4	Camberwell	19	97	99	6
N.R., W.M.	350	Hampstead	11	8	12	1
L., S.	24	Wandsworth	7	100	85	5
K., L.	87	Lewisham	5	30	22	6

4. *Sewerage.*

A system of sewerage is the necessary complement of a water supply. It carries off the water charged with the various impurities of houses, shops, manufactories, and streets. These impurities are however of subordinate importance. The water-closet throws into the sewer the evacuations of the sick, and carries them in the sewage sometimes directly into a river, and sometimes over land. The matters undergo various transformations, and sewage is sometimes innoxious and inoffensive; at other times, where there is stagnation or languid circulation, fermentations arise, and, as at Southampton, the germs of disease ascend into streets and into dwellings.

There is, however, good reason to believe that where the circulation is sustained and rapid the danger from this source as far as cholera is concerned amounts to little, and is certainly insignificant when compared with the evils resulting from the accumulation of the cholera flux in streets and cesspools, whence it often finds its way into the wells and canals and streams close to inhabited places.

Almost coincidently with the first appearance of epidemic cholera, and with the striking increase of diarrhœa in England, was the introduction into general use of the water-closet system, which had the advantage of carrying nightsoil out of the house, but the incidental and not necessary disadvantage of discharging it into the rivers from which the supply was drawn.

The water-closet was invented by Bramah, apparently at the close of the last century; the dates of its general introduction are thus described by Mr. W. Haywood, the able engineer to the corporation of the city of London:—"Water-closets "were invented about 45 years ago (1813), and became general in houses of the "better class about 30 or 35 years since (1833) or (1828), and the entire discharge "of the dejecta from the houses in which the water-closets were fixed in many "cases took place. Nevertheless even their introduction did not directly in all "cases lead to this, inasmuch as the interdiction of the Commissioners of Sewers "prevented it; and the custom obtained, to a large extent, of building cesspools "having overflow drains just beneath their doming, by which means the solid "matters were deposited, and the supernatant liquid only ran off; but gradually "the existing mode of construction crept in, and the entire refuse of the better class "of new houses flowed by the drains into the public sewers.

"In the year 1849 what may be said almost to be an organic change in the "system took place. In 1848 the City Commission of Sewers obtained its Act "for sanitary purposes, which became operative upon the 1st of January of the "following year (1849); for the first time indeed then was this discharge into the "sewers legalized. Previously a penalty might have been enforced for such an "usage of them, but henceforth, within the City of London, those incurred a "penalty who failed, upon notice, to construct the drainage of premises in such a "manner as not to discharge all waste waters *and fæcal matters directly into the "public sewers*" [*i. e.* directly into the sources of water supply], "of which the full "utility was therefore for the first time recognized by statute; this Act was "speedily followed by others for the remaining area of the Metropolis and for the "entire country, the clauses of the City of London Sewers Act being the basis "upon which they were framed."

It will be noticed in Table 1* that the deaths from cholera and diarrhœa increased in London in 1842; increased still more in 1846, when the potatoe crop was blighted, and in 1849 culminated in the epidemic cholera.

The experience of South London might be specially cited to show the great utility of sewerage in conjunction with a liberal supply of such water as is obtained from the Thames above Teddington Lock; and to prove that cholera matter is not distributed to any considerable extent by such sewers as those of South London. Good sewers lower the level of the wells, and ensure the filtration of the surface waters through a greater thickness of earth.

5. *Wealth and Poverty.*

Wealth gives the command of the necessaries of life in food, clothing, dwelling; it implies personal purity, and also secures prompt and skilful medical treatment. Poverty presents the sad reverse. Hence the poor as a general rule suffer more than the rich in cholera. But that is by no means always the case, particularly where the water is impure. Thus in East London many of the victims were in good circumstances. The poorest man in St. George, Southwark, was less likely to be attacked by cholera than the richest man in Stepney. The pauper of Hampstead escaped in 1849, while the opulent perished in Belgravia. And the same rule obtained all over the kingdom where there were equivalent differences in the qualities of the waters.

The relative economical condition of the various districts of London is shown by the assessed annual value of the houses, but with the value of the dwelling houses is unfortunately mixed up the value of the shops, manufactories, and other structures so as to give an undue degree of relative value to the city and to some other districts. Still the division of the assessed annual value of the property in each district by its population supplies a good index of its condition.

The Table 26 has been calculated to determine the effects of this influence. On comparing the four lowest and poorest Surrey districts of South London with the wealthiest districts of Middlesex the subordination of this cause to others is evident.

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* Appendix, p. 1.

With the density the parks produce some disturbing effect, and the Broad-street explosion of 1854 throws a heavy charge on St. James's, Westminster, in 1854. But it will be observed that in spite of depressed soil, density, and poverty, the mortality by cholera of the four south districts in 1866 was very little above the mortality of the favoured districts of West London. Bethnal Green is by our standard the poorest district in London, and the deaths by cholera in 1866 were in the proportion of 63 in 10,000, but even this high rate is not so high as the proportion in the other and wealthier districts supplied from Old Ford with water. There in the five districts paying nearly double the mean rent of Bethnal Green the deaths were 64, 76, 89, 97, and 116 in 10,000.

——	Initials of Water Companies.	Elevation.	Density.	House Rent of each Person.	Deaths by Cholera to 10,000 living.		
					1849.	1853–4.	1866.
				£ s.			
Bermondsey - - - -	S.	0	94	2 7	161	179	6
St. George Southwark - -	S.L.	0	204	2 11	164	121	1
Newington - - - -	S.L.	−1	149	2 12	144	112	3
Rotherhithe - - - -	S.L.	0	33	2 18	203	165	9
All London - - - -	——	39	39	5 0	62	46	18
Kensington - - - -	G.J., W.M., C.	40	31	6 6	24	38	4
St. George Hanover-square -	G.J., C.	34	81	11 8	18	33	2
St. Martin-in-the-Fields -	N.R., C.	38	70	12 8	37	20	5
St. James Westminster -	G.J., N.R.	58	208	13 10	16	142	5

6. *Occupations.*

Occupations expose persons in very various degrees to epidemical disease. In the case of cholera seamen living in seaports are more exposed than other people simply because they live in suffering places. Miners perish from the same cause and from the unclean habits they acquire under ground. Where the water is contaminated thirsty occupations expose men to danger. Some classes are more likely to neglect diarrhœa than others who, like medical men and intelligent people, appreciate the importance of early treatment. Table 18 in Appendix, p. 37, shows the deaths at different ages, both of men and of women, in the various professions. 6,995 males died of cholera. The following are the numbers in some professions :—*One* clergyman died, 4 Protestant ministers, and 2 other religious teachers; 3 solicitors, *no* barristers; 2 physicians, 3 surgeons, 7 druggists; 2 authors, editors, or writers; 2 artists; 10 musicians; 4 schoolmasters; 9 hotel-keepers, 27 publicans, 6 beer-sellers; 3 merchants, 1 banker; 41 clerks, 13 commercial travellers; 36 railway officers and men; 12 cabmen, 86 carriers, carters, or draymen; 56 barge, lighter, watermen; 203 seamen in merchant service; 4 land proprietors, 58 farmers, 152 agricultural labourers; 27 gardeners; 3 booksellers, 10 printers; 12 watchmakers; 47 engine and machine makers; 14 coachmakers; 21 builders, 116 carpenters, 67 bricklayers, 49 masons, 18 plasterers, 47 plumbers, 34 cabinet-makers; 3 undertakers; 10 wheelwrights; 7 woollen-cloth manufacturers; 37 silk manufacturers, 41 cotton manufacturers; 10 hairdressers, 62 tailors, 111 shoemakers, 10 ropemakers; 9 cow-keepers or milksellers, 45 butchers, 10 fishmongers, 21 bakers, 14 greengrocers, 10 sugar refiners, 19 grocers; 6 tallow-chandlers; 9 curriers; 40 sawyers, 23 coopers; 254 coal-miners, 3 copper or tin miners, 12 iron miners; 22 coalheavers, 13 gas-works servants; 25 brickmakers, 36 railway labourers, 16 navvies; 6 earthenware

makers, 4 glassmakers; 15 salt manufacturers; 25 copper manufacturers, 17 tin manufacturers; 5 lead manufacturers; 147 iron manufacturers; 89 blacksmiths, 22 boiler-makers; 689 labourers; 17 emigrants; 14 gentlemen; 5 prisoners.

2,690 deaths occurred among sons, grandsons, nephews, brothers, so returned, without any designated occupation.

7,383 *women* and *female children* were carried off by cholera; 2,846 being simply returned as wives, 1,064 as widows, 2,551 as daughters, granddaughters, nieces, and sisters.

Besides these, 10 were registered innkeepers' wives, 35 publicans' wives, 20 farmers' wives, 15 butchers' wives, 88 shoemakers' wives; 5 were schoolmistresses, 147 were domestic servants; 24 nurses, 63 charwomen, 10 hawkers and pedlars, 14 cotton manufacturers, 11 milliners, 49 seamstresses; 19 were laundresses.

To show the relative mortality these numbers are compared in Table 18 (p. 37 of Appendix) with the numbers living; it will be seen that the range of mortality is considerable, but the great differences are due to the sanitary condition of the locality in which the occupation is carried on. The mortality of salt-workers, copper workers, and sugar refiners was high. Now of 2,016 men engaged in the salt manufactures of England 1,237 live in Northwich; 2,236 of 3,827 copper manufacturers live in Swansea, Neath, and Llanelly; and 1,373 out of 2,790 sugar refiners live in the heart of East London. In all these districts the epidemic raged with great severity among all classes of the population, and it is clear that if the occupations had been pursued in other places no such mortality would have occurred. The comfortable English clergymen, the farmers, and the agricultural labourers in open districts suffered little because they lived in happier sanitary regions.

7. *Sex and Age.*

The fatality of an epidemic depends not only on external conditions but also on the internal organization. It is found by experience that the two sexes at different ages are not affected to the same extent by all diseases, either because by the habits of life they are not exposed to the same extent to the causes of disease, or because the power of resisting the operation of those causes varies.

The three epidemics of cholera supply data for determining the mortality of cholera at different ages in the two sexes, for the deaths were 102,186, inclusive of about 14,418 deaths by the epidemic, which were registered under the head of diarrhœa. It is important to include these outside deaths in estimating the effect of age, inasmuch as the occult form of the disease is not met with in equal proportions at all ages; and it is evident that we have the means of framing an estimate by comparing the deaths registered from diarrhœa in the epidemic years (1849, 1854, and 1866) with the deaths under the same head in ordinary years, such as the three years 1848, 1853, and 1864. This has accordingly been done, and the excess is shown in Table 9 (Appendix, p. 20).

The characteristic symptoms, it will be seen at a glance, are not so well marked in early infancy or in the second infancy of old age; and the reason of this is that the muscular and nervous systems being then less active, and giving rise to less convulsive and violent symptoms, the medical attendants return the cases as diarrhœa.

At all ages above 5 and under 55 the number of such cases of occult choleraic diarrhœa is not considerable; while under the age of five years, according to this estimate, four cases of diarrhœa must be added to every six deaths registered from cholera to get the actual deaths by the epidemic. At the age of 75 and upwards also there is a large addition of these occult cases.

After correction we find that the mean of the mortality in the three epidemics was, of males 18·0, females 17·8 to 10,000 living at all ages.

The addition for occult cases was nearly the same, or 2·6 to the male and 2·5 to the female mortality. (See Table 10, Appendix, p. 20.)

The mean mortality from all causes in the three cholera years was, for males, 19·3 in excess, for females, 17·9 in excess of the average mortality to 10,000 living; so females suffered less than males.*

The mortality is higher in boys than in girls at all the ages under 15; at the ages of reproduction, 25–45, the mortality of women, many of them pregnant, exceeds the mortality of men; but at the ages after 65 the mortality of men exceeds the mortality of women.

There is evidently a law of mortality involved in the age, independently of sex: thus in the three first lustres of life the deaths of boys to 10,000 living were 31·8, 13·2, and 7·6; of girls 28·4, 12·6, 6·4; and the mean mortalities of the two sexes at the same ages were 30·1, 12·9, and 7·0, which differ little from the series 30·1, 14·5, and 7·0, where the numbers are obtained by assuming that the mortality is inversely as the age, and decreases about 14 per cent. for every year of age, or is less than half at 5–10, and less than a fourth at 10–15, what it was in the first five years of life.

After the age of puberty, or from the age of 15 to 25, the mortality also increases very little; it is 8·1 for males and 7·8 for females; and at the six decennial ages extending from 25 to 85, the mortality increases from 15·4 to 43·6, at a very constant rate, as is seen on comparing the calculated series with that observed in both sexes.

Ages.	Observed in 3 Epidemics, the Deaths by Cholera to 10,000 living at each Age.			Calculated Series.
	Men.	Women.	Mean.	
25–35 - -	15·2	15·6	15·4	15·4
35–45 - -	19·5	20·2	19·8	19·0
45–55 - -	23·5	23·1	23·3	23·4
55–65 - -	28·4	31·4	29·9	28·9
65–75 - -	35·9	35·4	35·7	35·7
75–85 - -	42·2	44·9	43·6	44·0
85–95 - -	46·0	41·4	43·7	54·0
95 & upwards -	82·4	32·8	57·6	67·0

Note.—Let m_x = mortality by cholera at age x, then $r^n m_x = m_{x+n}$ = mortality at age $x + n$. In the series given the logarithm of r is taken at $\bar{1}\cdot93665$. This applies only to the ages under 15. At the ages from 25 to 85, and even upwards, the logarithm of r is 0·00911.

$$r = \left(\frac{35\cdot65}{15\cdot4}\right)^{\frac{1}{40}} = \left(\frac{m_{70}}{m_{30}}\right)^{\frac{1}{40}} = 1\cdot0212. \quad \text{And logarithm } r = 0\cdot00911.$$

* Mean Mortality from all Causes to 10,000 Living.

	All Ages.		Under 5 Years.	
	Males.	Females.	Males.	Females.
3 years 1849, 1854, 1866, when cholera was epidemic	250·5	231·5	755·9	658·1
26 years, 1838 to 1866, exclusive of three above years -	231·2	213·6	722·2	622·4
	19·3	17·9	33·7	35·7

Registrar General's 29th Report, p. xvi *to* xx.

Thus to 10,000 men living of the age 25 and under 35 the deaths by cholera and choleraic diarrhœa, as above defined, were 15·2; to 10,000 women the deaths were 15·6; and the mean mortality of the two sexes in equal numbers is expressed by 15·4. The mean deaths by cholera at the next age (35–45) were 19·8 to the 10,000 living, and so on. The calculated series approximates very closely to the observed facts: it is a series in geometrical progression, and may be conceived as representing this principle, that human life loses the power of resisting the zymotic life of the cholera epidemic year by year after the age of puberty, or what is equivalent, that the lethal power of the epidemic on the organism increases at the rate of 2·12 per cent. Thus, for instance, 1,000,000 persons of the age 30, are exposed to cholera and 1540 of them die; then of the same number of the age 31 exposed to the same epidemic under precisely the same circumstances, 1573 will die; and to 1,000,000 persons of one year of age older, or age 32, the deaths will be 1606. So some force is taken away from the organism every year of life, every second we may conceive, by which its constituents become less able to resist the action of the cholera leaven. And the diminution of resisting force obeys a law which is of this nature: the loss is an accumulating quantity, and in the end becomes so great as to leave the life at the mercy of other forms of life, or of other forces.

Thus the mortality at one age being given, the mortality at any other age within certain limits can be calculated.*

Small-pox, scarlatina, diphtheria, measles, and whooping-cough obey special laws of their own, yet all of them agree in this: the mortality by them declines as age advances; but the fevers and the other zymotic diseases taken in the aggregate are more closely allied to cholera, for the deaths by them are most numerous at advanced ages.†

8. *Attacks of Cholera.*

The resistance which the body offers at different ages may be of two kinds; it may resist an invasion and, as in unsuccessful vaccination and in unsuccessful inoculation, not *take a disease*, as it is called; or it may take the disease and live through it, or succumb to it, in variable proportions.

All the cases of cholera have never been registered in any epidemic, and it is impossible to determine directly what relative numbers are attacked at each age.

The deaths out of 3635 cases of cholera at different ages were investigated by the scientific committee of the Board of Health, and the result showed that, given 100 men attacked at the age 25–35 about 36 died, while of 100 attacked at the age 35–45 about 44 died; and generally the mortality of persons actually attacked increases as age advances, according to a determinable law. So in the ages before puberty the mortality of cases declines until it reaches the minimum. Here observation grows more difficult, as the mortality of cases of choleraic diarrhœa has not been determined, and it cannot be derived from the mortality of cases of diarrhœa selected indiscriminately for medical observation at hospitals or dispensaries.

To avoid fallacies of observation the cases of cholera, and the deaths at the ages 25–55, when the symptoms are well marked, may be taken; and having the number of deaths by cholera given at three ages to a fixed number living, we can calculate the corresponding number of attacks at those ages from the scientific committee's returns. Thus the mean mortality by cholera at the age 25–35 is by the three epidemics 15 to 10,000 living; then by the committee's returns 107 deaths occur in 300 attacks: therefore in this proportion the 15 deaths imply 42·1 attacks. Applying the same method, the attacks at other ages have been calculated.

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* $m_{60} = r^{30} m_{30} = 28{\cdot}89 = 15{\cdot}40\, r^{30} = 15{\cdot}40 \times (1{\cdot}0212)^{30}$. By logarithms $\lambda 15{\cdot}40 + 30\lambda r = \lambda m_{60} = \lambda 28{\cdot}89$.

† See Supplement to Registrar General's 25th Annual Report, pp. viii and ix.

Ages.	Population.	Men.		Women.	
		Attacks.	Deaths.	Deaths.	Attacks.
25–35	10,000	41·3	14·7	15·1	42·8
35–45	10,000	42·8	18·9	19·4	45·2
45–55	10,000	43·8	22·4	21·9	44·7

Thus it may be inferred that at these ages the proportion of men attacked differs little from 43, and of women little from 44 in 10,000; men and women in the prime of life, in the reproductive ages, are nearly equally liable to attack, but the influence of advancing age is manifest in the advancing mortality.

The proportions attacked appear to be greater after than before the age of 55, but this disparity may be compensated by the cases of choleraic diarrhœa; all that is certain is that old women are more liable to attacks of cholera than old men.

The facts are displayed in the annexed Table, deduced partly from the observations of the Scientific Committee of the Board of Health on the epidemic of 1854.

The morbility differs less than the mortality.

AGES.	Death to One Attack.		Estimated Proportion to 10,000 Living.			
			Males.		Females.	
	Males.	Females.	Attacks.	Deaths.	Attacks.	Deaths.
All Ages -	·486	·480	31·6	15·4	31·9	15·3
0–5	·611	·632	31·5	19·3	27·0	17·0
5–10	·542	·424	22·9	12·4	27·7	11·7
10–15	·437	·500	16·5	7·2	12·5	6·2
15–25	·328	·389	23·9	7·8	19·2	7·5
25–35	·356	·354	41·3	14·7	42·8	15·1
35–45	·441	·429	42·8	18·9	45·2	19·4
45–55	·513	·491	43·8	22·4	44·7	21·9
55–65	·562	·519	46·5	26·1	55·0	28·5
65–75	·589	·578	52·1	30·7	51·8	29·9
75–85	·741	·695	40·1	29·7	49·4	34·3
85–95	·858	·667	31·7	27·2	44·3	29·6
95 & upds.	..	·500	..	20·6	59·6	29·8

9. *Duration of fatal Cases.*

The greater the dose of any poison the more fatal it is, and the more rapidly it is fatal. By parity of reasoning it may be presumed that the more destructive an epidemic is the more rapid are the cases in their course.

The mortality by cholera in the epidemic of 1849 was at the rate of 30 in 10,000, and the mean duration of the fatal cases was 50 hours. As the mortality by cholera in 1866 was only at the rate of 7 in 10,000, we may expect to find the fatal cases of longer duration, if the duration is in an undetermined degree inversely as the mortality. The duration of fatal cases in 1866 was in fact 61 hours; and we have this exponential equation from which the value of x can be found $\left(\frac{30\cdot3}{6\cdot8}\right) = \left(\frac{61\cdot4}{49\cdot9}\right)^x$. That upon trial is found to be $x=7\cdot2$. Put m for mortality of cholera in the epidemic when the duration of cases was shortest (t'), and m' for mortality

for time (t) when the cases were longest; then $\frac{m}{m'} = \left(\frac{t'}{t}\right)^x \therefore \left(\frac{m}{m'}\right)^{\frac{1}{x}} = \frac{t'}{t} \therefore$ $m = m' \left(\frac{t'}{t}\right)^x$ and $t' = \left(\frac{m}{m'}\right)^{\frac{1}{x}} \cdot t$. The value of x is 7·3 or 7·0 according as it is deduced from the facts of 1849 and 1854, or 1854 and 1866; so that 7·2, or nearly 7, may be taken as the mean value.

The duration therefore of fatal cases of cholera in two epidemics varies inversely as the 7th (or more closely 7·2) root of the mortality.

To give an illustration, let us apply this formula, deduced from the observations of 1849 and 1866, to determine, from the duration of fatal cases, the mortality of the epidemic in 1854. Then $\left(\frac{49·9}{57·4}\right)^{7·2} \times 30·3 = 11·06$ mortality by cholera in 1854. The observed mortality was 10·9. Thus the calculated series is 30·3, 11·1, 6·8, while the observed series is 30·3, 10·9, 6·8.

The *numbers* and the *logarithms* (λ) are subjoined.

Epidemic Year.	Mortality by Cholera. Deaths to 10,000 (m)	Mean Duration of fatal Cases in *hours* (t)	λm	λt
1849	30·3	49·9	1·4814	1·6981
1854	10·9	57·4	1·0374	1·7589
1866	6·8	61·4	0·8325	1·7882

It is probable that the mortality, as well as the duration of cases of cholera, follows some such law in different epidemics and localities.

And it may be laid down as a general law of each particular zymotic disease that the quicker the fatal disease is in its course in any given epidemic the more fatal the epidemic is to the affected population.

10. *Cholera Flux, its Dispersion over large Areas of Water.*

The average quantity of this fluid is large, but it has not been determined directly, and it varies with the severity of the duration of the disease. Applying Pacini's numbers subsequently given, p. lxxviii, to the fatal cases of different durations in the Table on p.78, it is found that the average volume of the dejections in a cholera case is equivalent to 8·24 litres. How many cholera corpuscles this quantity contains cannot be calculated. They are exceedingly minute. By Pacini's estimate 1,000 millions would not occupy more space than a cubic millimetre; and there are 1,000,000 cubic millimetres in a litre of water. Assume, for the sake of illustration, that their numbers in a litre of flux equal the number of globules in a litre of blood, then the number in 8·24 litres of fluid will be 41,769 millions.

This enables us to conceive how the cholera corpuscles may be dispersed through the waters of rivers, not only of the size of the Lea and of the Thames, but of the Ganges.

Mr. Beardmore, the able engineer of the Lea Trust, says that the area of the Thames between Bow Creek and Teddington Lock may be taken at 2,300 acres, and the volume of its waters at about 2,300 *million cubic feet* when the tide rises to Trinity high-water-mark at London Docks, after making due allowance for the slope of the water. High water at Teddington takes place two hours after high water at London Docks; the distance being 25½ miles.

The tidal area of the river Lea and its branches above the mouth of Bow Creek he estimates at 95 acres, and the volume of its waters when full at 50 *million cubic feet:* he is unable to give the volume at low water, but holds that it might be taken at *five million* cubic feet.

The number of litres in the river Lea at high water is 1,416 millions; at low water 142 million litres; and according to Vierordt one litre of blood contains about 5,069 million globules; consequently the corpuscles in the 8·24 litres of the flux from a

patient, if in equal number, would run up to 41,769 millions. It is certain that the flux finding its way down the sewers would not be equally distributed in the river Lea for instance, but in the water would be in irregular masses like clouds in the sky; and that at some points a quart of the waters might contain hundreds or thousands of corpuscles capable of propagating their numbers by millions in the mucous membranes of the stomach and intestines.

Whether the cholera corpuscle can propagate itself in sewage water at a high temperature out of the body is not yet known, but its diffusion is adequately accounted for on the hypothesis that it is only propagated in the living organism.

11. *Days of the Week.*

In spite of the popular belief in ill-omened Friday, it is evident that the days of the week can in themselves have no more influence than the deities after which they are named on the fatality of cholera. It happens that in all England the fewest deaths in the epidemic occurred on Saturday, and next to it on Sunday. On Wednesday the greatest number of deaths occurred, and next to it stands Tuesday. In the epidemic of 1849, the deaths on Tuesday and Saturday stood highest, on Thursday and Friday lowest. In London the deaths were highest on gay Monday and Tuesday, lowest on dull Friday. If the temperate or intemperate habits of any of the working classes of London had any effect on this series of facts, they therefore raised the deaths on Monday, lowered the deaths on Friday.

The order of deaths in 1866 was quite different in East London. There the deaths were high on Tuesday, Wednesday, and Thursday; low on Sunday, Monday, Friday, and Saturday. The excess was greatest on Wednesday, and the defect was greatest on Friday. The outbreak there began on a Wednesday, and attained its maximum on a Tuesday and Wednesday. It will be recollected that the pumping from Old Ford ceased every Saturday at 7½ p.m., and was only resumed on Monday morning at 5½ a.m., the whole water field being supplied on Sunday from the purer Lea Bridge reservoirs.

DEATHS from CHOLERA on EACH DAY of the WEEK in the 23 Weeks ending 3d November 1866.

	Total in 23 Weeks.	Sunday.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
In England and Wales -	13,553	1,897	1,903	1,987	2,039	1,940	1,900	1,887
In East London and West Ham - - - -	4,284	577	585	632	680	666	549	595
In England and Wales, exclusive of East London and West Ham -	9,269	1,320	1,318	1,355	1,359	1,274	1,351	1,292
Proportion on each day to 1000 deaths on the average day in East London and West Ham	Average. 1,000	943	956	1,033	1,111	1,088	897	972
	Defect or Excess over average daily deaths -	−57	−44	+33	+111	+88	−103	−28
Proportion on each day to 1000 deaths on the average day in the rest of England - - -	1,000	997	995	1,024	1,026	962	1,020	976
	Defect or Excess over average daily deaths -	−3	−5	+24	+26	−38	+20	−24

12. *Meteorology.*

Heat, sunshine, clouds, humidity, winds, storms, rains, lightning, have the same kind of influence on epidemics as they have on vegetation, blights, and all the lower forms of life. They do not generate zymotic germs, but they promote or retard their growth and development.

The principal meteorological phenomena of the 153 days from June to October are displayed in the Appendix, pp. 252-6, and the diagram at the end of the report.

In the week when the cholera broke out epidemically the temperature of the Thames water was high, and rising: it was 64° on July 9th, and rose to 70° on July 15th: the temperature of the air was from 4° to 11° above the average for the same time; it rose to 87° in the shade and to 163° in the sun on July 13th; and afterwards declined: the highest temperature of air and water fell to 59° air and 64° water on July 31st, when the cholera was most fatal in London. No rain fell for the 20 days from July 7th to July 26th. The air was dry and calm on the days of the outbreak: wind variable. The weather was fine, the sky often cloudy. Of ozone no notice is taken until August 4th to 9th, when it is marked at 1, 2, 3, and 4 degrees. Electricity presents nothing remarkable during June or July; Mr. Glaisher noted the "blue mist" in the air on July 30th, nearly three weeks after the epidemic began, and a few days before it obtained the maximum: he noted it nearly every day down to August 22d: and recurs again to it occasionally in September and October.

IV. THEORIES OF CHOLERA.

1. *Zymotic Theory.*

The analogy between the phenomena of zymotic diseases and the phenomena of fermentations, but not the identity, suggested the name of that important class of maladies; and the analogy, instead of diminishing, has become more striking since the researches of Pasteur have shown that ferments of various natures produce correlative products. The yeast globules containing granulations, with nitrogenous matter and phosphatic minerals, grow and reproduce themselves in sugar, which they convert into alcohol, carbonic acid, and other compounds: without living yeast-globules there is no alcoholic fermentation, and without sugar no yeast-globules are generated.* It is so with other ferments, which by a previous theory were held to be nitrogenous matters undergoing changes, which set fermentable bodies in motion. Pasteur has now in a series of remarkable researches proved that ferments are organized bodies, differing in character, and living usually in the absence of free oxygen, while they have the power of appropriating or detaching this element from its feebler chemical combinations. Thus the ferment of butyric acid is a kind of vibrion. Tartrate of lime dissolved with phosphate of ammonia and alkaline or earthy phosphates in boiled water from which air is excluded, remains unchanged for an indefinite time; but so soon as a few infusorial forms from a previous spontaneous fermentation of the tartrate are sown in the phial the vibrions multiply rapidly, and the tartrate is converted into a mass of deposited vibrions of about a thousandth of a millimetre in diameter and of variable lengths. The vibrions are reproduced by fissiparity, and during the whole process of fermentation every particle of the deposit under the microscope exhibits a multitude in rapid wriggling motion. This vibrion differs from those that create butyric acid: there are several varieties.

When the water is unboiled and is exposed to the air the tartrate of lime ferments spontaneously in the course of a few days, and gives place to a mixture of animalcules living without free oxygen. The same change of the materials takes place in a phial full of a solution in aerated distilled water. In such cases what happens? This, replies Pasteur. The smallest of the infusoria, *monas, bacterium termo,* are developed in the aerated distilled water, because it holds in solution oxygen, traces of ammonia, with phosphate and tartrate of lime, and these

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* Nouvel Exemple de Fermentation determinée par des animalcules infusoires pouvant vivre sans gaz oxygène libre, et en dehors de tout contact avec l'air de l'atmosphere. Par M. L. Pasteur Comptes Rendus des séances de l'Academie des Sciences, tome LVI. 9 Mars 1863.

animalcules take from it integrally, with incredible rapidity, all its oxygen, which is replaced by rather more than its volume of carbonic acid. This effect is produced within 24 or 36 hours at the utmost, at a temperature ranging from 25° to 30° Centigrade. Then and not till then appear the infusorial ferments which can live without free oxygen gas. To the question, how can animalcules be generated which live without oxygen and perish in air? the reply is easy. They are generated after the birth of a first generation of large consumers of oxygen that deprive fluids completely of that gas. The proper ferments take their oxygen or carbon from existing organic compounds ; and even putrefaction in air-tight vessels is carried on by *infusoria* living without free oxygen, while in the open air they are associated with other types that consume free oxygen : the sulphuretted hydrogen and other compounds affecting the smell are only incidental products. Putrefaction itself is a struggle of different forms of life for organic matter.*

In the microscopic world a multitude of minute bodies form a sort of border land on the confines of the three kingdoms differing essentially in their nature, and animated by forces generating forms giving rise to most extraordinary phenomena.

Natural science has advanced so far then as to render it almost certain that the fermentations are actions of the simplest organic forms ; and following in its wake we are justified in accepting the hypothesis that the zymotic principles of disease are specific molecules which have the power of reproducing themselves in successive generations, growing and decaying by laws like the higher forms of life, not only under the same but also under modified conditions.

The cholera flux (rice-water evacuations) contains albuminous matter, silica, phosphates, sulphates, and carbonates of lime, potash, and soda, as well as a considerable quantity of chloride of sodium.† A characteristic feature under the microscope is the "granular corpuscle ;" on a mucous base it forms the bulk of the deposit which subsides in most samples. "Myriads of vibrions," says Dr. Hassall, "have been detected in every drop of every sample (twenty-five) of rice-water "discharge hitherto subjected to examination. Of these vibrions many formed "threads more or less twisted, which under the microscope presented a dotted "appearance."† "In none of the samples were sporules or threads of fungus "present, or a peculiar body of any kind noticed other than the vibrions." He examined and found them in the small intestine 12 hours after death, and by a special arrangement at St. Bartholomew's Hospital in two cases immediately and in several cases within two hours after death. He concludes that they are "contantly present" in the cholera fluid, that they are developed in it during life, and are found so high up the bowels as the small intestine. Vibrions he found in healthy fæces only in small numbers, and thinks they might be generated in the lower bowel where incipient decomposition begins. Vibrions thrive in alkaline or feebly acid organic matter, and sulphuric acid destroying their conditions of life destroys the vibrions.‡ "Vibrions are true *aquatic productions*, unlike fungi, "which are for the most part aerial, fluids being the media in which, as far as "I am aware, they are always developed, and to which they are usually "confined." They are not distilled even from rice-water fluid, and yet Dr. Thomson found them in small quantities in the distilled water through which the air of a cholera ward had been drawn, as well as in sewers. Hassall also found in the breath of cholera patients a few, on their linen abundance of vibrions.

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* Comptes rendus de l'Academie des Sciences, tome LVI. Séance du 9 Mars 1863. See also Mèmoire sur les Corpuscules organisés in Annales des Sciences Naturelles, tome 16. 4^{me} serie. Etudes sur le Vin, 1866. Mémoire sur la Fermentation Alcoolique (1860) and other papers by the same author.

† See Dr. R. D. Thomson's Analysis, pp. 285–8 ; and Dr. Hassall's Microscopic Examination of Excretions of Cholera Patients (pp. 289–307.) Appendix to Report of Scientific Committee on Cholera Epdiemic, 1854. These vibrions are well exhibited in plate 26.

‡ Aucun infusoire n'apparaitra dans le vin, parce que le vin est acide et que l'acidité les fait perir. * * * Encore ne verra-t-on apparaitre que les ferments végétaux dont la vie peut s'accommoder d'une certaine proportion d'acide et d'alcool. Ainsi jamais de fermentation butyrique dans les vins, parce que le vibrions qui determinent cette fermentation perissent dans les liquides acides. Pasteur, Etudes sur le Vin, p. 64.

As vibrions are found in impure water and wherever putrefaction is going on in the absence of acids, Hassall did not venture to regard them as the cause of cholera. The tendency, in fact, when this excellent microscopic observer* wrote, was to regard vibrions and other ferments as results and not as causes of putrefaction.

The habits of the vibrion, the velocity of its development, and its powers of disorganizing other organic forms, are seen under the microscope. If vibrions constituted the cholera-ferment, diffusion through water, and to some extent through sewers or air, rapid multiplication in the intestines in the absence—disappearance in the presence—of acids would be perfectly intelligible. Two vibrions would become by fissiparity 4, 8, 16, and at the 100th generation at this uninterrupted rate 126,765,000,000,000,000,000,000 :† and as generations succeed each other by the hour this accounts for the swarms in every drop of cholera fluid. It was infinitesimal creatures apparently of some kind or other in infinite number that threw the Thames and the Lea into the fermentation that excited so much attention some years ago. Their number, like that of higher forms of life, is limited by subsistence, by struggle with other bodies, and by length of life.

The best microscopists insist that it is organized matter still minuter and at the utmost verge of vision, that is found in zymotic disease. Pasteur calls the stuff, or zymine, "granulations" in the diseased silkworm. Beale designates it degraded "germinal matter" in the cattle disease.‡ Pacini names it in cholera "choleragenic molecules" (*molecole colerigene*).§ Every one of these little living molecules moving under the microscope has the power of producing out of suitable matters, by conversion of force alone or conjunctively, molecules identical in nature and power: they have all its character of life; they generate, they die, that is they are turned into other forms by other forces; and as with the ova of higher species the secret of their metamorphic power has hitherto eluded the finest analysis of chemistry, the highest power of the microscope.

These molecules are well seen and isolated in the vaccine lymph, which contains a limpid albuminous, saline fluid, leucocytes, and a multitude of molecules, which M. Chaveau calls "elementary granulations," and which I call *vaccinads*. Like the particles of tannate of iron colouring ink, they are never completely deposited in the lower strata of the lymph, and they pass through all kinds of filters (*tous les filtres*). By decantation the leucocytes can be separated from the plasma, while the residue retains all the lymph's activity. The albuminous liquor, with its salts, withdrawn by absorption into an upper layer of distilled water, standing on the lymph 48 hours, leaves granules at the bottom. Experiments were made with the two liquors, on children, on horses, and on heifers. (1) No effects were produced by the albuminous liquor. (2) The granular fluid produced the full effects of vaccine lymph, *vaccinine*.

This was the first result of M. Chaveau's researches.‖ In a subsequnt series of experiments he tried the effect of pure and of diluted vaccine lymph. First, he tested the pure lymph by vaccinating successfully a certain number of patients, and then found that the lymph diluted in from 2 to 15 times its quantity of water took effect in nearly every puncture. This proved that water did not destroy the granules, of which the number was so great that 10 milligrams of the fluid, for

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* Dr. Hassall was on the first *Lancet* Commission, which did so much to detect adulterations of food. I am not aware that he was ever convicted by the keenest antagonist of a single microscopical error of any consequence.

† Upon the assumption that generation is by fissiparity, the produce theoretically possible is shown by the formula $n = 2^x$. This may be called linear development.

‡ Dr. Beale figures in motion minute *amœbæ* of the ·0001 inch in diameter. Fig. 71. Plate 5. He used a magnifying power of 5,000 diameters. "If the contagium," as he calls it, of cattle plague "exist in the form of living particles, these must be less than the 50,000th part of an inch "in diameter (·00002 inch), and yet capable of retaining their active and peculiar properties." Appendix, Cattle Report, pp. 148-9.

§ Pasteur on Silkworm Disease. Beale's Microscopic Researches on the Cattle Plague in Appendix to Third Report of Cattle Plague Commission. See also in the same Appendix the papers of Dr. Angus Smith, F.R.S. and Mr. Crookes on Disinfection. Du Cholera Asiatique par Dr. Pacini: translation of Dr. Janssens, Bruxelles, 1865.

‖ See Comptes rendus de l'Academie des Sciences, 17 Feb. 1868, and a subsequent number.

instance, were so diffused in 150 milligrams that every milligram of the solution on the lancet-point contained vaccine granules enough to ensure their propagation in children and animals. Diluted in 50 times the volume of water the solution rarely took effect; when it did take effect the pustule was pure and unmodified. With a dilution in 150 times its volume of water M. Chaveau succeeded once. He then diluted 8 milligrams of lymph with 3,200 volumes of water and failed with this dilution to produce the disease after many trials: but reasoning on the matter he inferred that as the failure was probably due to his missing the floating vaccine granules (*vaccinads*), they being still present, he should get the usual result by injecting the whole of the fluid into the veins of a horse. He tried the experiment and produced one of the finest specimens of horse-pox.

We can reason still further upon these experiments. As the eight milligrams of lymph were distributed through 3,200 milligrams of water then the chance of taking up on the point of a lancet granules enough to take effect would be inconsiderable. But if the whole of the 3,208 milligrams of the fluid were inserted in the arms of 3,208 persons it is certain that the great majority would escape, and it is pretty nearly as certain, as the matter of all the granules would be present and would be inserted, that one, two, or more of the vaccinations would take effect. To fix our ideas, divide the water into eight portions, each of 401 milligrams, and let the *one* milligram of lymph remain fixed in the midst of 400 parts of water. Then if a milligram of fluid is inserted in the arm of each person only one can be attacked, while the 400 escape; and so it might be in the rest of the eight groups exposed to the chance of infection.

3,200 children could be produced in succession as persons who had been all vaccinated with the water in question without effect; and, according to the common fallacy, it would be asserted that the water was pure and stainless. The positive infection of one individual would be set aside by the preponderance of 400 over *one*.

By the logical method, as the proportions vaccinated with effect are by hypothesis *eight* in 3,208, while in other series of cases, where pure or a less infected water is employed, *none* or *one* or *two* in 3,208 are attacked, it is inferred that the vaccine granules diffused in the water were the probable cause of the eight vaccine pustules.

But this is an under statement of the case, for the granules would be distributed irregularly through the water, and thousands of negative instances might occur in succession without invalidating the induction.

Our excellent English microscopist Beale had, before Chaveau, declared that the "active properties of vaccine lymph are entirely and solely due" to these corpuscles. He has figured them, and says that under very high magnifying powers they are seen as multitudes of very minute particles exhibiting most active molecular movements.*

Zymotic matters, which may for shortness be called *zymes*, have some property analogous to those of ferments, which like the torula thrive in oxygen; or to those, on the other hand, which, like the butyric ferment, only live in its absence: these analogies may throw some light on the preference for the skin and the breathing passages exposed to the air in some, and for the intestinal tube where there is no oxygen in other zymotic diseases. The cholera zyme belongs evidently to the latter class.

Again, vibrions, the ferments of putrefaction, are suppressed or extinguished in acid solutions: they do not multiply in such conditions. They are not met with in wines. Their antagonists reign in that kingdom.

The cholera zyme appears also, like the vibrion, to suffer in acid solutions where it does not multiply; if we can venture to refer the incontestable efficacy of solutions of sulphuric acid to its effects on the zymotic matter in premonitory diarrhœa. The permanganate of potash by giving off oxygen might have some effect on this kind of ferment, not only in water but in the intestines, if it could travel so far into

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* See Appendix to Report on Cattle Plague, fig. 69, and page 149; also Microscope, in its application to Medicine; by Lionel J. Beale, M.D., F.R.S. 3d edition. Plate VII. fig. 43.

a region usually destitute of oxygen. Camphor, aromatics, creasote, carbolic acid, chlorine, vinegar, and some salts appear to destroy many ferments, and may render zymotic matter inert. How opium acts, as it unquestionably does, in premonitory diarrhœa is not yet cleared up.

As the state of the stomach and small intestines varies in the different stages of digestion, it is evident that vivacious cholera molecules in ingested liquids might in nine cases out of ten be destroyed by the gastric juice, or by the other secretions. If these molecules have the force of ferments, so have the ptyaline, the pepsine, and the pancreatic juice*; the gastric molecules also convert matter, and in the presence of acids either hydrochloric or lactic, into nutritive matter; so it is only after a struggle, or under unfavourable conditions, that the zymotic corpuscles carry the day. If the stomach at the end of a meal holds more food than its secretions can convert, or if taken at an inopportune juncture, perhaps fasting in hot weather, a glass of cholerized water may be fatal, whereas at another hour or in another person it may be destroyed, or pass away innocuous.

Alcohol diluted does not destroy *cholrine*, as may be inferred from the experience of the fleet in the Black Sea, where the sailors who drank grog (=1 rum+3 cold water) suffered, and the officers escaped. There are other cases of infected water taken with brandy, as in a case in the Broad-street eruption, producing cholera. Spirit drinkers, it is agreed, enjoy no exemption; nay, as their digestion is weakened, the foreign ferment the more easily triumphs.

Heat influences all zymotic matter, and carried up to a certain elevation destroys it. A temperature of 65° centigrade† destroys, says M. Dumas in his report to the Institute, all the ferments, the known parasitic vegetables, and their analogies as yet undistinguished in wine. To destroy the germs of the greater part of them in *water*, a temperature of 100° C. is required, and in some cases a heat still greater; in wines the presence of alcohol ensures their destruction at the lower temperature of 65° or even 50°.‡ Cold upon the other hand suspends the action of these germs. This is also what is observed in cholera. The waters of rivers, saturated with sewage ferments, present rapid changes at temperatures above 15° C., and destroy the oxygen; at the boiling temperature, or at a temperature, say, of 130° C., it is probable that zymotic matter is rendered inert. Dr. Henry disinfected scarlet fever clothing by exposure to a temperature of 100° C.§ Boiling water is evidently a capital precaution. But it must not be assumed, without further investigation, that cholera matter is invariably destroyed in boiling water, and still less in the waters used for making coffee or tea, where it so often happens that the temperature never reaches 100° C.

Filtration, as has been shown by Chaveau, does not stop the passage of vaccine granules, nor does it remove the characteristic opalescence of cholera water. One volume of cholera flux, mixed with 500 volumes of distilled water, produces an opalescent liquid, which retains its opalescence after passing through filter paper; and after passing this filtered liquid rapidly through animal charcoal, the opalescence though diminished is not entirely removed. Effectual filtration, however, removes a considerable proportion of the choleraic matter, and certainly diminishes its energy; but, as the process is usually performed, it is far from affording infallible security.‖ This might be anticipated from the exceeding minuteness of the choleraic molecules.

Many zymotic matters retain their activity in the dry state, and are preserved by exclusion from the air.

To sum up the zymotic theory. It is now held by naturalists that each organ of the body has its proper life; and that it consists of minute centres of action, which have been called cells, globules, organic units, germs, granules, and other names. The cells like the supposed vesicles of the clouds are now shown to be

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* See Carpenter's Physiology by Power, 6th Edition, Chap. III.

† 149° Fahrenheit.

‡ Pasteur sur le Vin, pp. 257—262. Rapport de M. Dumas, after which a gold medal was justly conferred on Pasteur.

§ Parkes on Hygiene, 2d Edition, p. 82.

‖ See notes by Professor Frankland, in Appendix, pp. 116, 131, and 144.

solids, and Beale proposes to call them "germinal matter," which is perhaps a description rather than a name. "Monad" would serve to designate these living particles, but as it, as well as the other names proposed, have been already appropriated, these units of force and life may be designated *biads.** Nearly alike under the microscope, *biads* differ infinitely in power and variety; for instance the brain-cells of man in an early stage of development resemble the pus globules of ordinary inflammation.† "Masses which could not be distinguished from one "another [even by Dr. Beale], manifest the most remarkable differences in power." * * "By chemical analysis every kind of germinal matter (*biad*) yields one "substance resembling fibrin, another allied to albumen, fatty matter, salts, and "water." Of these *biads* all bodies are built up.

It is only with particular kinds of these *biads*, then, that we have to do in *zymosis;* and, to give definite form to the theory, while *vaccine* lymph may be briefly called *vaccinine*, the granules of Chaveau may be named *vaccinads;* while those of *varioline* (small-pox lymph) are named *variolads;* those of *syphiline*, *syphilads*, and those of *cholrine*, *cholrads*,—the "choleragenic molecules" of Pacini.

It is life in this low form, where it is developed in isolated particles at war with those which constitute men, that generates zymotic diseases. An epidemic is the war of a conquering host of innumerable particles of life. It is therefore subject to the laws of growth and decay, both in the individual man and in communities.

2. *Mathematical Theory.*

* * because our Italy contains still many men, who, preferring the science of medicine with its sacrifices, to the trade with its gains, will know how to count the cost of this slight fruit of twelve years of research and thought; and if in some respects we fail to attain our aim, we fain hope they will reflect that *in magnis et voluisse sat est.*—PACINI.

Pacini accepts the zymotic theory, and shows that the choleragenic molecules remove the portions of the absorbent epithelium of the gastro-enteric tube, which then allows the organic water of the blood to escape. He proceeds further, and after a careful investigation of all the phenomena, advances what he calls a "mathematical theory" of cholera.‡ It is the fruit of twelve years researches and studies; it is an illustration of the method to be pursued in the application of analysis to pathology, and affords an example of the facilities to be derived from symbols in involved chains of reasoning.§

All natural phenomena are complicated, and it is only by a process of abstraction that their laws can be deduced, and be analytically expressed. Take the simple case of falling bodies: what infinite varieties of appearances are presented by the fall of bodies of various sizes and compositions through air and water. Galileo, setting aside everything unessential, fixed on two facts, the *space* a heavy body traverses in falling, and the *time* of its fall, as fundamental; and then deduced the law that the spaces described by bodies in falling are as the square of the time. $\left(s=\frac{g\,t^2}{2}\right)$. Here is the law; but in its deduction all complications are explicitly set aside. The formula does not, therefore, suffice to express the space through which in any given time any single body falls in practice. In falling through a fluid the body encounters a resistance, which varies as the square of the velocity (v^2); and depends further upon the form of the body, and the ratio of its specific gravity to that of the resisting fluid. This can be expressed by a constant coefficient for the same body, and the same fluid, say gk^2; then the space described by the falling body in the time t is by the equation

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* *βια* force, *βιος* life.

† Beale on the microscope, p. 150, and plate xx.

‡ Della natura del colera Asiatico, sua teoria matematica e sua comparazione col colera Europeo e con altri profluvij intestinali. Memoria del Dot F. Pacini, Firenze, 1866.

§ On this subject see De Morgan's Logic, Boole Laws of Thought, and the paper by Sir Benjamin Brodie on the Calculus of Chemical Operations (Trans. Royal Society, vol. 156, p. 781. Year 1866.

$$s = \frac{1}{gk^2} \cdot \log. \tfrac{1}{2} (e^{gkt} + e^{-gkt}).$$

The formula is much more complicated, and the value of the coefficient varies for different forms and specific gravities of the falling body or of the fluid. It is deduced by an analysis of which Galileo had not the command ; yet it is not in contradiction with the law of Galileo, which only asserts the operation of a principle under the simplest conditions. For many uses the complications may be disregarded.

Again, Pacini reminds his readers that the resistance (r) of a fluid passing through a vessel depends on its velocity (v), in a way expressed by the equation of Coulomb ; $r = a\,v^2 + b\,v$, where a and b are two constant coefficients, dependent on the special conditions. Applying this formula to the case of the circulation of the blood, if for our purpose we do not want to know the absolute value of the velocity, or of the resistance, but only their relations as they vary, this is shown adequately by $r = a\,v^2$, or even by $r = v^2$; from which we learn that if the velocity of the blood fall in the proportion of 1 to $\frac{1}{2}$, the force required to carry on the circulation falls from 1 to $\frac{1}{4}$, and so on ; thus showing how the feeblest heart suffices to sustain a slow circulation.

If we take a single case of cholera, it is evidently impossible to introduce the whole of the phenomena into an equation, so as to predict, for example, the duration of the choleraic process. It is on the selection of the fundamental facts that the success of the investigation turns ; and here it is necessary to state briefly the result of Pacini's researches,* and to give in outline his analysis of the phenomena.

Pacini's researches confirm the Zymotic Theory. In cholera Pacini examined the mucous membrane of a considerable proportion of the small intestine, after having washed it lightly with the minutest precaution, without touching it, to detach from its surface the abundant detritus with which it is covered in that disease ; placing it under water to render the villi clearer he noticed that a very considerable number of villi were gone, and that on numerous spots the mucous membrane looked like velvet that had lost its pile. Without all these precautions the absence of villi would only have been detected where the shaven spots were of some magnitude.† He has in the micrographic museum of the school prepared specimens of these choleraic erosions, which resemble the perforating ulcer of the stomach. Erosions were not always visible ; in some cases necrosed spots of one or two centimetres square were discovered, which, if detached, would have left such apparent erosions. Some small fragments and several villi were found in the choleraic dejections. All the villi which were found detached in the intestines, and others still adherent, as well as the necrosed patches of the mucous membrane, were completely invaded by a thick mass of very fine molecules, about the 1000th part of a millimetre in diameter : with these molecules the tissue of necrosed fragments was infiltrated, giving it a whitish, opaque appearance, and an unnatural density and consistence. On the surface of the patches were similar molecules enclosed in mucus ; great numbers were agglomerated in small, globular, white masses, large enough in some cases to be seen with the naked eye. He could not however affirm their identity, as they were very like other corpuscles found in abundance in the intestinal fluids mixed with vibrions and other infusoria, constituting both in cholera and in health what Bloch has justly called the "chaos of intestinal infusoria." These infiltrated molecules have been found by other authors

* It may be proper to mention that Pacini is one of the first microscopists in Italy, and that he is the Professor of Anatomy at the Florence School of Medicine. I had, when attending the International Statistical Congress, the pleasure of seeing him at work in his "pathological laboratory," in the large Hospital of Santa Maria Nuova. He was examining the dejections and the intestines of a young Danish artist who had just died of cholera. The laboratory contained many cholera preparations, both fluid and solid. He had in bottles cholera flux, decanted successively after standing, so as to show the various densities of the fluid, as I show them in long tubes. He used, I believe, bichloride of mercury to preserve them.

† Du Cholera Asiatique par le Dr. Ph. Pacini, Professeur d'Histologie et d'Anatomie Topographique à l'Ecole de Médecine de l'Institut Supérieur de Florence. Trad. de l'Italien, par Dr. Janssens, Bruxelles, 1865.

in the mucous membrane.* From the first, Pacini felt certain that the erosions were not inflammatory but traumatic lesions, where the agent, like the edge of a knife, cut point after point away, during the whole of the algid stage, and even after death, as is proved by the detritus chiefly of epithelium on the surface washed time after time by the cholera flux. The lesions from the first diarrhœa to the end of the algid stage are then produced by a cause independent of the life of the individual ; they are wrought by the infiltrated corpuscles, which in multiplying themselves break down the tissue of the mucous membrane. The corpuscles thus multiplying are living, as in the case of ferments. Now, he adds, as it is shown subsequently that it is by the destruction of the mere surface of the mucous membrane that these corpuscles occasion the characteristic aqueous discharges of cholera, we are justified in admitting that such molecules constitute the specific cause of cholera, and that consequently they may be called the cholera ferment (cholrine).

The white flakes are not epithelium but mucus previously formed and carried down by the cholera flux ; the greater part of the lost epithelium disappearing in the stage of diarrhœa.

The flux of Asiatic cholera differs from that of common cholera and diarrhœa ; it is not as in those cases accompanied by irritation ; it is passive and painless ; and the lymph flows out of the surface denuded of epithelium, as the blood flows in passive hœmorrhage. In the gravest cases the mucous membrane is said to be colourless, and apparently in the normal state, for the absence of epithelium makes no change in its appearance, and is not visible to all eyes. The flow is in proportion to the extent of surface affected, at first inconsiderable, sometimes reabsorbed, sometimes giving rise to borborygma but to no flux. As the absorbing surface is progressively attacked the flux increases, and the moment arrives when the absorbing surface and the excreting surface are in such proportions that the loss and the repai ation are in equilibrium. That extent of excreting surface Pacini calls limiting ; it is the fatal limit any excess over which drains the blood of its water. The abstraction in this way of a pound of water from the circulation is of much more consequence than the loss of a pound of blood, as in the latter case thirst ensues and the loss in bulk is soon supplied so that the tension of the blood in the vessels is sustained ; not so in cholera, for adequate absorption is impossible, the thirst is inextinguishable, and the patient cries out in vain for water to drink. The water gradually running off, the volume of the blood and its hydrostatic pressure are reduced ; the impulse of the heart grows feebler, the viscidity and density augment, and the velocity of the current of blood becomes less and less ; nutritive matter is deposited no more in the tissues ; hæmatosis and calorification and the pulmonary function fall to the lowest ebb ; hence the fearful collapse. The secretions dry up, ulcers dry up, and as the blood is denser and its hydrostatic pressure is diminished, its endosmotic force is proportionally augmented ; it does not nourish, it is nourished by the tissues ; venous absorption increases and the thirsty blood sucks up from every fibre and cell every drop of accessible organic water. The vocal chords sound no more, cramps shake the muscles, the glands secrete no tears, no bile, no urine. The body is dried up like a mummy ; yet the brain amidst the vast disorder, shielded by the skull, and sustained by the atmosphere, loses little of its organic water and retains its faculties for some hours, until lulled mercifully into a semi-syncope of sensibility, it at last dies.

In the cases of cure these steps are retraced, and the shorter, sharper the attack the speedier the recovery.

As the blood absorbs the decomposed tissues it becomes contaminated ; hence, if the algid state is protracted and reaction comes late secondary fever follows. I must refer to Pacini's close and well reasoned papers for the details of pathology. But I will proceed to show how he has succeeded very happily in constructing from the well observed facts of pathology, physiology, and physics equations to express the laws of the phenomena.

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* See Dr. Gull's lucid Report to College of Physicians on Pathology of Cholera, London, 1854.

He takes as an example the case of a man of moderate build, weighing 65 kilograms (143 lbs. = 10 stone 3 lbs.); of which 20 are solids, 45 are water, comprising 20 kilograms of organic water in the turgescent tissues. The blood weighs 7 kilograms; 1·47 are solids, 5·53 water. From a multitude of chemical analyses of the blood he infers that at the point of death it has lost an average quantity of its water equivalent to 1 kilogram. The quantity of blood-water lost at death he expresses by the symbol A. He takes this quantity as constant, for reasons which he assigns, among others the common observation that "the blood " is always dense and viscous without notable difference in the several cases, be " the quantity of the flux or the gravity of the case what it may." The superficies of the intestinal tube including the superficies of its valves and its four million villi, equivalent to three times the plane surface upon which they are implanted, he sets down at S = 30,000 square centimetres, including for the stomach 1000, the small intestine 26,000, the large intestine 3,000 square centimetres.

When a small portion of the intestine is invaded, the premonitory diarrhœa is the result, and the symptoms increase as the surface affected extends until the cholera limit is attained; this limit he fixes at $s = 2000$ square centimetres, and at this initial point the water exuded from this surface (2000) is equal to the water absorbed from the rest of the intestinal tract (28,000) = S − s. As the quantity of superficies c increases, the exudation surface $(s + c)$ increases, the absorbing surface diminishes as it is always S − $(s + c)$.

The initial velocity of exudation at this point when the whole of s is invaded may be represented by $a = 0{\cdot}2$ *gram*, from *one square centimetre* of superfices in *one hour;* and the initial velocity of absorption over the sound absorbing surface being represented by a' we have this equation:

$$a\,s = a'\,(\mathrm{S} - s) \;\therefore\; a' = \frac{a\,s}{\mathrm{S} - s} = \frac{0{\cdot}2 \times 2000}{30000 - 2000} = \frac{400}{28000}$$

$$= \frac{1}{70} = {\cdot}0143 \text{ gram.}$$

Here $a = 14\,a'$ and in the *unit* of time $as + ac$ = effusion; while $\{a'\,(\mathrm{S} - s) - a'c\}$ = absorption; then subtracting the quantity absorbed from the quantity exuded we have (1) $\delta = ac\,\frac{\mathrm{S}}{\mathrm{S} - s}$ = quantity of the dejections in the same time unit = the immediate loss of the blood-water. But this is repaired to a certain extent by interstitial absorption of water into the thicker blood from the tissues; so the real loss of water by the blood is less than $ac\,\frac{\mathrm{S}}{\mathrm{S} - s}$; it is in fact (2) $ac\,\frac{(s + c)}{\mathrm{S}}$, if it is in direct proportion to $s + c$ and inverse proportion to S, which supplies the whole of the blood in the normal condition. Subtract then this special loss of the blood-water from the total loss (1) and we have the amount of interstitial absorption (i) in a unit of time $= i = \frac{ac\,\mathrm{S}}{\mathrm{S} - s} - ac\,\frac{s + c}{\mathrm{S}} = ac\left\{\frac{\mathrm{S}^2 - (\mathrm{S} - s)\,(s + c)}{\mathrm{S}\,(\mathrm{S} - s)}\right\}$.

These are fundamental equations.

Resuming. To reduce the problem to the simplest form Pacini restricts the investigation to cases of cholera fatal in the algid stage; the complication of cases of recovery and of reaction are thus eliminated; he takes a man of average size; he assumes that death ensues when the man loses from his blood a given quantity of water A, which further to fix our ideas is taken in the figures at 1 *kilogram by weight.* The intestinal tract of a superficies of S (= 30,000 square centimetres) is constantly pouring out and absorbing among other matters water by exosmosis, by endosmosis, or by other forces; the large balance in favour of absorption is expressed by the difference between the *ingesta* and the *egesta*, and it is all absorbed by the surface S in the normal state; but the cholera molecules rapidly convert the surface s which was absorbing in excess, into a surface exhaling in excess and carrying off blood-water, but not more than is immediately replaced by

absorption from the sound surface which may reabsorb some of the flux; when the abraded surface extends beyond s to $s + c$ of the surface the effusion from $(s + c)$ exceeds the absorption from the sound surface, and the loss of a part of A commences: cholera has set in. The case goes on until A is exhausted, and the time (T) in which this takes place bears a definite relation to the variable c. The surface $(s + c)$ is absorbing as well as exhaling, but only the excess of water effused after deducting water absorbed by this surface is taken into account; it is fixed when the surface c is first attacked at a velocity expressed by a, which for various reasons is set down as constant. So is the rate a' regulating the flow of water from the undestroyed surface.

The whole of the water (R) effused into the intestine from the surface affected does not appear in the flux, as it is diminished by E, the water absorbed. The flux in a given case is expressed by $D = R - E$. The greater c grows before death, from the nature of the equation the less is the effusion, the less is the absorption, and the less is the flux. This agrees perfectly with the observed facts; the more violent the case the less is the absolute amount of the flux. It is the case not of the *cholera sicca* for it never occurs, but of something near it. What is constant in all cases is the absolute loss of the water A by the blood; but the time in which it takes place varies as c varies. Then the quantity of the aqueous loss is made up by the absorption of organic water (I) from the tissues, so that $D = A + I$. The quantity of water drunk in cholera and merely passing through the intestine is excluded from D.

The velocity with which blood is lost is of consequence as well as its quantity, so also is the velocity ($\triangle$) of the loss by the flux: it is at the rate of about ·75 kilogram per hour in the shortest case, half this or ·36 in the case of 18 hours duration, and only ·11 in the case of 120 hours duration. It is obtained by dividing D by T.

The severity of the case is inversely as the time; Pacini calls it the gravity of the attack. It is expressed by $G = \frac{1}{T}$. Thus a case terminating in 12 hours is ten times as *grave* as a case fatal in 120 hours. The blood-water escapes with tenfold velocity.

The equation $e = \frac{E}{TSa'}$ = the fraction of aqueous absorption from the intestine when that from the whole tube in the normal state is taken for unity; it is only 0·103 in a 3 hours case, and 0·803 in a case of 120 hours.

Collapse creeps on as the water—the volume of the blood decreases as its hydrostatic pressure decreases, as it ceases to transmit the stroke of the heart, as the blood by its viscidity resists the nutritive action of exosmosis on the tissues, on which nutrition and life hang: this state of debility and syncope is *collapse* (C); which may be expressed by the proportion the water of the blood taken away in the time t bears to the quantity to be taken away before death. Let the loss in a unit of time be expressed by $\alpha = \frac{A}{T}$, then $T\alpha = A$; and $C = \frac{t\alpha}{A\alpha - t\alpha} = \frac{t}{T - t}$. This is equivalent, as α is taken to be uniform, to assuming that the loss out of A is always proportional to the time t that has elapsed from the origin.

It follows from this series, of which examples are given, that the collapse is in all cases not only the same at death, but is also the same in the middle point of the time the case continues; for then $\frac{A}{2}$ has been taken, and $\frac{A}{2}$ has been left, and the ratio of one to the other is unity $= \frac{2A}{2A}$.

The collapse in the first hours increases much faster in the short cases than in the long cases.

The degree of collapse alone does not indicate the distance of death. When the same degree of collapse in one case expressed by $1 = \frac{3}{3}$ has been attained in 3 hours as in another of the same degree has been attained in 12 hours $\left(1 = \frac{12}{12}\right)$ the latter case will probably go on more slowly and will terminate much later.

On the contrary the degree of collapse in the *last hour before death* will be expressed by 5 in a 6 hours case, and by 23 in a 24 hours case: it will be four times greater in the slow than in the fast case, which by its greater velocity reaches the goal at the same moment as its slow rival.

Pacini makes the quantities represented by A, S, s, a, and α constant, while c and T are dependent variables in the equation $T = \frac{AS}{2as} \cdot \frac{2s + c}{(s+c)c}$; where T (the duration of case) is a function of c (= effusing intestinal superficies in excess of s), the T varying inversely and more rapidly than c, which is squared. By inserting arbitrary values of c Pacini obtains the correlative values of T. From these he readily deduces the other elements. It is the easiest form for calculations such as Pacini has given. But as T = the duration of fatal cases is ascertained by direct observation more readily than c, it appears to be convenient to enter the table by the time, and thence to pass to the value of c, as can be done by the subjoined equation, where $b = s - \frac{AS}{2as\,T}$; and $d = \frac{AS}{aT}$. As the equation is quadratic the double sign occurs, but the *plus* sign alone is applicable to the case in hand.

$$c = -\frac{b}{2} \pm \frac{1}{2}\sqrt{4d + b^2}$$

$$\text{Here } 4d = \frac{600\,000\,000}{T}; \text{ and } b = 2000 - \frac{37500}{T}$$

Pacini remarks that Asiatic cholera differs essentially from European cholera, in which the flux is produced by secretional or catarrhal irritation, proceeding even to the verge of inflammation.

"Nel colera Asiatico abbiamo veduto, che il fermento colerigeno, per l'azione meccanica resultante della sua moltiplicazione riproduttiva, distruggendo o distaccando l'epitelio, dà luogo ad una vera linforragia traumatica o passiva, come una emorragia per ferita. Invece nel colera Europeo è noto che il profluvio intestinale è prodotto da una irritazione secretoria o catarrale della membra mucosa, irritazione che può avere anche la forma di una decisa infiammazione; ed ognuno può concepire le mille cause esterne ed interne che possono eccitarla (pp. 114–15)."

In the one case the fluid is aqueous, like lymph, in the other bilious and acrid; in the one case there is only a sense of sinking fulness, in the other sharp and severe pain, increased by slight pressure. The intensity of the flux from irritation may drain the water from the blood, and then give rise to the same symptoms as Asiatic cholera; but here the superficies affected is less extensive than in the insidious form, and the danger is therefore less.

The extent of superficies affected is the capital fact; and it is the same in the case of irritations of the skin, detaching the epidermis and giving rise to effusions of lymph. A small blister is of little consequence, a large blister may prove fatal to a child.

In burns and perhaps in small-pox also the relation between the extent of skin affected and the duration of the patient's life may probably be expressed analytically.

In bronchitis and in influenza the same method of investigation is applicable; as in the prognosis the extent of surface involved measures the danger.

Symbols.

A = the blood-water withdrawn by the cholera discharges from the time any part of c is affected until death—its loss by hypothesis is taken to be fatal. It is set down as 1 kilogram in a man of 65 kilograms weight (143 lbs.).

Note.—Pacini estimates the blood at 7 kilograms (= 1·47 solids + 5·53 water) in a man weighing 65 kilograms; of which 20 kilograms are solids, 45 kilograms are water; while of the 45 kilograms no less than 20 kilograms are excess of organic water giving turgescence to the tissues.

$\alpha = \frac{A}{T}$ = the intensity of the aqueous loss from the blood; it is the ratio of the whole Time of the cholera process (T) to A.

a = velocity of effusion from $(s + c)$ at the origin of c; that is the quantity effused in a *unit* of time from a *unit* of superfices; taken at 0·2 gram, or 0·0002 kilogram, from 1 square centimetre, in 1 hour.

Note.—By Vierordt's estimate the *Ingesta* of a strong well-fed man are 3·209 kilograms daily: deducting 0·172 for fæces, 3·037 kilograms are left. This is absorbed daily by the mucous membrane of the intestinal tube, at the average rate of 126 grams hourly; but this quantity must vary from hour to hour, and be at a maximum during the process of digestion, when the distended intestine is full of osmatic matter. On dividing by Pacini's number, 30,000, the average absorption is at the rate of ·0042 gram per hour for each square centimetre of surface. He makes the absorption factor at the time of the cholera attack ·0143, or more than three times greater than this 24-hour average. And it is very probable that the cholera molecules enter the villi chiefly during the period of active absorption, when endosmosis is strongest. Nearly 8·553 kilograms* of matter, principally water, are, according to the best estimates, poured into the intestine and absorbed again daily, with the 3·036 kilograms of food and water. Pacini only deals with the latter quantity.

a' = velocity of absorption from the absorbing surface of the bowels.

$C = \frac{t}{T - t}$ = *collapse* at end of each hour of time (t); and when $t = T$ this becomes $\frac{t}{o} = \infty$.

c = the *excess* of effusing mucous surface over and above s, and immediately giving rise to characterized cholera: now cholera has begun; effusion exceeds absorption.

$D = \frac{AS^2}{(S - s)(s + c)}$ = total dejections in declared cholera, including those retained in intestine,—exclusive of increment from increase by drink. Diminishes as c increases.

$\Delta = \frac{D}{T} = \frac{2\,Sasc}{(S - s)(2s + c)}$ = the velocity of the flux—which is important, as it is in the correlative case of hæmorrhage.

$E = AS\frac{(S - s - c)}{(S - s)(s + c)} \cdot \frac{s}{c}$ = the whole of the water absorbed from the unassailed superficies of the intestine $= (S - s - c)$, during the cholera process.

$e = \frac{2s(S - s - c)}{S(2s + c)}$ = the fraction of absorption from the intestine, the normal absorption being taken for the unit.

$G = \frac{2as(s + c)c}{AS(2s + c)}$ = gravity of the cholera case: it increases rapidly with c.

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* Bidder and Schmidt estimate the quantities for a man of 89 kilograms. The German is 37 per cent. heavier than Pacini's model. See Carpenter's Physiology, Sixth Edition, pp. 325–6.

$I = A \cdot \frac{S^2 - (S - s)(s + c)}{(S - s)(s + c)}$ = the whole of the interstitial aqueous absorption from the tissues of the body during the cholera process. The quantities are connected with D and with each other by the general equation ;

$$D = R - E = A + I \therefore D + E = R = A + E + I:$$

Which may be read thus :—The cholera dejections consist as to their water of the difference between the intestinal aqueous effusion (R) from the surface $(s + c)$, and the quantity of water absorbed (E) from the residual surface $(S - s - c)$. The water which they carry off is made up of that lost (A) from the blood, and of that taken (I) from the tissues.

$R = A. \frac{S}{c}$ = the whole of the choleraic aqueous *effusion* from the superficies $(s + c)$ of the intestines.

S = mucous superficies of the gastro-intestinal tube, taken as 30,000 square centimetres.

$S - (s + c)$ = the sound surface of mucous membrane still absorbing the fluid matter of the intestines.

s = the *limiting superficies*, over which the choleraic effusion may extend without producing the characteristic symptoms of algid cholera ; taken at 2000 square centimetres : cholera dates from the moment this limit is passed.

$s + c$ = the whole of the effusing surface in cholera ; it is taken at $2000 + c$.

T = time or duration of whole cholera process in hours, reckoned from the moment that effusion exceeds absorption to death.

Pacini calls attention to the circumstance that the factor of intensity a does not appear in many of these equations : it is only brought into account where the element of *Time* (T) is concerned. Then if $ac \frac{s + c}{S}$ is put as the loss of water by the blood in a unit of time, and the time to transpire before the fatal quantity A of water be taken from the blood be T′, then evidently $T' ac \frac{s + c}{S} = A$; and $T' = \frac{AS}{a(s + c)c}$. Now, as the velocity both of effusion and of absorption depends upon the velocity of the blood in circulation, it is evident that the velocity of effusion and of absorption will decrease as the circulation decreases : so a must grow less and less, and so will the factors of the velocity of the two absorptions, which are implicitly involved in a, the factor expressive of the velocity of effusion. Consequently $T' = \frac{AS}{a(s + c)c}$ is the *inferior limit ;* it is the shortest possible duration of the fatal case.

To obtain the superior limit of time T″, assume that the superficies s is exceeded by an infinitely small quantity, then in every instant of time an infinitely small portion of A will be lost : hence the effusion in an instant of time will be

$as + \frac{A}{\infty}$; then, as A will only be expended in the time ∞, we have in that time for the whole amount of effusion $\infty\, as. + A$. Now we have this proportion;

$$\infty\, as + A : \infty :: R : T'' = \frac{\infty R}{\infty\, as + A} = \frac{R}{as}$$

or, substituting its value for R, we have $T'' = \frac{AS}{acs}$, which is the *superior limit.*

Taking the mean of the lowest and highest limits—thus deduced—the effective time is obtained; and

$$T = \frac{T' + T''}{2} = \frac{AS}{2a(s+c)c} + \frac{AS}{2acs} = A.\frac{S(2s+c)}{2as(s+c)c}.$$

The duration of cholera when fatal is prolonged by two circumstances; by the realizable draught of the blood for water on the tissues, and by the retarded circulation; but the supply of water from the tissues is not inexhaustible, and the retardation of the arterial flow can only stop the flux by stopping nutrition—that is by death.

The absorption factor e is thus deduced: Let a' be the factor expressing the velocity of intestinal absorption in the normal condition, then from the whole surface S in the time T the absorption will be $TSa' = A.\frac{S^2(2s+c)}{2(S-s)(s+c)c}$. But $E = A\frac{S(S-s-c)s}{(S-c)(s+c)c}$ is the total aqueous absorption from the intestines in declared cholera; and dividing the last by the first equation $\frac{E}{TSa'} = \frac{2s(S-s-c)}{S(2s+c)}$ $= e$, the fraction of absorption in cholera when the normal absorption is taken for unity.

TABLE OF THE CHIEF RELATED ELEMENTS OF ALGID CHOLERA.

$c = -b \pm \sqrt{4d + b^2}$ (See p. lxxv.)

DURATION OF FATAL CASE (T)		INTESTINAL SUPERFICIES AFFECTED.	FLUX in Kilograms.	VELOCITY OF FLUX $= \frac{D}{T}$	INTESTINAL ABSORPTION. (Ordinary absorption = 1.)
Days.	Hours.	(c + 2000)	(D)	(Δ)	(e)
	1·43	30,000	1·071	·750	·0000
	2	22,423	1·434	·717	·0414
	3	16,057	2·002	·667	·1030
	4	12,836	2·504	·626	·1543
	5	10,879	2·955	·591	·1980
	6	9,558	3·363	·561	·2358
	12	6,143	5·232	·436	·3906
	18	4,929	6·521	·362	·4824
1	24	4,291	7·491	·312	·5449
	30	3,893	8·257	·275	·5907
	36	3,618	8·884	·247	·6261
	42	3,415	9·412	·224	·6546
2	48	3,260	9·860	·205	·6778
3	72	2,882	11·153	·155	·7406
4	96	2,682	11·985	·125	·7780
5	120	2,557	12·571	·105	·8030
6	144	2,471	13·008	·090	·8210

The Table may be read thus: (1) in a fatal case of 2 hours duration it may be inferred that 22,423 centimetres of the intestinal superfices are invaded; that the flux is 1·434 kilograms, (less than 3 pints): the velocity of the flux is expressed by 717 grams per hour; the intestinal absorption is ·0414 of the ordinary absorption taken at unity. (2) In a fatal case of 24 hours duration 4,291 centimetres of intestinal superfices are invaded, the flux amounts to 7·491 kilograms; the velocity of flux is 312 grams per hour; the absorption is ·5449.

PROGRESS OF COLLAPSE; showing the Degree of Collapse (C) at the end of t hours in cases of 6, 24, 48, and 72 hours duration (T).

DURATION OF FATAL CASES.	COLLAPSE AT DIFFERENT STAGES OF FATAL CHOLERA. (in t Hours.)							
	1 Hour.	2 Hours.	3 Hours.	4 Hours.	5 Hours.	Collapse in Middle Hour is always equal to *unity*.	Last Hour before Death.	Death.
6 hour case	$\frac{1}{5}$	$\frac{2}{4}$	$\frac{3}{3}$	$\frac{4}{2}$	$\frac{5}{1}$	1	5	∞
24 „	$\frac{1}{23}$	$\frac{2}{22}$	$\frac{3}{21}$	$\frac{4}{20}$	$\frac{5}{19}$	1	23	∞
48 „	$\frac{1}{47}$	$\frac{2}{46}$	$\frac{3}{45}$	$\frac{4}{44}$	$\frac{5}{43}$	1	47	∞
72 „	$\frac{1}{71}$	$\frac{2}{70}$	$\frac{3}{69}$	$\frac{4}{68}$	$\frac{5}{67}$	1	71	∞

Let x = duration of case in hours, then collapse at end of first, second, third, x hours is expressed by this general formula :—

$$\frac{1}{x-1} \, , \, \frac{2}{x-2} \, , \, \frac{3}{x-3} \cdots\cdots \frac{x-1}{1} \, , \, \frac{x}{x-x} = \infty$$

The preceding theories deal directly with the material causes and the pathology of cholera. We now come to theories of the diffusion of cholera.

3. *Air, Water, Contact Theories.*

Hippocrates in his great work sought the causes of epidemic diseases in earth, air, and water. The discoveries of the nature of air by Boyle and others fixed attention on that element in the last century; in recent times air has had its sectaries, and so has water; but as the air of London is not supplied like water to its inhabitants by companies the air has had the worst of it, both before parliamentary committees and royal commissions. For air no scientific witnesses have been retained, no learned counsel have pleaded; so the atmosphere has been freely charged with the propagation and the illicit diffusion of plagues of all kinds; while Father Thames, deservedly reverenced through the ages, and the water-gods of London, have been loudly proclaimed immaculate and innocent. If diseases spread they did it not, it was the air.

In vain did the sewers of London and of twenty towns pour their dark streams into the Thames and the Lea; their waters were assoiled from every stain by chemists who had carefully analyzed specimens selected by the water companies, and demonstrated the inevitable effects of the operation of oxygen on all sewage in running streams. One scientific witness who was deservedly trusted at the time in the courts of law, was so convinced of the innocence of his clients, that he stated in evidence how before delivering his lectures it was his practice to drink a glass of the Southwark water, in which Dr. Hassall subsequently detected muscular fibre and the other ingredients of sewage.

Dr. Snow's theory turned the current in the direction of water, and tended to divert attention from the atmospheric doctrine, which in London has received little encouragement from experience.

The atmospheric theory has been nowhere clearly announced. But in one form it assumes that cholera originating in the East, after the lapse of months, traversed the Continent and found its way to England, "when the east end of London terribly "felt its shock, resulting in an extraordinary mortality, mainly attributable to "masses of filth in various forms:" there was a calm for several days; then, it is asserted, a continuous wind, chiefly north-west, conveyed this poison-fraught air direct through the heart of the cholera field, "tolerably co-extensive" with the field

of the Old Ford supply of water, and no further; there the north-west wind was staid, and the devastations of its poison ceased. Now this invisible poison in the atmospheric ocean must necessarily have been greatly diluted in millions and millions of gallons of oxygen on its way over the German Ocean; but so minute are its germs and so numerous, that their diffusion through this volume of air cannot be pronounced, *a priori* impossible. The stoppage of the effects of the vast stream of air at the boundary line of one particular kind of water-supply, and the fact as well as the effect of the deflection of the wind, are neither reconcileable with meteorological observations nor with the known laws of pneumatics. The air is breathed by the whole population, yet only a certain number die of cholera; so the theory, on this score, encounters as great difficulties as the water theory, and may claim analogous solutions. The theory of the east wind, with cholera on its wings, assailing the east end of London is not at all borne out by the experience of previous epidemics, when the south districts of London and several central districts bore the main brunt of the attack. It ignores all past experience.

If the case is argued on the basis that Asiatic cholera is propagated by the cholera discharge, and no other basis deserves much attention, then it is evident that in the East Indies, under the ordinary practices of the population, the cholrine may be either wafted through the dry air of the dry season, or in the rains washed into the tanks; but in London, with the watercloset system and with sewers, the diffusion by the dry method must be rare and insignificant. From the surface of a saturated solution of cholera sewage in the Thames, in the Lea, in the Limehouse Cut, or in the stagnant sewers, it is exceedingly probable that a certain quantity of the cholrine rises. Several facts seem to show that this actually occurs. The quantity of this matter that is carried up in dust, in vapour, or in currents of air, must be small in comparison with the quantity in the waters of the Lea and of the Thames at the in-takes of the water-pipes. The quantity of cholera corpuscles in the air of East London could scarcely be greater than the quantity of vibrions detected by R. D. Thomson in sewer air or in cholera wards, and by Hassall in the vapour distilled from cholera rice-water, teeming with vibrions; now the first quantities were small, the last *nil.*

The population of London probably inhaled a few cholera corpuscles floating in the open air, and more rising from polluted waters and from the sewers, but the quantity thus taken from the air would be insignificant in its effects in comparison with the quantities imbibed through the waters of the rivers or of ponds into which cholera dejections, either in the diarrhœal stage or the stage of collapse, had found their way, and been mingled with sewage by the churning tides. During the height of the cholera explosion in East London nothing unusual was there visible in the atmosphere; the air was transparent and often bright in the sunshine; but the river Lea, close to the Old Ford reservoirs, and to the ponds* from which the water was distributed in those fatal days, looked black, foul, contaminated. These appearances presented probably tolerably accurate pictures of the activity of the zymotic agencies in air and water. An indifferent person would have breathed the air without any apprehension; but only a very robust scientific witness would have dared then to drink a glass of the waters of the Lea at Old Ford after filtration.†

No facts can be cited to prove that cholera is propagated by the breath of cholera patients.

But there are many facts in favour of the opinion that the disease spreads from person to person, not by contact with the cuticle, but by contact of the colourless, inodorous flux with the mucous membranes. Dirty people in crowded

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* The temperature of the stagnant water in the two ponds, in the heat of the weather, is higher than the temperature of the river; it approximates to the temperature of the soil and the air.

† When Captain Tyler conducted his inquiry I saw the Lea, and it then looked comparatively clear, while during the cholera epidemic it was quite black and turbid. By a common fallacy an analysis at one date is assumed to express the condition of the waters of a river at all dates.

houses take the disease from a first case in unusual numbers ; and the soiled linen communicates the disease.

Theory influences practice, and the zymotic theory has suggested remedies and disinfectants, which like creasote and carbolic acid stop the action of putrefactive and other ferments. The theory of quarantine is based on the theory of contagion.

4. *Theory of Spontaneous Generation.*

The question of the origin of plagues may now be relegated to the great question of spontaneous generation. Plagues are propagated by a leaven (*zyma*), and the leaven itself consists of specific forms of living matter. It involves all the difficulties of the origin of species, and awaits the same solution.

Inorganic matter crystalizes. Can it spontaneously assume the forms and exercise the functions of the lowest forms of life ? Can organic matter like wort, or sewage, or blood, produce any of the lowest infusorial forms in any way except by the intervention of parent forms of the same type ? Pasteur's researches were designed to prove a negative. He showed that in numberless instances fermentescible matter, after exposure to great heat or in contact only with air raised previously to a high temperature, remained unchanged for a definite time, but that as soon as air was admitted containing living germs fermentation commenced. From these experiments he drew his conclusions against spontaneous generation. It is clear that the experiments do not justify this generalization : under certain conditions infusoria were not generated : but are there no other conditions in which organic matter may be placed ? Take the condition of time alone : might not forms be assumed in ten years which are not assumed in ten months ?

Then, as regards zymotic matter, the changes might be only a change from one organic form to another : a slight change of the ordinary cholera corpuscles (*cholerads*) of India might convert them into a state of such activity as will be only extinguished by the destruction of millions of the human race.

These developments of zymotic matter do, we know, take place when puerperal fever is generated in lying-in hospitals; gangrene, erysipelas, pyæmia in hospitals ; typhus in jails, dwellings, or armies ; Asiatic cholera in great pilgrimages. The matter thus generated under given conditions is diffusable, and finds its way wherever kindred conditions exist.

With regard to all the plagues—and to Asiatic cholera among them—we are necessarily driven back to the hypothesis of spontaneous development. There was a date when the Asiatic cholera leaven (*cholerad*) did not exist : it has therefore been developed out of prior-organized substance. Like species of the animal kingdom plagues lie hidden in the strata of past history ; they live, they flourish, they perish like organic forms, because they are in their essence successive generations of organic forms at enmity with the corpuscles of which the human race consists.

If the algid cholera in its active pandemic state can be spontaneously generated in Asia, why can it not be spontaneously generated in Africa, in Europe, in America ? We know that the summer cholera is generated in London. We know that sporadic cases of algid cholera were fatal in remote villages of England before the wave of Asiatic cholera reached our shores. Why then, asks the sect of anti-contagionists, refuse to admit the spontaneous generation of cholera in England ? why resort to the theory of importation ? Before the first outbreak of algid cholera in England the waterclosets poured their contents into the rivers from which the towns drank : then came diarrhœa in an intense form ; then came summer cholera ; then came what you call Asiatic cholera. Is not small-pox subject to the like eruptions in England ? The sect of contagionists has much to say on the other side ; but it is on either side difficult to prove a negative. In the meantime it is difficult looking at the chain of evidence to refuse the conviction that Asiatic cholera came from Asia.

V. PREVENTION OF CHOLERA.

1. *Efficacy of Preventive Personal Measures; Post Office, Customs, Army, Navy, Police.*

The experience of the public services establishes the efficacy of the medical treatment of the diarrhœal stage of cholera beyond doubt.

The Post Office, during the epidemic of 1854, had 2865 men in its employ at the London office; among them were 2130 cases of cholera and diarrhœa, and 5 cases proved fatal. The death-rate on strength was 17 in 10,000. "Two of the "men were absent on leave, and were not seen by the medical officer; the other "three lost their lives entirely because they neglected to apply to the physician "until they had been suffering from diarrhœa for some days."* During the two months, 15th July to 15th September 1866, no less than 262 cases of diarrhœa occurred among 1325 men attached to the head office; some of the cases were obstinate, but none was fatal. In Bethnal-green a man with his wife and child was attacked; the wife and child died of the complaint, the man recovered; he had immediate recourse to the medicines supplied by the department, and after three distinct attacks left the neighbourhood alive. Among 975 men north of the Thames, 218 cases of diarrhœa occurred; the proportions varied from 11 cases in 158 men in the western district to 80 in 165 in the south-eastern district where 49 in 100 men had diarrhœa, while in the west the proportion was only 7 in 100. There was no death, although the men evidently experienced the effects of the poison.

As the men are often attacked in the night, and the diarrhœa in a considerable number of cases turns into cholera in 12 hours or less, the remedy should be always at hand day and night during the epidemic season, and the men should be kept constantly on their guard. These conditions were realized by the precautions taken at the instance of the medical officer, with the happiest result. The men were recommended to take only boiled water, and to attend to their drains; they were supplied on demand with disinfecting powder, and put on a good regimen. The letter-carriers, in addition to an astringent mixture, kept in their pockets a small roll of candied confection of opium, of which a dose was to be taken at once if they were attacked with diarrhœa while delivering letters.†

The utmost precautions were required and were taken in the infected districts; the men were well handled, and were all carried through the epidemic alive.

Dr. Walter Dickson gives an account of the health of the out-door officers, watermen, and other inferior officers of Her Majesty's Customs in 1866. 853 are stationed in London, and 600 of them lived in the Tower Hamlets. 296 of the men are stationed at Gravesend. Twenty men were placed on the sick list for diarrhœa at Gravesend, and one had choleraic symptoms, but recovered. In London 55 cases of diarrhœa were put on the sick list; 10 cases were severe, and in a few cases convalescence was protracted; one out-door officer, aged 39, died of cholera. He was in the habit of taking Cockle's pills with impunity; but on July 25th he swallowed two pills when on duty; their action was unusually "brisk," and was soon followed by "intense collapse," from which he rallied,

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* MS. communication of Dr. Waller Lewis, by whom the other particulars were also kindly supplied.

† 151 gallons of an astringent mixture at a cost of 113*l.*, and 3500 rolls of the candied confection of opium at a cost of 25*l.*, were distributed among the London Post Office establishments.

Dr. Waller Lewis prescribed also what he calls a "sulphuric orangeade," thus compounded: Dilute sulphuric acid, concentrated compound infusion of orange peel, of each 3 oz.; syrup 12 oz.; boiled filtered water four gallons. A wine-glassful may be taken for a draught, with the addition of more or less boiled and filtered water according to taste. 1350 gallons of this beverage were consumed during the prevalence of the epidemic; it superseded to a great extent raw water and bad beer; its cost is only 4½*d.* per gallon. The idea is excellent, as in hot weather men drink anything, and this supersedes noxious waters.

to die, however, of consecutive fever on the tenth day.* Another out-door officer, old, and suffering from heart disease, was carried off by diarrhœa. There were four times more cases of diarrhœa than in the preceding year; but only one or at most two deaths. These men are employed all day on or near the river; they come more than other people in contact with persons from infected ports, and they often reside in the very streets which suffered most severely. Their houses are we are told, with few exceptions, clean and comfortable. The deaths from cholera among the same class amounted to 27 in 1832–3, to 14 in 1848–9, to 3 in 1853–4, and to 1 in 1866. The mortality decreased in the same proportion as the precautions increased. The men are all instructed on no account to neglect diarrhœa in its early stage, but to apply at once for relief; and they are all supplied with simple and safe remedies. This is another proof of the efficacy of treatment, even among men exposed to the cholera in every way, and actually attacked in numbers by diarrhœa.

Dr. Balfour has shown that the deaths of soldiers by cholera in Great Britain during the epidemic of 1832 were 60, or at the rate of 27 in 10,000.† The Guards

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* Eleventh Report of the Commissioners of Her Majesty's Customs for the year 1866, p. 120.

† The following extract from a paper by Dr. Balfour gives the history of cholera as it appeared among the troops quartered in Great Britain and Ireland during the years 1831, 1832, 1833, and 1834. It is particularly interesting, as the deaths of the civil population were not then all registered, and the civil returns were imperfect:—

"During the summer and autumn of 1831 bowel complaints were unusually prevalent and severe, both among the military and civil population, and several cases closely resembling spasmodic cholera were reported to have occurred. The first unequivocal case of the disease, however, appeared at Sunderland on the 26th October, though not officially notified by the Local Board of Health to the Central Board in London till the 1st November.

"The first recognized case among the troops in Great Britain occurred in the 3d Light Dragoons at Piershill Barracks near Edinburgh on the 2d January 1832, and the second in the Grenadier Guards at Knightsbridge Barracks, London, on the 30th January. No further case occurred among the military till March, when 7 admissions and 4 deaths were reported in the Coldstream Guards in London. From this period the cases gradually increased, occurring in different corps throughout the country, till the disease reached its maximum in August, when the admissions amounted to 71, and the deaths to 32. It then rapidly subsided, and in November the troops in Great Britain were entirely free from it. In December it again broke out in Portsea, and several cases occurred in that and the following month.

"The greatest number of cases in 1832 occurred in London, Plymouth, and Glasgow.

"In 1833 and 1834 cholera appeared occasionally among the troops, but was chiefly confined to those quartered in the large towns where it still prevailed among the civil population, the majority of the cases having occurred in London, Manchester, Exeter, Portsmouth, and Sheerness.

"The following Table shows the prevalence and mortality by this disease among the troops in Great Britain and in Ireland in each of these years:—

Years.	Strength of Troops.	Cases of Cholera.	Deaths.	Ratio per 10,000.	
				Admitted.	Died.
Army in Great Britain.					
1832	22,066	174	60	79	27
1833	21,321	51	19	24	9
1834	19,251	27	7	14	4
Total -	62,638	252	86	40	14
Army in Ireland.					
1832	23,517	712	173	300	73
1833	21,293	172	52	80	24
1834	19,336	127	54	65	28
Total -	64,146	1,011	279	157	43

"In England in 1832, of 2d Life Guards 5 died, Grenadier Guards 7, Coldstreams 7, Scots Fusilier Guards 2, in all 21. Then 9 died of cholera in 1833, and 2 in 1834. Three of the Coldstreams died in Ireland in 1832, and 1 of Scots Fusilier Guards in 1834."

in London lost 16 in 4676 men in the year 1832. In the year 1866 the Director General of the army, Dr. Logan, is able to furnish proofs of the efficacy of preventive measures. The Guards did not lose a man. Out of a force of about 8380 men in London and Woolwich, 2 men died of cholera in Woolwich; this is a little more than 2 in 10,000. In all England, including those 2 men, 5 soldiers died of cholera out of a strength of 54,500.

The navy, out of a mean force of 23,080 men on the home station, lost 7 by cholera in 1866; the mortality was at the rate of 3 in 10,000. Dr. Bryson, the Director General, drew up some judicious "precautions;" and great pains were taken to get the men treated in the first stage.

Observations in various public establishments, such as the school at Limehouse, the Albert Works in North Woolwich, and the houses in the worst districts brought under efficient house-to-house visitation, tend to show that cholerization, if the word is allowed, can be arrested in its first stage by medical treatment.

The Metropolitan Police Force was not quite so fortunate, as in a force of 7372 *seven* died of cholera; and it is a striking fact that these *seven* men died in three East London Divisions out of a force of 1162 men. The mortality of the force stationed in Stepney and Whitechapel—the Old Ford waterfield—was at the rate of 74, in Finsbury 28, in the rest of London 0, in 10,000 living. The aggregate mortality was not by a fifth part so high as in 1849, but higher than in the Customs.

METROPOLITAN POLICE.

RETURN showing the NUMBER of DEATHS which have occurred in the METROPOLITAN POLICE FORCE during the under-mentioned years, distinguishing the Number of DEATHS from CHOLERA in each year, and giving the Total Numbers of all Ranks who belonged to the Police Force on the 1st July in each of the years mentioned.

YEAR.	Total Strength of Police.	Number of Deaths from Cholera.	Number of Deaths from other Causes.	Total Number of Deaths from all Causes.	REMARKS.
1848 -	4,900	—	36	36	The deaths from Cholera in 1866 occurred in the following Divisions: G. or Finsbury - 1; H. or Whitechapel - 3; K. or Stepney - 3
1849 -	5,510	27	35	62	
1853 -	5,602	2	39	41	
1854 -	5,681	18	34	52	
1866 -	7,372	7*	57	64	The strength of each of those Divisions on the 1st July 1866 was: G. - - 350; H. - - 235; K. - - 577
*Of which in East London	1,162	7			
Elsewhere -	6,210	0			
		54	201	255	

Metropolitan Police Force,
4, *Whitehall Place,*
10*th February* 1868.

2. *Quarantine.*

Contagion has given rise to passionate controversy, especially in connexion with quarantine. The word still strikes terror into all the nations on the Mediterranean except the Turks; and vexing quarantine is still their idol, although it forever fails to protect them from violent eruptions of disease.

Now contagion is deprived of its terrors by the discovery that it acts through the agency of cholera flux in air or water, and when it actually enters the body only gives rise to disease in some cases which can generally be arrested by prompt attention in the premonitory stage.

The rigorous precautions to take are careful abstinence from contaminated water, the destruction of the flux, the disinfection of soiled linen, and in certain cases the removal of inmates from ships or houses. The isolation of the sick is generally unnecessary; but in a seaport they may be very properly treated in special hospitals for the reception of the patients suffering either from diarrhœa or cholera.

The practice of England, where cholera has been kept within narrower bounds than in other countries, I humbly submit, deserves the serious attention of the people of the continent.

It is here a settled principle that the sick are under all circumstances to have the help they require, at any risk either of the lives of nurses, of medical men, or of the community at large, which, by abandoning the wounded in the battle of life would violate a fundamental law of its existence. No medical man ever shrinks from the discharge of his duty. The same spirit has shone in nurses and sisters during the last epidemic; and I witnessed myself the devotion of the women to their husbands and children in Poplar. The succour of their friends in agony was evidently with them a sacred duty, and a point of honour against which the risk to their own lives did not weigh.

Est hic, est animus lucis contemptor; et istum
Qui vitâ bene credat emi, quo tendis, honorem.

I might cite as an example the relief which the people of Liverpool yielded to the German emigrants in the recent epidemic; but a simpler instance will serve to illustrate the usual conduct of the people in a smaller town, and at the same time to show how well their humanity was appreciated on the other side of the channel.

"On a certain day in September 1866 two French fishing-smacks, "S. Josephe" and the "Franclin," were off the port of Scarborough, with ten of their crews affected with cholera. The fact being made known to the then mayor of the town, Mr. Ambrose Gibson, he gave orders for their removal to the workhouse infirmary, which order was promptly executed. The result, under the skilful management of Dr. Taylor, the surgeon, the assiduous attention of Mr. White, the master, and the liberality of Mr. Woodall, chairman of the board of guardians, was that eight of the unfortunate sufferers were restored to health. This fact was communicated to the French Government by the vice-consul of France to the district. The poor fishermen returned to Fécamp full of gratitude for the kindness they had received at the hands of their English neighbours, and they expressed their gratitude in enthusiastic terms. The inhabitants of Fécamp assembled in public meeting to express their admiration at the humane and noble conduct of the authorities at Scarborough, and they voted to Dr. Taylor a case of surgical instruments, and a bronze plate to Mr. Woodall, to be permanently placed in the workhouse infirmary. To each of the gentlemen named above was also presented a written testimonial of the gratitude of the people of Fécamp. These gratifying proceedings were terminated by reciprocal hospitalities on the part of Commander Vence, of the French navy, and the Mayor of Scarborough.

"This simple narrative exemplifies the truth of the adage that 'peace has its victories as well as war.' Such acts of humanity tend to cement the friendship of rival but not hostile countries. They give fresh force to the aphorism of the greatest amongst Englishmen, that 'one touch of nature makes the whole world kin.'"—*From "The Lancet" of 24th August* 1867.

With this may be contrasted the following case, which represents with equal fidelity the feeling and the general behaviour of the people of the south of Europe in similar cases. The description is abridged from an article entitled "My Experience in a Greek Quarantine," which appeared in the *Cornhill Magazine* of February 1866, and illustrates the hardship which arises under the Quarantine Laws as at present administered in the Mediterranean.

The narrator states, that having occasion during the summer of 1865 to go from one of the Turkish islands of the Mediterranean over to a European port, he was obliged to go to Syra, the entrepôt of the Levant, to take passage in the Austrian Lloyd's steamer; but as the cholera panic had virtually stopped regular communication between Turkish and Greek ports, he was obliged to borrow the yacht of an English friend to make the passage. "Our island had had no case of cholera, "and indeed had never been visited by it; its general healthfulness was all that "could be desired by the most exacting Board of Health, and as, moreover, we "were fortified with English, Turkish, and Greek bills of health, I anticipated, "at the worst, a detention of four or five days previous to being permitted to "land." But on arriving off Syra a Greek man-of-war's boat stopped the yacht, and on learning that she was from a Turkish port ordered her off to Delos for 11 days quarantine, the Greek officials declining to look at the yacht's bill of health or to hear any protest or explanations. Arrived at the quarantine ground it was found that the so-called lazaretto was only an insignificant collection of huts, built of rough boards, the coast being of the most bare and desolate character. At anchor was an English steamer from Alexandria with over 200 passengers on board, mostly Syriotes and other Greeks flying from the cholera, then in the beginning of its fury at Alexandria; their quarantine term was 14 days, of which nearly a week had passed with no symptoms of sickness of any kind. The unlooked-for detention had exhausted the steamer's provisions; "and "provisions were not only not supplied by the Board of Health, but permission to "carry them off was denied those who would have taken them, so great was the "panic at the idea of communication with the ship. Mr. Lloyd (the English "consul) succeeded now and then in sending a small supply by the *guarda costa*, "and they bought now and then a kid of the herdsman on the 'clean' part of the "island at exorbitant rates. But they too finally refused to communicate; and "then the captain wrote to the consul. 'For three days my men have had no "bread, and two of them have gone raving mad.' Amongst the cabin passengers "was a French woman, pregnant and near her confinement; for her the captain "begged for a doctor or nurse in vain, none would venture; and when the time "was come the poor mother had only the kindly care of the captain and her "fellow-passengers, among whom was no woman or person competent to care for "her. Fortunately she passed through her trial in safety." The protests of Mr. Lloyd to the authorities were met by the argument that it was better a few should suffer than that 40,000 people should incur the peril of cholera, which might be communicated if provisions were allowed to be carried to the quarantine station. Mr. Lloyd was threatened that his house should be burnt over his head "if he persisted in attempting to bring cholera into Syra." Ultimately the Government at Athens ordered an inquiry, and then meagre supplies were allowed.

A very few days before the steamer's time had expired a ship arrived from Alexandria which actually had cholera on board. Twenty or more had died and were thrown overboard on the voyage, and several more were sick. As she came into the quarantine ground and cast anchor she dragged some distance, and seemed in a fair way to drift against the armed cutter doing duty as *guarda costa* and *capo guardiano*, whose crew, stricken with fear at the proximity of the infected ship, ran out their guns to keep her from coming into contact with them.

The scene on board the ship is thus described:—"The huddled passengers "driven on deck by the pestilence and heat, and doubtless already in a frenzy "of fear from the perils within, found themselves met on the threshold of de- "liverance from their awful fellow-voyager by the open mouths of Greek "carronades. Women shrieked and men howled with fright. . . . . The "*guarda costa* people were in a worse panic, if possible . . . . What the "extent of the contagion was we, of course, knew not; but the hurrying and "trepidation of the people on board, and in the boat which came alongside, made "it evident that something unusual was going on. The boat lay far off, and the "officers shouted very loudly, and we heard afterwards from the quarantine boat "there were four or five dead of cholera on board, whom they wanted to send "on shore to be buried, but this was refused as dangerous! then to be permitted

" to sink them in the sea; this was still less to be allowed. They begged for a " doctor—no one would go: *guardiani* even would not go on board, for any " compensation, and they rowed away leaving her to her fate. We shortly after " received an intimation that by reason of this new arrival all ships in quarantine " at that time must stay 14 days more! . . . . Here was the ship of the " Ancient Mariner, in sooth, anchored only, but with anchors almost useless on " that tranquil sea, the fiery sun above, and the glassy water below, and nothing " to break that awful monotony but the merciless quarantine boat coming to ask " and refuse. We could see the people on the ship gather on the forecastle and " in the rigging, looking out to the land, which, brown and dry as it was, was to " them a refuge. The second and the third day came, and the dead multiplied, " until ten or a dozen corpses were on board. Still no physician, no landing, no " burial even; and the plague-stricken ship and its dying cargo lay still under the " August sun. The third day the crew received permission to put the bodies " overboard, tied with ropes, that they might not drift away and carry the plague " to some Greek community. . . . We saw the dead lowered overboard, one " by one, and with glasses could see them floating alongside, horrible to sight " and fancy. . . . . No physician could be found in Syra who had humanity " enough to hear the cry of that suffering company, or venture on the plague-" stricken ship. They did finally get permission to bury the dead, . . . and " finally the sick were landed. There had been 140 passengers on board when " the ship left Alexandria, and there were over a hundred when she came to " quarantine. The untouched remaining on board until they were attacked in " their turn, and were carried ashore to die. Their provisions too were failing, " and at last starvation came to help the pestilence."

At the end of the quarantine period the yacht had to undergo a five days' " observation " behind the lighthouse island off the port in company with the English steamer, which was, however, threatened with a third fortnight, and only escaped it by the energetic remonstrances of the British consul, backed up by the Legation at Athens. A Greek man-of-war was sent from the Piræus to Syra with a commission to ascertain the truth of the complaints made by Mr. Lloyd, and finding them well founded, ordered the admittance of the steamer to pratique; but so great was the terror of the population, and the timidity of the Commission, that the latter ceded to the threats of a revolution, and compromised the matter by admitting the passengers to the lazaretto of Syra, and sending the ship away.

The narrator thus concludes: " If all these things are not recorded in the " chronicles of that city, they are in the minds of many who were martyrs to the " inhuman cowardice of Syra, and who will bear me testimony that every " occurrence of which public recognition could be taken in the above narrative is " strictly true."

In Rome, at the close of the cholera epidemic in 1867, I was struck by the circumstance that no official information was then published, as it was supposed, to avoid creating a panic among the people. The facts have since been collected, and the occurrences in the epidemic at Albano have been admirably described by the Marchese Cinque Quintili:* the conduct of the residents represents very accurately the effects of cholera on the people of the Mediterranean; while it also displays the devotion of a Roman cardinal. What this exalted prelate did in Albano the common people did in Poplar.

The Marchese Cinque Quintili cites, as an example of the salutary effects of isolation, the case of a previous plague, where a rigid cordon confined its ravages to one side of the Tiber. Without any cordon at all, and indeed with the freest daily communication between the population on both sides of the Thames, the same thing has been witnessed in London.

In great cities isolation is impossible. Here what is required is the destruction of the dejections and the purification of the linen. The successful effects of this course of precaution is well illustrated by the experience of Bristol.†

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* Appendix p. 281. † Appendix p. 225.

In seaports, when a ship with people on board suffering from cholera arrives, the proper course to pursue is to remove as quickly as possible all the passengers unaffected from the ship, and to place the sick, when they can be moved with safety, in a hospital, a house, or a tent, where the medical and nursing arrangements are good, and where all the dejections can be destroyed. The passengers at the same time to be cautioned, and supplied with remedies for the treatment of diarrhœa.

To detain unaffected passengers shut up in a ship from an infected port is to maintain precisely those conditions which favour an eruption, and to transfer them to a lazaretto is gratuitous annoyance and cruelty. The inconvenience affects every traveller; it is certain, it is general. The advantage amounts to nothing: neither Spain, Italy, nor France, where the quarantine has been in force, has ever escaped the destructive influence of any epidemic of cholera. They have suffered much more than England. And up to the latest dates the epidemics in the quarantine countries have shown no abatement of virulence. The reason is obvious: quarantine absorbs all the attention of the authorities, and serves as an excuse for the neglect of extensive hygienic measures of water supply, and purification.

Rational regulation of intercourse is important; but quarantine is the least important of all the measures for the mitigation of cholera that have ever been devised. I might refer to the high rates of mortality from all kinds of disease in Naples and the other cities under the ægis of quarantine. The water is contaminated, and the air is polluted with excremental effluvia: by shutting out one form of the seeds of disease, they give freer scope to others. To take an illustration from our own experience: suppose that during the two years 1848–49 all communication between London and the rest of the world had been entirely broken off; that we had sent out no vessels from the Thames, and warned all ships away;—what would have been the result? Legitimate commerce would have been interrupted, but it is certain that smuggling would have sought to supply its place, and if it succeeded in anything, would have succeeded in carrying cholera into the lowest haunts of the river side: but if cholera had been kept out, other diseases would have stepped in to supply its place, for in those very years the waters of London were contaminated with sewage, diffusing the germs of many diseases, and were every year growing fouler. The substitution of purer waters cut off the sources of all kinds of diseases; quarantine could only have cut off one, if it had been crowned with success. In truth, all that the cities of the Mediterranean can hope to attain from quarantine is immunity to live in the midst of indescribable impurities, and to die of other diseases than cholera.

3. *International Cholera Conference at Constantinople.**

While cholera was epidemic in England, a Conference sat in Constantinople. Seventeen states took part in it: England, France, Prussia, Austria, Russia, Belgium, Holland, Denmark, Sweden, Italy, Greece, Spain, Portugal, the Papal States, Persia, Turkey, and Egypt were represented by 36 delegates. The Conference was opened by His Highness Aali Pasha, Minister for Foreign Affairs, on February 13th; the real work of the Congress began on March 8th, 1866; the program was then adopted, and the work was divided into four parts. They discussed (1) the origin and development of cholera; (2) the mode of its propagation; (3) measures of preservation—hygiene—restriction; (4) form of resolutions.

Upon the two first counts they report; but it would be unreasonable to expect a Conference so constituted, to discover or to invent anything new under these heads. The chief aim of the Conference was to come to some agreement on the methods to be adopted for preventing the transmission of the epidemic from India, and its diffusion over Europe. Here Dr. Goodeve and Dr. Dickson had evidently a difficult part to play. At first it was intimated that the epidemic originated in the *soil* of the Ganges, but this was combated; and the belief that it depended upon the

* See Despatch from Her Majesty's Ambassador at Constantinople, with documents presented to both Houses of Parliament, 1868.

neglect of the British Government in keeping up the efficiency of the hydraulic works of their predecessors was "entirely abandoned." The cholera, said the Conference, is to be combated step by step from India to the Red Sea; the entrance of that sea is to be guarded by an international quarantine establishment, with its head quarters in Suez; and should cholera reach Egypt, it decided, by a majority of 13 to 3 votes, that an interdiction should be laid on all Egypt, *so that all intercourse between it and the Mediterranean might be interrupted during the whole period of the epidemic: the mails only being allowed to pass onwards!* The minority consisted only of the two English delegates and Salem Bey! Four delegates did not vote on this extravagant proposition.

The influence of the English delegates is, however, evidently perceptible in the importance, unusual in such a body, attached to hygienic measures.

The Conference "demands for every man pure and abundant air, pure water, and "a pure soil. The Conference believes that these elements should constitute the "permanent privilege of populations," and should not be postponed until cholera epidemics threaten, or are in the midst of populations. They attach due importance to the hygienic regulation of ships. Their views on the destruction of the chief source of the malady by chemical agents are equally sound. It is only when they come to the chapter on restrictions that the panic terror of the Mediterranean overwhelms their judgment.

A vessel from a port in which cholera prevails, though in perfect health, is, according to them, to *be detained ten days in quarantine:* that alone would put a stop to all maritime intercourse — all steamers running between the ports of Europe when cholera was epidemic, while intercourse by land would continue.

A ship in which cases of cholera or choleraic diarrhœa have occurred, it is asserted, should be compelled to discharge its cargo, and to land all its healthy passengers at the lazaretto, there to remain in rigorous quarantine until ten days after their isolation from the last person attacked.

As some mitigation of the rigour, a ship that has not had cholera on board, but has been 15 to 29 days at sea, is to be detained *five days;* and a ship at sea 30 days without cases is to be let off with 24 hours' quarantine and fumigation, or disinfection: the places of confinement, the Conference hopes, will be made as pleasant as possible. The lazaretto is to be isolated, and to be well provided with hygienic conveniences.

Now, science lends no sanction to this irrational rigorous system of quarantine; and if England does not accept the trammels of the Conference on the line of her communications with India through the Red Sea, it is not because the country is indifferent to the invasions of cholera. Everything practical that the Conference suggests is accepted. England has a greater interest in the subjugation of cholera than any other state. It is the scourge of her splendid Asiatic empire; it impedes the development of India; it consumes the population; it is the fell destroyer of the army in the East, and is a more formidable enemy than the fiercest barbarians in the field; it has wasted these shores four several times within thirty-four years. We cannot, therefore, be insensible to the facts to which the English Commissioners call Lord Stanley's attention. If the Indian Government has not been arraigned formally at the bar of Europe, it has been reminded of "the responsibility which attaches to India as the source of the disease;" and "a large share of the measures proposed by this Conference are directed towards "India, and the cholera routes between India and Europe."

This responsibility is not repudiated. All the gigantic difficulties will be overcome if the native population can be led to co-operate in the work. India is equal to the task. The men who won an empire, and stood shoulder to shoulder in the presence of an army in mutiny, can subdue the last dire enemy and deliver the populations not only from Asiatic cholera but from the immemorial fevers of the East. The health of the British army in India has already been improved; and its losses by cholera, although still too great, are no longer what they were in the years before the mutiny. Bombay, Calcutta, and Madras have already undertaken important

sanitary works* ; and we may hope soon to hear of the successful prosecution of such works in the great cities on the Ganges. The irrigation works are not all that India requires. Drainage must carry off the matters which generate disease ; a conservancy system adapted to the tropics, and to the circumstances of the different soils, must be carried out; and, above all, provision must be made to supply the people with pure water. At the risk of offending the susceptibilities which sustain their stupendous theology, the fatal error of throwing the dead bodies of the population into the rivers from which their waters are drawn must be abandoned ; other practices must be changed ;† and the cities, the pilgrimages, the religious festivals must be brought under regulation, as they have been to some extent, to secure the nations of the world from evils against which they have a right to demand protection. How the health of armies in the field can be sustained is described in the Report of the Royal Commission on the Sanitary State of the Army in India, and was exemplified by Lord Napier of Magdala in the Abyssinian campaign.

To render the generation of great epidemics of cholera rare, nay impossible, India has only to carry out the measures which have proved efficacious in England.

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* The mortality of the English troops by cholera in Bengal was to a strength of 10,000 in 1830–45 at the average annual rate of 132 deaths, in 1860–4 it was 99, and in 1865 it was 31 (Report of Royal Commission on Sanitary State of Army in India, vol. I., p. 576 ; Statistical, Sanitary, and Medical Reports of Army Medical Department, year 1865, p. 107). See a good account of the works undertaken in Bombay by the Municipal Commissioner, Mr Arthur Crawford, and the Health Officer, Dr. Hewlett, in their Annual Report for the year 1867. The mortality in the four years 1864–5–6–7 was at the rate per 1000 of 31, 35, 21, 19. The deaths from cholera in the same years were 4847, 2883, 332, and 111. The estimated population for the four years is 816,562 : the mortality from cholera on every 10,000 *inhabitants* was 59, 35, 4, and 1 in the four years, whereas the mortality from fever was 154, 229, 121, and 69. The intelligent efforts of the Bombay authorities do them very great credit; and by still further activity they may render Bombay, which was once the graveyard of Europeans in India, a shining shrine of health.

† Au lever et au coucher du soleil, des myriades d'Indiens de toutes les classes et de tous les sexes se rendent en groupes au bord des rivières pour sacrifier à la déesse Cloacina ; mais au lieu de porter leur offrande au temple ils l'abandonment avec indifférence au courant de l'eau et y repandent l'infection.

Briquet : Rapport sur les Épidémies de Choléra-morbus ; Mem. de l'Acad. Imp. de Médecine, Vol. 28 ; Part 1 ; p. 61.

1. MAP SHOWING THE MORTALITY FROM CHOLERA in the REGISTRATION DISTRICTS OF LONDON 1849

The Figures represent the annual mortality to 10,000 of population in each District (See Table 25.)

ANNUAL MORTALITY
Deaths to 10,000 living

0 and under 25	*Indicated by Tint*	*No 1*
25 " " 50	*" " " 2*	
50 " " 75	*" " " 3*	
75 and under 100	*" " 4*	
100 & under 150	*5*	
150 " " 200	*6*	

HAMPSTEAD 8
ISLINGTON 22
ST PANCRAS 22
HACKNEY 25
LEYTON
STRATFORD 66
OLD FORD RESERVOIRS
MARY LE BONE 17
CLERKENWELL 19
ST LUKE 34
SHOREDITCH 76
BETHNAL GREEN 90
31
WEST HAM 58
ST GILES 53
HOLBORN 35
WEST LONDON 38
EAST LONDON 45
64
MILE END OLD TOWN
LONDON CITY 38
WHITECHAPEL
ST GEORGE IN THE EAST 42
62
STEPNEY
POPLAR 71
ST JAMES WESTMINSTER 18
STRAND 35
FIELDS 37
ST MARTINS IN THE FIELDS
WESTMINSTER 66
ST MARTINS
ST SAVIOUR 133
ST OLAVE 181
ST GEORGE 184
BERMONDSEY 161
ROTHERHITHE 205
WOOLWICH 30
KENSINGTON 24
ST GEORGE HANOVER SQUARE
WESTMINSTER 68
CHELSEA 46
NEWINGTON
Marshes
CAMBERWELL 97
GREENWICH 97
LAMBETH 120
WANDSWORTH 100
LEWISHAM 30
River Lea
River Lea
River Lea
THAMES RIVER

South London supplied with Thames water contaminated with London sewage in 1849 & imperfectly drained

2. MAP SHOWING THE MORTALITY FROM CHOLERA in the REGISTRATION DISTRICTS of LONDON 1866.

The Figures represent the annual mortality to 10,000 of population in each District (See Table 25.)

This Map has been adapted from that given by Mr Radcliffe. The figures and shading are not the same

ANNUAL MORTALITY
Deaths to 10,000 living

0 and under 25	*Indicated by Tint*	*Nº 1*
25 " " 50	*" " " 2*	
50 " " 75	*" " " 3*	
75 and under 100	*" " 4*	
100 " " 150	*" " 5*	

East London Waterworks Area supplied from Lea Bridge Reservoir

Area supplied from Old Ford Reservoir

East London Water Works Area supplied from Old Ford

West Middlesex Water Works

New River Water Works

Grand Junction Water Works

West Middlesex Water Works

Chelsea Water Works

Southwark and Vauxhall Waterworks

Lambeth and Southwark and Vauxhall Water Works

Lambeth Waterworks

Southwark and Vauxhall Waterworks

Kent Waterworks

Plumstead and Kent Waterworks

Marshes

River Lea

Lea Navigation Canal

STRATFORD 80

OLD FORD RESERVOIRS

BETHNAL GREEN 63

WEST HAM 53

STEPNEY 76

Mile End Old Town 64

WHITECHAPEL

ST GEORGE IN THE EAST 97

STEPNEY Limehouse 116

POPLAR 89

West Ham Sewage Outfall (Pumping)

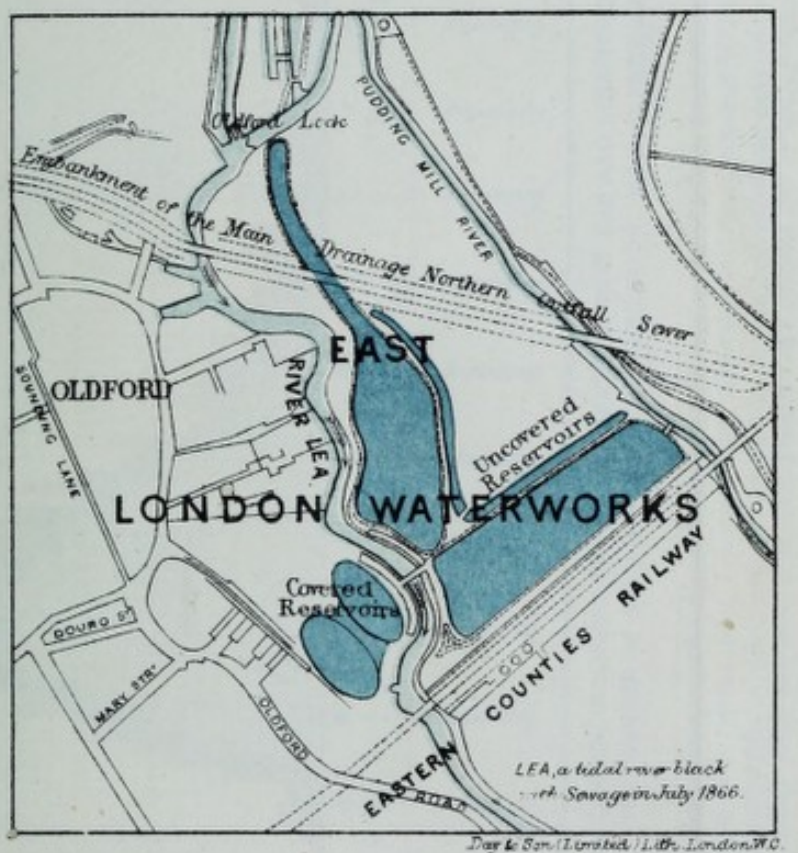
West Ham Sewage Outfall (Gravitation)

THAMES RIVER

South London supplied with filtered Thames water no longer contaminated with London sewage and drained in 1866.

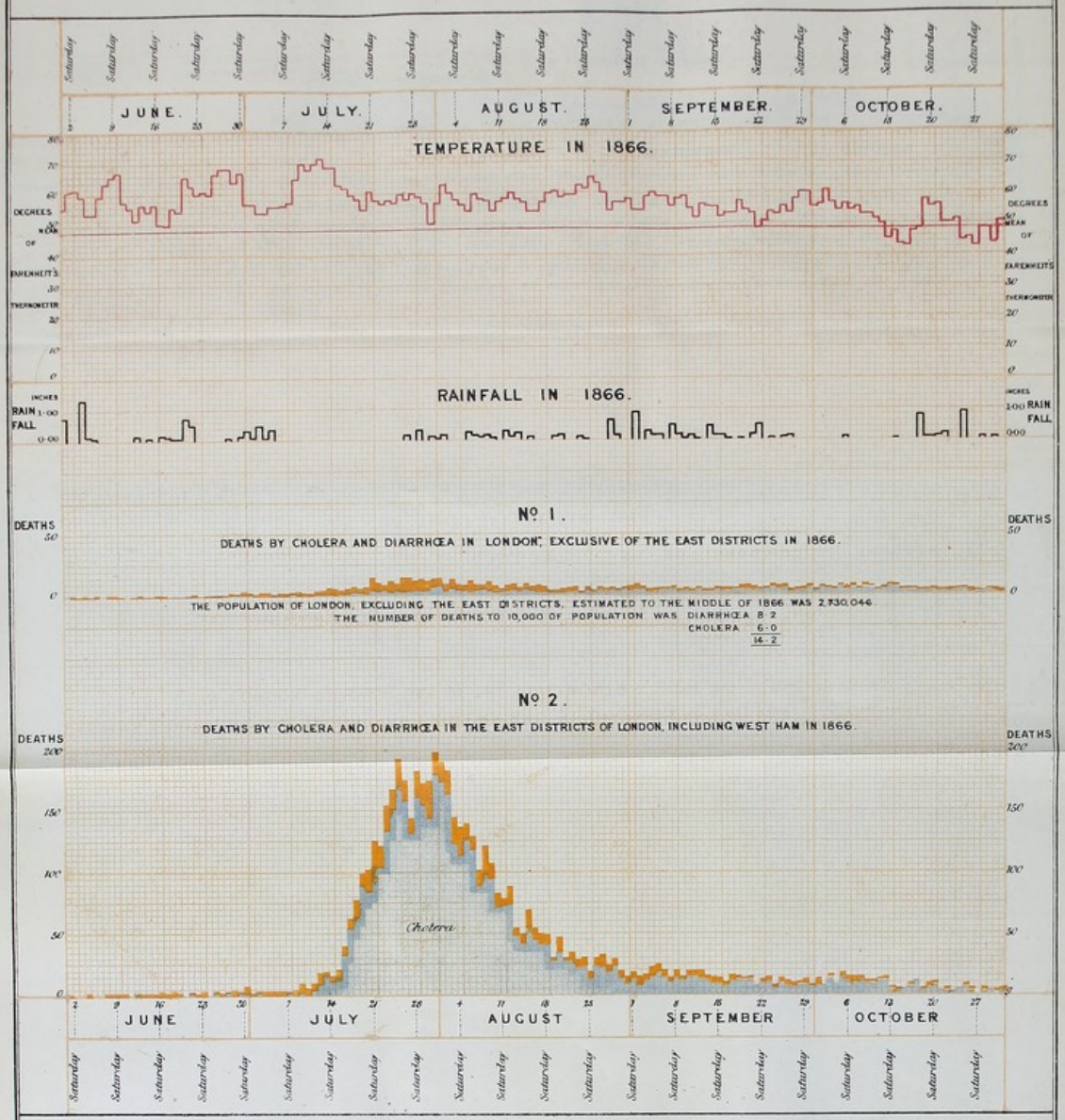
No. 3.

OLD FORD RESERVOIRS OF EAST LONDON WATERWORKS.



No 4.

DIAGRAMS EXHIBITING THE DEATHS BY CHOLERA AND BY DIARRHŒA; THE TEMPERATURE AND RAINFALL, IN LONDON, ON EACH DAY OF THE FIVE MONTHS, JUNE TO OCTOBER, 1866.



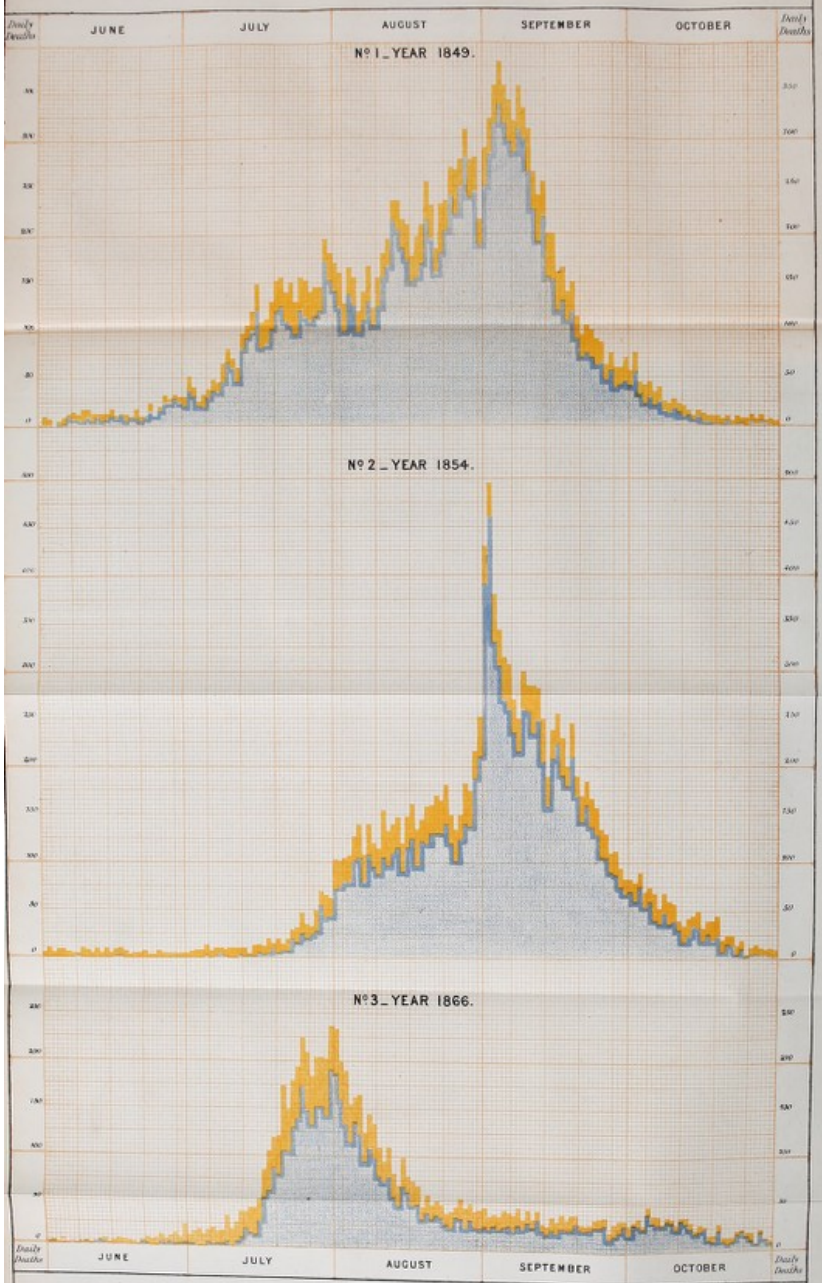
THE POPULATION OF THE EAST DISTRICTS OF LONDON, INCLUDING THE SUB DISTRICTS OF WEST HAM AND STRATFORD, ESTIMATED TO THE MIDDLE OF 1866 WAS 668,757.
THE NUMBER OF DEATHS TO 10,000 OF POPULATION WAS DIARRHŒA 14·3
CHOLERA 64·7
79·0

The number of deaths by Cholera (blue line) in the East Districts of London, including West Ham, on July 28th (Diagram No 1) was 160, from Diarrhœa (yellow line) 21, and from Diarrhœa and Cholera 181. The lines (Diagram No 1) representing the deaths by Cholera and Diarrhœa are on a scale to show the deaths in the rest of London out of a population equal to that of the East Districts, thus the deaths out of 2,730,046 people on July 28th were 15, but the deaths out of 668,757 or their number was only 4, which is the number represented under that date in Diagram No 1.

Day & Son Lithographers to the Queen, London W.C.

DIAGRAMS EXHIBITING BY COLOURED VERTICAL LINE THE DEATHS BY CHOLERA AND BY DIARRHŒA IN LONDON.

ON EACH DAY OF THE FIVE MONTHS JUNE — OCTOBER FOR THE YEARS 1849 — 1854 — 1866.



In reading the above Diagrams it should be borne in mind that they represent the actual number of Deaths that occurred on each day and not the number of deaths in proportion to the respective populations. The estimated population of London was 2,286,635 in 1849, 2,554,300 in 1854, and 3,037,991 in 1866. Consequently, to make the diagrams No 2 and 3 strictly comparable with No 1, the second should be reduced in the proportion of 100 to 82 and the third in the proportion of 100 to 75. The lines of 1866 therefore, if proportional to the population, would be about 3 fourths of their present length.

APPENDIX.

I.—TABLES.

TABLE **1.—Mortality** by **Cholera** and **Diarrhœa** in ENGLAND and in LONDON, **1838–66.**

YEARS.	ENGLAND.				LONDON.			
	DEATHS registered from		ANNUAL MORTALITY. Deaths to 1,000,000 living.		DEATHS registered from		ANNUAL MORTALITY. Deaths to 1,000,000 living.	
	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.
1838	331	2,482	22	162	15	393	8	215
1839	394	2,562	25	165	36	376	19	201
1840	702	3,469	45	221	60	452	31	236
1841	443	3,240	28	203	28	465	14	238
1842	1,620	5,241	100	325	118	704	59	353
1843	—	—	—	—	85*	834*	42	410
1844	—	—	—	—	65*	705*	31	340
1845	—	—	—	—	43*	841*	20	397
1846	—	—	—	—	228*	2,152*	106	997
1847	788	11,595	46	676	117	1,976	53	898
1848	1,908	11,067	110	638	652	1,913	291	853
1849	53,293†	18,887†	3,034	1,075	14,137	3,899	6,182	1,705
1850	887	11,468	50	645	127	1,893	55	813
1851	1,132	14,728	64	833	213	2,574	90	1,085
1852	1,381	17,617	77	984	162	2,375	67	983
1853	4,419	14,192	244	784	883	2,487	359	1,011
1854	20,097	20,052	1,094	1,091	10,738	3,147	4,288	1,257
1855	837	12,770	45	689	149	2,049	58	804
1856	762	13,815	40	734	152	2,244	59	866
1857	1,150	21,189	60	1,111	214	3,115	81	1,181
1858	673	13,853	35	719	131	2,035	49	759
1859	887	18,331	45	940	193	3,301	71	1,211
1860	327	9,702	17	494	51	1,373	18	496
1861	837	18,746	42	944	168	2,611	60	928
1862	511	11,112	25	552	106	1,736	37	607
1863	807	14,943	40	735	159	2,384	55	821
1864	934	16,432	45	798	156	2,894	53	981
1865	1,291	23,531	62	1,133	196	3,611	65	1,206
1866	14,378	17,170	685	818	5,596	3,147	1,842	1,036

* These figures represent the deaths in 52 weeks, the abstracts for the complete years 1843, 1844, 1845, and 1846 not having been made.

† The deaths by Cholera and by Diarrhœa in 1849, as returned in the Cholera Report, were 53,293 and 18,887; but as a certain number of these persons had also other fatal diseases at the time of death, the general abstracts refer only 53,273 deaths to Cholera and 17,831 to Diarrhœa: 20 and 1,056 deaths having been referred to the other heads. The epidemic was one of the causes of death; it killed sick and dying men.

TABLE 2.—**Deaths** registered from **Cholera** and **Diarrhœa** in **London** and in **Nine large Town Districts** of **England, 1838–66.**

YEARS.	LONDON.		BRISTOL.		BIRMINGHAM.		LIVERPOOL.		MANCHESTER.		SALFORD.		SHEFFIELD.		LEEDS.		HULL.		NEWCASTLE-UPON-TYNE.	
	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.	Cholera.	Diarrhœa.
1838	15	396	—	9	3	16	7	41	2	90	6	23	—	29	6	28	—	6	—	39
1839	36	376	1	1	4	15	12	45	2	88	—	35	—	20	6	24	—	3	—	50
1840	60	452	5	25	28	32	13	51	6	109	1	48	2	37	40	21	6	15	4	61
1841	28	465	1	11	10	50	8	42	25	193	2	112	1	27	4	62	2	28	—	47
1842	118	704	4	29	6	57	12	85	48	265	4	127	8	44	36	85	—	33	4	48
1843*	85	834	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1844*	65	705	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1845*	43	841	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1846*	228	2,152	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1847	117	1,976	1	65	4	304	48	1,234	33	631	3	202	3	65	8	102	2	43	5	72
1848	652	1,913	4	54	10	366	33	508	21	487	7	189	3	133	5	124	20	78	12	66
1849	14,137	3,899	591	123	29	427	4,173	981	878	765	237	261	114	209	1,439	267	1,178	194	295	117
1850	127	1,893	3	74	7	344	32	632	19	557	4	156	8	114	15	141	61	55	2	82
1851	213	2,574	3	81	16	425	32	537	6	441	1	168	14	229	15	204	4	51	14	124
1852	162	2,375	8	94	13	440	30	659	23	821	13	327	23	217	5	311	7	76	6	86
1853	883	2,487	1	63	6	357	191	542	10	468	7	209	9	183	5	204	10	39	1,414	214
1854	10,738	3,147	76	78	17	560	1,084	814	26	645	24	306	126	334	48	228	15	54	17	106
1855	149	2,049	2	50	3	281	21	486	14	407	6	171	5	184	4	122	5	28	2	95
1856	152	2,244	5	95	5	334	16	590	20	450	5	205	6	177	8	156	6	66	3	66
1857	214	3,115	—	77	4	590	26	648	9	632	4	234	20	282	9	240	8	92	10	169
1858	131	2,035	—	65	7	336	18	557	10	437	4	203	5	176	2	212	6	55	1	118
1859	193	3,301	—	72	7	439	26	494	18	504	5	236	11	181	1	203	3	85	5	114
1860	51	1,373	1	41	—	135	6	295	2	294	1	114	1	105	—	137	3	34	9	102
1861	168	2,611	—	67	3	416	16	426	12	645	6	254	2	208	3	245	4	95	5	164
1862	106	1,736	1	48	2	255	22	388	8	310	5	142	8	185	5	141	2	44	4	109
1863	159	2,384	2	54	4	382	20	421	9	492	3	226	12	217	5	284	4	77	13	137
1864	156	2,894	1	71	5	422	29	530	6	417	1	162	15	261	5	247	3	56	10	143
1865	196	3,611	—	90	8	476	31	706	20	757	5	354	10	337	8	362	7	141	14	217
1866	5,596	3,147	17	64	10	293	1,487	732	60	621	23	243	19	206	14	245	16	61	41	150

TABLE 3.—ENGLAND. **Deaths** REGISTERED from **Cholera** and **Diarrhœa** in each DIVISION, COUNTY, and DISTRICT, during the YEARS **1849, 1854,** and **1866.**

DIVISIONS AND REGISTRATION COUNTIES.	POPULATION, 1861.	CHOLERA.			DIARRHŒA.		
		1849.	1854.	1866.	1849.	1854.	1866.
ENGLAND AND WALES	20,066,224	53,293	20,097	14,378	18,887	20,052	17,170
DIVISIONS.							
I. LONDON	2,803,989	14137	10738	5596	3899	3147	3147
I. SOUTH EASTERN COUNTIES	1,847,661	3209	1581	865	1469	1600	956
I. SOUTH MIDLAND COUNTIES	1,295,515	1517	1229	111	913	1240	699
V. EASTERN COUNTIES	1,142,562	879	961	501	774	1118	519
V. SOUTH WESTERN COUNTIES	1,835,714	4564	338	631	1086	953	892
I. WEST MIDLAND COUNTIES	2,436,568	5174	892	139	2403	3104	2007
I. NORTH MIDLAND COUNTIES	1,288,928	584	247	83	764	967	772
II. NORTH WESTERN COUNTIES	2,035,540	8836	1916	2391	4206	4404	4518
X. YORKSHIRE	2,015,541	6346	624	358	1955	2179	1964
X. NORTHERN COUNTIES	1,151,372	3474	632	610	789	824	1135
I. MONMOUTHSHIRE & WALES	1,312,834	4573	939	2493	629	516	561
I.—LONDON.							
MIDDLESEX (*part of*)	2,030,814	7000	4983	4879	2593	2027	2418
SURREY (*part of*)	579,748	6323	5098	377	1050	911	569
KENT (*part of*)	193,427	814	657	340	256	209	160
II.—SOUTH EASTERN COUNTIES.							
SURREY (*extra-metropolitan*)	273,264	256	252	82	144	213	133
KENT (*extra-metropolitan*)	545,272	1208	1056	284	507	621	290
SUSSEX	366,836	355	94	79	279	279	177
HAMPSHIRE	456,654	1240	130	417	390	324	279
BERKSHIRE	205,635	150	49	3	149	163	77
III.—SOUTH MIDLAND COUNTIES.							
MIDDLESEX (*extra-metropolitan*)	187,325	408	380	51	187	231	163
HERTFORDSHIRE	177,452	323	97	9	123	189	83
BUCKINGHAMSHIRE	147,207	176	68	10	103	136	48
OXFORDSHIRE	171,233	115	183	4	106	153	64
NORTHAMPTONSHIRE	231,079	141	152	7	123	127	107
HUNTINGDONSHIRE	59,137	14	18	1	34	49	34
BEDFORDSHIRE	140,479	73	61	22	86	184	92
CAMBRIDGESHIRE	181,603	267	270	7	151	171	108
IV.—EASTERN COUNTIES.							
ESSEX	379,705	577	513	471	299	423	200
SUFFOLK	335,499	80	67	15	216	266	156
NORFOLK	427,448	223	381	15	259	429	163

ENGLAND.—**Deaths** REGISTERED from **Cholera** and **Diarrhœa** in each DIVISION, COUNTY, and DISTRICT, during the YEARS **1849, 1854,** and **1866**—*continued.*

No.	REGISTRATION COUNTIES.	POPULATION, 1861.	CHOLERA.			DIARRHŒA.		
			1849.	**1854.**	**1866.**	**1849.**	**1854.**	**18**
	V.—SOUTH MIDLAND COUNTIES.							
17	**WILTSHIRE**	236,027	320	60	11	168	149	
18	**DORSETSHIRE**	182,193	119	45	6	63	86	
19	**DEVONSHIRE**	589,278	2362	188	525	360	303	3
20	**CORNWALL**	364,848	834	24	21	140	126	1
21	**SOMERSETSHIRE**	463,368	929	21	68	355	289	2
	VI.—WEST MIDLAND COUNTIES.							
22	**GLOUCESTERSHIRE**	443,535	1467	200	39	411	449	2
23	**HEREFORDSHIRE**	106,796	1	1	2	28	27	
24	**SHROPSHIRE**	260,409	311	13	17	115	94	1
25	**STAFFORDSHIRE**	760,541	2673	426	30	902	1198	8
26	**WORCESTERSHIRE**	294,953	432	103	36	207	265	2
27	**WARWICKSHIRE**	561,334	290	89	15	740	1071	5
	VII.—NORTH MIDLAND COUNTIES.							
28	**LEICESTERSHIRE**	243,648	18	14	3	153	231	2
29	**RUTLANDSHIRE**	23,479	9	2	—	7	15	
30	**LINCOLNSHIRE**	404,143	371	134	48	246	216	1
31	**NOTTINGHAMSHIRE**	323,784	137	80	12	238	329	2
32	**DERBYSHIRE**	293,874	49	17	20	120	176	1
	VIII.-NORTH WESTERN COUNTIES.							
33	**CHESHIRE**	470,174	654	141	391	414	586	4
34	**LANCASHIRE**	2,465,366	8182	1775	2000	3792	3818	41
	IX.—YORKSHIRE.							
35	**WEST RIDING**	1,530,007	4158	470	283	1454	1836	16
36	**EAST RIDING** (WITH YORK)	274,425	2141	70	54	438	245	2
37	**NORTH RIDING**	211,109	4	84	21	63	98	1
	X.—NORTHERN COUNTIES.							
38	**DURHAM**	542,125	1643	504	353	379	453	6
39	**NORTHUMBERLAND**	343,025	1410	92	224	269	231	3
40	**CUMBERLAND**	205,276	420	35	32	124	125	1
41	**WESTMORLAND**	60,946	1	1	1	17	15	
	XI.-MONMOUTHSHIRE AND WALES.							
42	**MONMOUTHSHIRE**	196,977	777	18	204	125	126	1
43	**SOUTH WALES**	690,722	3552	887	2033	403	309	3
44	**NORTH WALES**	416,135	244	34	256	101	81	1

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866.**

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	I.—LONDON.							
	MIDDLESEX (*part of*).							
1	KENSINGTON	185950	260	490	85	146	146	259
2	CHELSEA	63439	247	300	22	92	91	49
3	ST. GEORGE HANOVER SQUARE	87771	131	295	18	69	69	49
4	WESTMINSTER	68213	437	423	43	112	91	68
5	ST. MARTIN-IN-THE-FIELDS	22689	91	58	10	27	20	23
6	ST. JAMES WESTMINSTER	35326	57	485	13	40	22	14
7	MARYLEBONE	161680	261	347	54	229	168	178
8	HAMPSTEAD	19106	9	14	2	11	5	13
9	PANCRAS	198788	360	248	138	232	164	204
10	ISLINGTON	155341	187	97	120	110	116	156
11	HACKNEY	83295	139	73	103	93	55	75
12	ST. GILES	54076	285	115	49	77	68	82
13	STRAND	42979	156	111	29	62	41	39
14	HOLBORN	44862	161	25	22	55	43	73
15	CLERKENWELL	65681	121	59	45	92	61	91
16	ST. LUKE	57073	183	52	46	97	86	75
17	EAST LONDON	40687	182	85	59	57	46	27
18	WEST LONDON	27145	429	126	60	63	24	27
19	LONDON CITY	45555	207	71	20	47	28	15
20	SHOREDITCH	129364	789	237	139	189	149	137
21	BETHNAL GREEN	105101	789	192	611	207	111	174
22	WHITECHAPEL	78970	506	330	909	155	109	120
23	ST. GEORGE-IN-THE-EAST	48891	199	154	385	70	76	85
24*a*	STEPNEY	56572	335	241	559	102	80	110
24*b*	MILE END OLD TOWN	73064	166	147	501	82	74	95
25	POPLAR	79196	313	208	837	77	84	188
	SURREY (*part of*).							
26	ST. SAVIOUR SOUTHWARK	36170	539	495	32	111	90	39
27	ST. OLAVE SOUTHWARK	19056	349	315	21	49	14	16
28	BERMONDSEY	58355	734	845	35	149	115	80
29	ST. GEORGE SOUTHWARK	55510	836	546	38	125	91	45
30	NEWINGTON	82220	907	696	26	135	105	59
31	LAMBETH	162044	1618	941	114	276	244	179
32	WANDSWORTH	70403	484	422	40	75	105	68
33	CAMBERWELL	71488	504	553	46	86	98	66
34	ROTHERHITHE	24502	352	285	25	44	49	17
	KENT (*part of*).							
35	GREENWICH	127670	718	576	284	202	159	114
36	LEWISHAM	65757	96	81	56	54	50	46
	II.—SOUTH EASTERN COUNTIES.							
	1.—SURREY (*extra-metrop.*)							
37	EPSOM	22409	11	11	4	10	9	6
38	CHERTSEY	18642	36	4	2	6	13	11
39	GUILDFORD	29330	12	23	8	11	8	8
40	FARNHAM	30707	6	1	—	15	30	13
41	FARNBOROUGH	14318	—	—	—	4	3	4
42	HAMBLEDON	13907	—	—	3	6	10	6
43	DORKING	12445	4	4	3	5	12	7
44	REIGATE	20109	8	2	2	4	7	9
45	GODSTONE	9642	5	—	17	1	10	3
46	CROYDON	46474	94	90	15	43	55	42
47	KINGSTON	36479	32	48	17	26	35	15
48	RICHMOND	18802	48	69	11	13	21	9
	2.—KENT (*extra-metrop.*)							
49	BROMLEY	20368	10	21	3	13	11	5
50	DARTFORD	32316	117	32	10	19	24	17
51	GRAVESEND	18782	196	84	20	38	19	15
52	NORTH AYLESFORD	19121	73	48	7	16	28	11
53	HOO	2861	7	3	10	3	2	3
54	MEDWAY	51805	127	63	19	62	57	15

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866** —*continued.*

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA.			DIARRHŒA.		
			1849.	1854.	1866.	1849.	1854.	1866.
	II.—SOUTH EASTERN COUNTIES—*continued.*							
	2.—KENT (*extra-metrop.*)—*continued.*							
55	MALLING	21447	19	46	16	18	18	17
56	SEVENOAKS	22039	5	16	8	6	11	4
57	TUNBRIDGE	34271	19	62	4	21	45	28
58	MAIDSTONE	38670	98	88	23	56	71	25
59	HOLLINGBOURN	13584	10	10	2	13	9	4
60	CRANBROOK	13412	—	6	—	8	15	4
61	TENTERDEN	10947	2	5	—	12	3	5
62	WEST ASHFORD	15137	10	9	—	8	15	7
63	EAST ASHFORD	12286	6	1	8	9	6	2
64	BRIDGE	11316	5	27	5	9	5	8
65	CANTERBURY	16643	37	41	2	13	7	13
66	BLEAN	16161	23	26	6	9	19	11
67	FAVERSHAM	18867	16	13	14	12	17	9
68	MILTON	14775	68	116	21	16	29	9
69	SHEPPEY	18494	54	36	22	17	17	17
70	THANET	31862	203	206	58	57	89	21
71	EASTRY	25900	7	18	16	24	29	9
72	DOVER	31575	94	25	11	30	36	22
73	ELHAM	26925	1	59	9	15	35	8
74	ROMNEY MARSH	5708	1	—	—	3	4	2
	3.—SUSSEX.							
75	RYE	11927	8	—	—	6	—	4
76	HASTINGS	26631	51	4	3	28	16	22
77	BATTLE	12680	3	—	—	5	6	3
78	EASTBOURNE	10721	2	8	—	1	9	7
79	HAILSHAM	12068	3	1	3	7	5	5
80	TICEHURST	14626	11	6	—	17	14	3
81	UCKFIELD	17260	3	2	—	9	8	2
82	EAST GRINSTEAD	14097	1	4	1	4	12	5
83	CUCKFIELD	17163	17	1	—	9	4	4
84	LEWES	26995	2	2	7	21	26	10
85	BRIGHTON	77693	194	38	14	86	94	64
86	STEYNING	24053	24	8	—	9	9	6
87	HORSHAM	15313	4	6	1	9	11	5
88	PETWORTH	9397	1	2	—	—	3	4
89	THAKEHAM	7567	4	—	—	3	5	1
90	WORTHING	18921	8	6	19	7	12	12
91	WESTHAMPNETT	14811	4	1	3	13	28	6
92	CHICHESTER	14775	12	3	12	29	10	8
93	MIDHURST	12581	1	—	—	9	4	3
94	WESTBOURNE	6957	2	2	16	7	3	3
	4.—HAMPSHIRE.							
95	HAVANT	7212	3	1	9	5	3	—
96	PORTSEA ISLAND	94828	568	20	143	128	79	119
97	ALVERSTOKE	22653	126	10	19	20	19	11
98	FAREHAM	14864	11	—	8	14	7	9
99	ISLE OF WIGHT	55362	152	4	106	36	31	19
100	LYMINGTON	12094	—	—	2	8	7	4
101	CHRISTCHURCH	10438	—	—	—	—	1	2
102	RINGWOOD	5357	—	1	—	2	2	1
103	FORDINGBRIDGE	6377	9	1	—	1	1	4
104	NEW FOREST	13509	6	—	3	16	8	3
105	SOUTHAMPTON	43414	240	48	106	53	58	41
106	SOUTH STONEHAM	25542	34	4	3	23	23	22
107	ROMSEY	10771	15	1	16	12	3	3
108	STOCKBRIDGE	7286	2	12	—	1	5	2
109	WINCHESTER	26607	42	25	1	29	23	6
110	DROXFORD	10665	1	—	—	6	4	5
111	CATHERINGTON	2497	2	1	—	—	3	—
112	PETERSFIELD	7853	3	—	—	9	5	3
113	ALRESFORD	7182	—	—	—	—	1	—
114	ALTON	12063	9	—	—	6	10	5
115	HARTLEY WINTNEY	11480	—	—	1	1	10	8
116	BASINGSTOKE	17429	2	1	—	10	13	5
117	WHITCHURCH	5522	1	1	—	3	3	—
118	ANDOVER	17132	9	—	—	3	3	3
119	KINGSCLERE	8517	5	—	—	4	2	4

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866**—*continued.*

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	II.—SOUTH EASTERN COUNTIES—*continued.*							
	5.—BERKSHIRE.							
120	NEWBURY	19999	27	4	—	14	13	4
121	HUNGERFORD	19882	1	—	—	20	8	10
122	FARINGDON	15688	1	1	—	2	9	4
123	ABINGDON	20861	34	10	—	23	24	8
124	WANTAGE	17308	—	3	—	10	12	15
125	WALLINGFORD	14017	—	1	—	7	10	4
126	BRADFIELD	15771	3	1	—	8	21	4
127	READING	25876	17	7	1	44	33	15
128	WOKINGHAM	14465	1	13	—	1	10	—
129	COOKHAM	13031	8	—	—	11	11	4
130	EASTHAMPSTEAD	7436	—	—	1	2	5	2
131	WINDSOR	21301	58	9	1	4	7	7
	III.—SOUTH MIDLAND COUNTIES.							
	6.—MIDDLESEX (*ex.-met.*)							
132	STAINES	15976	41	20	1	20	23	7
133	UXBRIDGE	23155	40	49	4	21	23	14
134	BRENTFORD	50534	184	196	24	39	80	59
135	HENDON	19220	14	2	4	14	11	23
136	BARNET	19128	28	23	2	29	30	5
137	EDMONTON	59312	101	90	16	64	64	55
	7.—HERTFORDSHIRE.							
138	WARE	16515	18	6	—	8	13	10
139	BISHOP STORTFORD	20212	3	9	1	18	16	6
140	ROYSTON	25014	9	3	2	9	32	9
141	HITCHIN	25603	127	3	—	27	23	20
142	HERTFORD	15301	81	12	3	7	10	9
143	HATFIELD	8400	2	—	—	10	8	2
144	ST. ALBANS	18926	12	25	1	8	20	7
145	WATFORD	20355	45	14	1	11	22	6
146	HEMEL HEMPSTEAD	13922	21	9	—	11	21	8
147	BERKHAMPSTEAD	13204	5	16	1	14	24	6
	8.—BUCKINGHAMSH.							
148	AMERSHAM	18240	11	7	1	15	23	6
149	ETON	22353	41	7	—	16	19	3
150	WYCOMBE	35138	100	44	5	22	30	8
151	AYLESBURY	23600	19	5	4	28	35	19
152	WINSLOW	9265	—	1	—	5	5	3
153	NEWPORT PAGNELL	24855	4	3	—	11	16	8
154	BUCKINGHAM	13756	1	1	—	6	8	1
	9.—OXFORDSHIRE.							
155	HENLEY	18200	4	2	1	13	14	7
156	THAME	15305	—	16	—	2	18	6
157	HEADINGTON	17185	31	54	—	18	26	9
158	OXFORD	20037	44	78	—	22	24	9
159	BICESTER	15555	2	—	—	1	6	6
160	WOODSTOCK	14236	—	1	1	5	5	4
161	WITNEY	23238	33	18	1	15	25	3
162	CHIPPING NORTON	17306	—	1	—	2	11	11
163	BANBURY	30171	1	13	1	28	24	9
	10.—NORTHAMPTONS.							
164	BRACKLEY	13471	—	10	1	5	4	6
165	TOWCESTER	13004	—	86	1	9	16	7
166	POTTERSPURY	11632	—	33	—	4	4	3
167	HARDINGSTONE	9928	24	—	—	5	2	5
168	NORTHAMPTON	41152	49	8	1	26	20	32
169	DAVENTRY	20600	5	6	—	4	13	4
170	BRIXWORTH	15367	—	1	—	11	8	6
171	WELLINGBOROUGH	24224	2	2	2	6	18	12
172	KETTERING	18995	1	—	1	5	12	10
173	THRAPSTON	14065	9	—	—	8	3	2
174	OUNDLE	15463	2	1	—	2	5	4
175	PETERBOROUGH	33178	49	5	1	38	22	16

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No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	III.—SOUTH MIDLAND COUNTIES—*continued.*							
	11.—HUNTINGDONSH.							
176	HUNTINGDON	20518	7	6	1	20	20	20
177	ST. IVES	19654	5	10	—	3	12	7
178	ST. NEOTS	18965	2	2	—	11	17	7
	12.—BEDFORDSHIRE.							
179	BEDFORD	38072	37	3	2	25	42	15
180	BIGGLESWADE	25393	28	14	2	19	30	18
181	AMPTHILL	16970	1	11	—	9	22	11
182	WOBURN	11684	2	12	—	3	12	5
183	LEIGHTON BUZZARD	17648	3	17	16	18	20	7
184	LUTON	30712	2	4	2	12	58	36
	13.—CAMBRIDGESH.							
185	CAXTON	10966	12	1	—	1	9	13
186	CHESTERTON	25083	5	3	1	9	17	20
187	CAMBRIDGE	26361	5	3	—	29	18	13
188	LINTON	13510	2	1	1	12	14	5
189	NEWMARKET	28675	5	17	—	19	35	9
190	ELY	21928	3	46	2	13	16	10
191	NORTH WITCHFORD	14791	85	10	1	15	15	8
192	WHITTLESEY	6966	12	13	—	7	10	4
193	WISBECH	33323	138	176	2	46	37	26
	IV.—EASTERN COUNTIES.							
	14.—ESSEX.							
194	WEST HAM	59319	134	124	389	39	71	64
195	EPPING	16549	20	32	8	17	9	5
196	ONGAR	11317	3	6	1	2	17	2
197	ROMFORD	26965	163	113	23	43	72	15
198	ORSETT	11595	28	28	4	14	28	3
199	BILLERICAY	15031	4	25	—	8	16	10
200	CHELMSFORD	32765	4	3	1	9	20	16
201	ROCHFORD	18282	105	45	29	19	19	17
202	MALDON	22556	32	102	5	22	11	2
203	TENDRING	27105	71	8	1	33	23	15
204	COLCHESTER	23815	4	1	—	5	31	7
205	LEXDEN	22950	3	4	1	33	29	9
206	WITHAM	16324	2	6	—	13	18	6
207	HALSTEAD	18482	—	9	2	14	30	4
208	BRAINTREE	17170	—	5	—	8	12	11
209	DUNMOW	19759	3	1	—	13	8	8
210	SAFFRON WALDEN	19721	1	1	7	7	9	6
	15.—SUFFOLK.							
211	RISBRIDGE	17432	4	—	—	9	7	11
212	SUDBURY	31415	1	1	—	18	25	15
213	COSFORD	17376	—	4	1	12	9	6
214	THINGOE	18224	—	—	2	4	4	5
215	BURY ST. EDMUNDS	13318	3	—	2	4	6	8
216	MILDENHALL	9595	—	1	—	1	3	1
217	STOW	20908	2	3	—	7	7	11
218	HARTISMERE	17665	1	3	1	9	6	2
219	HOXNE	14694	1	—	1	9	10	—
220	BOSMERE	16174	1	4	—	10	7	10
221	SAMFORD	12736	2	7	—	7	12	3
222	IPSWICH	37881	18	33	2	59	83	29
223	WOODBRIDGE	22754	6	6	—	14	25	9
224	PLOMESGATE	20720	—	1	—	3	10	10
225	BLYTHING	26848	4	—	2	22	8	10
226	WANGFORD	13619	10	1	—	18	7	11
227	MUTFORD	24050	27	3	4	10	37	15
	16.—NORFOLK.							
228	YARMOUTH	30338	87	41	1	44	64	28
229	FLEGG	8631	2	2	—	9	16	3
230	TUNSTEAD	14516	4	—	—	11	7	17
231	ERPINGHAM	20874	1	17	1	10	17	3

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No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	IV.—EASTERN COUNTIES—*continued.*							
	16.—NORFOLK—*continued.*							
232	AYLSHAM	19052	21	4	—	7	17	4
233	ST. FAITHS	11298	6	17	—	—	7	2
234	NORWICH	74891	38	193	3	99	184	42
235	FOREHOE	12818	3	2	—	3	5	6
236	HENSTEAD	11290	1	2	—	2	4	2
237	BLOFIELD	11521	—	—	—	8	7	1
238	LODDON	14242	2	2	—	3	10	5
239	DEPWADE	25248	1	—	—	9	12	12
240	GUILTCROSS	11541	—	1	—	1	5	1
241	WAYLAND	11562	—	—	—	1	—	1
242	MITFORD	28020	21	10	—	8	6	2
243	WALSINGHAM	21118	—	31	—	2	19	3
244	DOCKING	17596	17	—	1	5	15	3
245	FREEBRIDGE LYNN	13486	—	1	—	2	2	5
246	KINGS LYNN	16701	2	9	1	19	15	8
247	DOWNHAM	20264	7	44	—	7	11	7
248	SWAFFHAM	13747	6	1	2	1	2	3
249	THETFORD	18694	3	4	6	8	4	5
	V.—SOUTH WESTERN COUNTIES.							
	17.—WILTSHIRE.							
250	HIGHWORTH	19237	2	17	1	3	14	6
251	CRICKLADE	11470	5	3	—	8	6	5
252	MALMSBURY	14556	1	1	2	7	2	2
253	CHIPPENHAM	22029	14	4	1	14	18	9
254	CALNE	8885	—	1	—	4	3	3
255	MARLBOROUGH	9774	5	—	1	4	4	1
256	DEVIZES	21680	67	2	—	7	7	6
257	MELKSHAM	17233	1	—	—	22	22	5
258	BRADFORD-ON-AVON	10475	7	1	—	16	14	2
259	WESTBURY	11751	4	—	—	8	13	4
260	WARMINSTER	15942	6	1	1	4	6	2
261	PEWSEY	12466	1	—	—	13	5	7
262	AMESBURY	8127	1	2	—	1	4	1
263	ALDERBURY	14770	27	6	3	16	9	9
264	SALISBURY	9039	165	15	2	30	10	—
265	WILTON	10674	12	7	—	2	—	2
266	TISBURY	9862	2	—	—	1	8	2
267	MERE	8057	—	—	—	8	4	1
	18.—DORSETSHIRE.							
268	SHAFTESBURY	12986	—	—	1	3	7	4
269	STURMINSTER	10340	—	—	—	1	6	1
270	BLANDFORD	14821	—	5	—	1	1	1
271	WIMBORNE	17253	—	2	1	7	5	6
272	POOLE	13742	31	—	—	4	6	5
273	WAREHAM	17072	1	—	—	5	4	2
274	WEYMOUTH	27291	59	—	1	22	25	6
275	DORCHESTER	24810	16	35	—	3	9	8
276	SHERBORNE	13463	1	2	3	—	8	3
277	BEAMINSTER	13587	—	1	—	7	7	1
278	BRIDPORT	16828	11	—	—	10	8	7
	19.—DEVONSHIRE.							
279	AXMINSTER	19758	1	—	2	11	5	9
280	HONITON	22729	5	—	6	6	2	7
281	ST. THOMAS	48405	21	4	117	28	12	40
282	EXETER	33742	44	10	113	39	32	40
283	NEWTON ABBOT	59063	86	10	51	41	33	30
284	TOTNES	32942	107	14	146	23	13	29
285	KINGSBRIDGE	19394	17	—	3	7	2	4
286	PLYMPTON ST. MARY	20502	151	3	—	6	7	12
287	PLYMOUTH	62599	830	59	13	49	62	95
288	EAST STONEHOUSE	14343	171	15	—	9	18	15
289	STOKE DAMEREL	50440	721	2	—	64	56	44
290	TAVISTOCK	35265	140	2	2	16	28	8
291	OKEHAMPTON	18580	6	—	2	2	3	4
292	CREDITON	20274	—	5	18	11	3	2

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	V.—SOUTH WESTERN COUNTIES—*continued.*							
	19.—DEVONSHIRE—*cont.*							
293	TIVERTON	30875	5	17	30	10	7	16
294	SOUTH MOLTON	19532	—	—	8	9	—	3
295	BARNSTAPLE	36293	52	1	—	26	10	5
296	TORRINGTON	16876	1	—	1	—	2	4
297	BIDEFORD	17790	2	46	13	3	6	6
298	HOLSWORTHY	9876	2	—	—	—	2	2
	20.—CORNWALL.							
299	STRATTON	8023	2	—	—	—	—	—
300	CAMELFORD	7784	1	1	—	5	2	2
301	LAUNCESTON	17005	3	—	—	5	1	2
302	ST. GERMANS	17631	236	1	2	18	9	9
303	LISKEARD	33562	132	1	—	25	22	12
304	BODMIN	19691	2	2	2	4	5	8
305	ST. COLUMB	16754	4	—	1	3	4	3
306	ST. AUSTELL	33797	135	1	4	6	17	6
307	TRURO	43070	81	2	1	13	19	13
308	FALMOUTH	23332	73	9	2	13	3	13
309	HELSTON	30036	6	1	—	11	6	10
310	REDRUTH	57173	133	3	6	9	11	28
311	PENZANCE	54554	22	2	3	28	27	39
312	SCILLY ISLANDS	2431	4	1	—	—	—	1
	21.—SOMERSETSHIRE.							
313	WILLITON	19918	1	—	2	1	3	3
313*b*	DULVERTON	6158	*	*	—	*	*	—
314	WELLINGTON	20480	1	—	5	8	10	6
315	TAUNTON	35601	60	1	1	31	19	33
316	BRIDGWATER	34420	235	—	10	31	15	20
317	LANGPORT	18077	—	—	3	10	7	5
318	CHARD	25591	2	—	—	13	6	5
319	YEOVIL	28189	3	—	—	18	19	13
320	WINCANTON	21500	2	—	—	9	11	9
321	FROME	25704	3	—	1	24	20	16
322	SHEPTON MALLET	16619	40	6	—	10	5	4
323	WELLS	21889	26	2	20	8	14	11
324	AXBRIDGE	36106	10	2	1	17	19	15
325	CLUTTON	23721	98	4	—	23	19	7
326	BATH	68333	90	—	1	101	79	67
327	KEYNSHAM	21802	77	2	—	18	17	14
328	BEDMINSTER	41237	281	4	24	33	26	32
	VI.—WEST MIDLAND COUNTIES.							
	22.—GLOUCESTERSH.							
329	BRISTOL	66027	501	76	17	123	78	64
330	CLIFTON	94687	563	92	10	88	154	75
331	CHIPPING SODBURY	18763	2	7	—	25	14	9
332	THORNBURY	16499	8	1	1	9	9	2
333	DURSLEY	13331	58	2	—	15	10	5
334	WESTBURY-ON-SEVERN	20189	7	7	1	6	10	6
335	NEWENT	12420	2	—	—	7	2	7
336	GLOUCESTER	34950	119	48	3	29	45	23
337	WHEATENHURST	7813	17	8	—	6	6	1
338	STROUD	36448	34	12	1	22	34	14
339	TETBURY	6110	—	—	—	1	3	—
340	CIRENCESTER	20934	1	—	—	7	5	2
341	NORTHLEACH	10895	—	1	—	—	3	—
342	STOW-ON-THE-WOLD	9687	—	—	1	1	—	—
343	WINCHCOMB	10082	—	—	—	4	5	4
344	CHELTENHAM	49792	6	5	—	51	63	19
345	TEWKESBURY	14908	59	1	5	17	8	3
	23.—HEREFORDSHIRE.							
346	LEDBURY	14880	—	—	—	—	2	2
347	ROSS	16306	—	1	1	3	1	4
348	HEREFORD	39287	—	—	1	21	17	12
349	WEOBLY	9018	—	—	—	1	1	1
350	BROMYARD	11811	—	—	—	1	2	1
351	LEOMINSTER	15494	1	—	—	2	4	2

* Included with Tiverton for these years.

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	VI.—WEST MIDLAND COUNTIES—*continued.*							
	24.—SHROPSHIRE.							
352	LUDLOW	17721	—	1	—	3	10	12
353	CLUN	10615	—	1	—	1	1	1
354	CHURCH STRETTON	6289	2	—	1	3	1	2
355	CLEOBURY MORTIMER	8304	1	—	—	7	1	3
356	BRIDGNORTH	15920	75	—	2	10	9	4
357	SHIFFNAL	11994	1	—	1	3	3	15
358	MADELEY	30403	61	1	4	9	4	11
359	ATCHAM	19455	15	—	1	6	3	7
360	SHREWSBURY	25784	116	2	—	26	14	34
361	OSWESTRY	23817	3	—	3	8	1	2
362	ELLESMERE	14611	3	2	2	4	1	3
363*a*	WEM	10644	6	2	—	4	6	3
363*b*	WHITCHURCH	11272	—	1	1	—	9	12
364	MARKET DRAYTON	14290	15	—	—	7	6	3
365	WELLINGTON	23873	9	1	1	17	13	23
366	NEWPORT	15447	4	2	1	7	12	4
	25.—STAFFORDSHIRE.							
367	STAFFORD	24474	3	2	1	11	12	6
368	STONE	21926	7	3	—	3	6	16
369	NEWCASTLE-UNDER-LYME	24567	241	—	1	24	15	24
370	WOLSTANTON	54356	79	21	2	65	86	109
371	STOKE-UPON-TRENT	71308	103	7	7	63	97	130
372	LEEK	24806	3	1	2	10	24	18
373	CHEADLE	20988	2	3	1	9	14	18
374	UTTOXETER	14787	—	2	—	1	5	3
375	BURTON-UPON-TRENT	41065	.6	3	1	13	18	25
376	TAMWORTH	15504	2	—	—	5	11	5
377	LICHFIELD	27541	6	2	1	14	12	11
378	PENKRIDGE	18662	8	1	3	9	11	18
379	WOLVERHAMPTON	126902	1365	80	8	243	312	133
380	WALSALL	59908	186	4	—	54	112	63
381	WEST BROMWICH	92480	250	41	1	108	112	133
382	DUDLEY	130267	412	256	2	270	351	178
	26.—WORCESTERSH.							
383	STOURBRIDGE	68726	314	16	14	73	75	66
384	KIDDERMINSTER	30507	13	—	5	34	25	24
385	TENBURY	7366	—	—	—	3	1	—
386	MARTLEY	15098	1	1	—	3	5	5
387	WORCESTER	30969	43	45	6	27	43	37
388	UPTON-ON-SEVERN	21010	13	9	1	3	11	3
389	EVESHAM	14767	—	1	1	8	12	9
390	PERSHORE	13865	—	23	—	8	5	6
391	DROITWICH	19237	22	4	1	10	8	13
392	BROMSGROVE	26259	19	2	1	20	30	9
393	KINGS NORTON	47349	7	2	7	18	50	43
	27.—WARWICKSHIRE.							
394	BIRMINGHAM	212621	29	17	10	427	560	203
395	ASTON	100522	6	15	4	102	196	93
396	MERIDEN	11290	1	—	—	4	6	7
397	ATHERSTONE	12118	—	5	—	8	8	10
398	NUNEATON	13054	2	—	—	11	15	3
399	FOLESHILL	19997	24	20	—	5	14	9
400	COVENTRY	41647	202	4	—	106	159	35
401	RUGBY	24436	1	3	1	2	10	5
402	SOLIHULL	13231	—	—	—	6	5	6
403	WARWICK	44047	20	—	—	29	46	20
404	STRATFORD-ON-AVON	21249	2	1	—	14	9	8
405	ALCESTER	16878	1	—	—	11	15	5
406	SHIPSTON-ON-STOUR	19852	1	21	—	3	18	9
407	SOUTHAM	10392	1	3	—	12	10	4
	VII.—NORTH MIDLAND COUNTIES.							
	28.—LEICESTERSHIRE.							
408	LUTTERWORTH	15515	1	—	—	5	1	2
409	MARKET HARBOROUGH	16059	—	4	—	4	14	6
410	BILLESDON	7272	1	1	—	2	1	2
411	BLABY	14305	—	1	—	17	14	9

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866**—*continued.*

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	VII.—NORTH MIDLAND COUNTIES—*continued.*							
	28.—LEICESTERSHIRE *continued.*							
412	HINCKLEY	16374	—	—	—	12	10	5
413	MARKET BOSWORTH	13428	1	—	—	—	5	2
414	ASHBY-DE-LA-ZOUCH	28543	4	2	—	9	7	11
415	LOUGHBOROUGH	24147	7	1	—	14	17	9
416	BARROW-UPON-SOAR	19778	2	2	—	7	10	11
417	LEICESTER	68056	2	3	3	75	146	147
418	MELTON MOWBRAY	20171	—	—	—	8	6	5
	29.—RUTLANDSHIRE.							
419	OAKHAM	11112	6	1	—	5	11	2
420	UPPINGHAM	12367	3	1	—	2	4	10
	30.—LINCOLNSHIRE.							
421	STAMFORD	18213	1	—	—	5	15	10
422	BOURN	20113	7	6	1	8	10	9
423	SPALDING	22129	2	1	—	22	13	9
424	HOLBEACH	18402	3	22	2	11	8	2
425	BOSTON	37969	35	—	1	7	14	16
426	SLEAFORD	24919	2	2	1	17	20	8
427	GRANTHAM	28886	4	3	—	7	16	7
428	LINCOLN	47063	7	—	—	42	23	18
429	HORNCASTLE	24718	5	—	1	12	8	5
430	SPILSBY	28799	1	—	2	5	7	5
431	LOUTH	34711	3	4	—	5	17	8
432	CAISTOR	37517	29	68	6	22	28	16
433	GLANFORD BRIGG	34731	26	8	5	20	16	17
434	GAINSBOROUGH	25973	246	20	29	63	21	21
	31.—NOTTINGHAMSH.							
435	EAST RETFORD	22677	21	2	1	8	9	14
436	WORKSOP	20704	2	27	2	8	7	6
437	MANSFIELD	30593	5	5	1	8	12	23
438	BASFORD	74357	42	12	5	40	75	40
439	RADFORD	30479	7	7	—	39	37	36
440	NOTTINGHAM	74693	18	16	2	94	156	89
441	SOUTHWELL	24425	—	1	—	3	4	1
442	NEWARK	30186	28	9	—	22	14	11
443	BINGHAM	15670	14	1	1	16	15	10
	32.—DERBYSHIRE.							
444	SHARDLOW	31113	6	—	2	19	21	11
445	DERBY	51049	18	4	2	40	53	30
446	BELPER	51711	3	3	5	22	22	35
447	ASHBORNE	20648	4	—	—	3	10	10
448	CHESTERFIELD	61779	3	5	9	23	46	49
449	BAKEWELL	31378	1	3	—	6	5	10
450	CHAPEL-EN-LE-FRITH	14020	4	—	—	1	4	6
451	HAYFIELD	32176	10	2	2	6	15	19
	VIII.—NORTH WESTERN COUNTIES.							
	33.—CHESHIRE.							
452	STOCKPORT	94360	72	15	15	165	233	101
453	MACCLESFIELD	61543	35	4	2	46	113	35
454	ALTRINCHAM	40517	7	4	3	19	37	33
455	RUNCORN	26792	82	29	12	25	34	22
456	NORTHWICH	33338	46	15	76	17	13	19
457	CONGLETON	34328	1	5	7	14	23	14
458	NANTWICH	40955	181	2	3	17	17	26
459	GREAT BOUGHTON (CHESTER)	58501	91	24	137	41	53	56
460*a*	WIRRAL	18420	139	43	58	70	63	13
460*b*	BIRKENHEAD	61420			78			83
	34.—LANCASHIRE.							
461	LIVERPOOL	269742	4173	1084	1487	981	814	732
462	WEST DERBY	225845	1135	206	502	279	245	416
463	PRESCOT	73127	176	71	22	59	96	67

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866**—*continued.*

No.	DISTRICTS.	Population, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	VIII.—NORTH WESTERN COUNTIES—*continued.*							
	34.—LANCASHIRE—*continued.*							
464	Ormskirk	46252	76	15	60	73	31	45
465	Wigan	94561	563	158	137	157	169	250
466	Warrington	43875	63	36	14	42	61	63
467	Leigh	37700	11	4	6	23	26	39
468	Bolton	130269	123	16	64	105	171	176
469	Bury	101135	58	12	18	84	106	127
470	Barton-upon-Irwell	39038	7	6	16	3	38	31
471	Chorlton	169579	280	13	26	305	293	318
472	Salford	105335	237	24	28	261	306	243
473	Manchester	243988	878	26	60	765	645	621
474	Ashton	134753	68	12	22	116	187	147
475	Oldham	111276	41	29	19	74	107	131
476	Rochdale	91754	23	15	11	54	70	75
477	Haslingden	69781	7	9	16	31	57	72
478	Burnley	75595	32	3	24	27	42	72
479	Clitheroe	20476	23	3	—	14	2	4
480	Blackburn	119942	45	9	26	86	117	190
481	Chorley	41678	28	5	11	15	14	34
482	Preston	110523	33	8	19	168	176	187
483	Fylde	25682	4	—	1	9	9	17
484	Garstang	12425	1	—	—	4	7	5
485	Lancaster	35297	94	10	1	39	15	29
486	Ulverston	35738	3	1	10	18	14	25
	IX.—YORKSHIRE.							
	35.—WEST RIDING.							
487	Sedbergh	4391	—	—	1	—	—	—
488	Settle	12528	—	—	2	7	1	3
489	Skipton	31343	7	4	6	4	9	6
490	Pateley Bridge	9534	2	—	2	3	1	2
491	Ripon	15742	3	3	—	13	12	3
492*a*	Great Ouseburn	11534	53	—	—	39	3	2
492*b*	Knaresborough	17176		1	—		13	8
492*c*	Wetherby	6486		—	—		1	2
492*d*	Kirkdeighton	941		—	—		—	—
493*a*	Otley	18669	6	—	1	6	15	22
493*b*	Wharfdale	15453	*	*	—	*	*	10
494	Keighley	43122	7	6	1	14	16	25
495	Todmorden	31113	12	1	9	24	20	14
496	Saddleworth	18631	5	2	4	5	15	16
497	Huddersfield	131336	52	31	16	71	132	83
498	Halifax	128673	27	18	13	46	71	61
499	Bradford	196475	426	34	34	244	313	208
500*a*	Kirkstall	49440	884	33	6	120	168	61
500*b*	Hunslet	25763			1			62
500*c*	Holbeck	15824			8			21
500*d*	Bramley	11391			—			9
501	Leeds	117566	1439	48	14	267	228	245
502	Dewsbury	92883	224	66	16	72	101	111
503	Wakefield	54899	241	2	3	73	61	82
504*a*	Pontefract	14635	238	21	3	68	32	14
504*b*	Hemsworth	7793		—	—		3	4
504*c*	Castleford	19954		—	1		—	38
505	Barnsley	45797		1	5		50	36
506	Wortley	38511		4	9		23	25
507	Ecclesall Bierlow	63618	36	15	5	47	84	77
508	Sheffield	128951	114	126	19	209	334	206
509	Rotherham	44350	30	14	4	32	49	57
510	Doncaster	39388	78	5	40	32	20	53
511	Thorne	16011	70	10	2	12	10	14
512	Goole	15153	74	19	50	26	23	17
513	Selby	16001	112	4	7	18	27	13
514*a*	Tadcaster	5996	18	2	—	2	1	—
514*b*	Bramham	12936			1			5

* Included with Otley and Hunslet districts for these years.

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866**—*continued.*

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	IX.—YORKSHIRE—*continued.*							
	36.—E. RIDING (WITH YORK.)							
515	YORK	59909	174	15	3	60	83	59
516	POCKLINGTON	16710	37	—	18	9	7	16
517	HOWDEN	15001	58	22	4	8	3	8
518	BEVERLEY	21029	20	5	3	3	8	8
519	SCULCOATES	51956	656	12	5	144	64	56
520	HULL	56888	1178	15	16	194	54	61
521	PATRINGTON	9681	4	—	—	—	1	4
522	SKIRLAUGH	9654	4	—	3	12	7	4
523	DRIFFIELD	19226	2	1	—	4	6	9
524	BRIDLINGTON	14371	8	—	2	4	12	9
	37.—NORTH RIDING.							
525	SCARBOROUGH	30425	8	2	4	8	21	17
526	MALTON	23483	6	5	—	18	24	16
527	EASINGWOLD	10148	1	—	—	3	5	4
528	THIRSK	12299	8	2	—	5	3	10
529	HELMSLEY	11832	—	—	2	6	6	7
530	PICKERING	10549	1	1	—	2	2	7
531	WHITBY	23633	10	33	2	7	7	14
532	GUISBROUGH	22128	3	30	2	2	6	26
533	STOKESLEY	10381	1	1	6	—	6	4
534	NORTHALLERTON	12174	3	4	—	1	4	3
535	BEDALE	8650	2	2	5	2	3	1
536	LEYBURN	10105	—	1	—	1	3	1
537	ASKRIGG	5649	1	2	—	2	1	1
538	REETH	6196	—	—	—	1	5	—
539	RICHMOND	13457	3	1	—	5	2	4
	X.—NORTHERN COUNTIES.							
	38.—DURHAM.							
540	DARLINGTON	26122	4	3	4	47	12	20
541*a*	STOCKTON	57039	248	230	63	62	96	100
541*b*	HARTLEPOOL	29153			27			50
542	AUCKLAND	50491	8	114	8	15	33	58
543	TEESDALE	20880	138	1	—	6	6	7
544	WEARDALE	16418	4	—	4	6	9	13
545	DURHAM	70274	192	26	18	40	39	48
546	EASINGTON	27293	72	13	12	9	20	23
547	HOUGHTON-LE-SPRING	21773	22	4	25	11	8	20
548	CHESTER-LE-STREET	27660	134	2	34	10	12	39
549	SUNDERLAND	90704	363	42	92	72	124	113
550	SOUTH SHIELDS	44849	201	48	47	66	40	75
551	GATESHEAD	59409	257	12*	19	35	54	54
	39.—NORTHUMBERLD.							
552	NEWCASTLE-UPON-TYNE	110968	295	17*	41	117	106	150
553	TYNEMOUTH	77955	815	23	167	89	57	112
554	CASTLE WARD	14943	17	—	2	3	7	11
555	HEXHAM	31850	13	—	1	13	11	22
556	HALTWHISTLE	6633	2	—	1	2	1	1
557	BELLINGHAM	7080	—	2	—	—	—	1
558	MORPETH	24003	36	—	9	9	12	36
559	ALNWICK	21053	142	—	2	17	17	9
560	BELFORD	6260	3	6	—	4	2	—
561	BERWICK	21862	76	41	1	6	13	10
562	GLENDALE	13211	11	3	—	9	3	3
563	ROTHBURY	7147	—	—	—	—	2	—
	40.—CUMBERLAND.							
564	ALSTON	6404	—	1	—	1	—	6
565	PENRITH	22322	4	—	—	5	3	9
566	BRAMPTON	10866	1	—	—	3	—	—
567	LONGTOWN	10469	1	—	7	—	2	6
568	CARLISLE	44820	51	21	2	38	53	37
569	WIGTON	23273	2	2	—	12	10	4
570	COCKERMOUTH	41292	282	3	7	27	20	54
571	WHITEHAVEN	39950	79	8	16	38	37	29
572	BOOTLE	5880	—	—	—	—	—	1

* In 1853 the deaths from Cholera in the district of Gateshead were 513, and in Newcastle-upon-Tyne 1414.

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866**—*continued.*

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	X.—NORTHERN COUNTIES—*continued.*							
	41.—WESTMORLAND.							
573	EAST WARD	15411	1	—	—	—	3	1
574	WEST WARD	8072	—	1	—	1	—	1
575	KENDAL	37463	—	—	1	16	12	12
	XI.—MONMOUTHSHIRE AND WALES.							
	42.—MONMOUTHSH.							
576	CHEPSTOW	17941	2	1	—	14	6	6
577	MONMOUTH	30244	22	—	—	5	14	8
578*a*	ABERGAVENNY	19527	438	11	1	66	43	7
578*b*	BEDWELTY	47565			122			31
579	PONTYPOOL	30288	69	—	20	9	31	11
580	NEWPORT	51412	246	6	61	31	32	33
	43.—SOUTH WALES.							
	GLAMORGANSHIRE.							
581*a*	CARDIFF	58285	396	225	76	75	47	41
581*b*	PONTYPRIDD	30387	*	*	48	*	*	28
582	MERTHYR TYDFIL	93008	1682	455	229	97	125	44
583	BRIDGEND	26465	87	17	80	8	9	12
584	NEATH	58533	738	54	520	61	26	56
585*a*	SWANSEA	51260	262	17	521	32	15	22
585*b*	GOWER	8316			29			7
	CARMARTHENSHIRE.							
586	LLANELLY	27979	45	—	232	11	16	46
587	LLANDOVERY	14775	14	2	2	5	2	1
588	LLANDILOFAWR	17222	40	3	12	3	1	4
589	CARMARTHEN	36675	142	2	143	20	5	11
	PEMBROKESHIRE.							
590	NARBERTH	21344	13	—	18	6	1	7
591	PEMBROKE	29003	11	9	42	33	9	19
592	HAVERFORDWEST	37343	13	40	40	14	20	17
	CARDIGANSHIRE.							
593	CARDIGAN	18585	—	4	5	1	3	2
594	NEWCASTLE-IN-EMLYN	19081	—	—	4	—	2	3
595	LAMPETER	9994	3	—	—	3	—	—
596	ABERAYRON	13540	—	—	1	—	2	1
597	ABERYSTWITH	25464	—	—	12	1	1	1
598	TREGARON	10737	—	—	—	—	—	—
	BRECKNOCKSHIRE.							
599	BUILTH	8305	1	—	1	1	1	1
600	BRECKNOCK	17279	7	54	—	7	7	7
601	CRICKHOWELL	22457	95	4	17	16	8	18
602	HAY	10819	1	—	—	1	6	2
	RADNORSHIRE.							
603	PRESTEIGNE	15671	—	—	—	6	—	—
604	KNIGHTON	10379	2	1	1	1	—	2
605	RHAYADER	6816	—	—	—	1	3	—
	44.—NORTH WALES.							
	MONTGOMERYSHIRE.							
606	MACHYNLLETH	12395	—	1	—	1	1	—
607	NEWTOWN	23732	8	19	—	10	14	12
608	MONTGOMERY	19097	37	4	2	5	1	1
609	LLANFYLLIN	21699	4	—	—	2	1	3
	FLINTSHIRE.							
610	HOLYWELL	39941	86	2	88	26	7	10

* Included with Cardiff and Merthyr Tydfil for these years.

Deaths REGISTERED from **Cholera** and **Diarrhœa** in each DISTRICT during the Years **1849, 1854,** and **1866**—*continued.*

No.	DISTRICTS.	POPULATION, 1861.	CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
	XI.—MONMOUTHSHIRE AND WALES—*continued.*							
	44.—NORTH WALES— *continued.*							
	DENBIGHSHIRE.							
611	WREXHAM	47975	5	4	23	20	23	26
612	RUTHIN	16083	1	—	11	2	—	1
613	ST. ASAPH	27518	4	—	6	12	4	6
614	LLANRWST	12770	—	1	—	1	—	1
	MERIONETHSHIRE.							
615	CORWEN	16107	3	—	3	1	—	1
616	BALA	6352	—	—	1	2	1	4
617	DOLGELLY	12482	—	—	—	—	1	3
618	FESTINIOG	18289	1	—	—	3	2	3
	CARNARVONSHIRE.							
619	PWLLHELI	20908	2	—	2	3	4	3
620	CARNARVON	32425	21	—	75	5	8	17
621	BANGOR	36309	6	3	14	2	9	14
622	CONWAY	13896	—	—	2	3	—	7
	ANGLESEY.							
623	ANGLESEY	38157	66	—	29	3	5	1

TABLE 4.—**Mortality** from **Cholera** and **Diarrhœa** during the Years **1849, 1854,** and **1866** in the several DIVISIONS of ENGLAND.

DIVISIONS AND COUNTIES.	DEATHS to 10,000 Persons living. CHOLERA. 1849.	CHOLERA. 1854.	CHOLERA. 1866.	DIARRHŒA. 1849.	DIARRHŒA. 1854.	DIARRHŒA. 1866.
ENGLAND	30	11	7	11	11	8
DIVISIONS.						
I. LONDON	62	43	18	17	13	10
II. SOUTH EASTERN	20	9	4	9	9	5
III. SOUTH MIDLAND	12	10	1	8	10	5
IV. EASTERN	8	8	4	7	10	4
V. SOUTH WESTERN	25	2	3	6	5	5
VI. WEST MIDLAND	25	4	1	12	14	8
VII. NORTH MIDLAND	5	2	1	6	8	6
VIII. NORTH WESTERN	37	7	9	17	17	14
IX. YORK	36	3	2	11	12	9
X. NORTHERN	37	6	5	8	8	9
XI. WELSH	39	8	18	5	4	4

TABLE 5.—NUMBER of DISTRICTS in ENGLAND and WALES in which **no Deaths** from **Cholera** were recorded in **1849, 1854,** and **1866.**

——	1849.	1854.	1866.
TOTAL - - - -	86	161	238
1. LONDON - - - - - -	—	—	—
2. SOUTH EASTERN COUNTIES - -	11	22	38
3. SOUTH MIDLAND COUNTIES - -	8	5	27
4. EASTERN COUNTIES - - - -	11	10	29
5. SOUTH WESTERN COUNTIES - -	10 *	31 *	36
6. WEST MIDLAND COUNTIES - -	18	26	37
7. NORTH MIDLAND COUNTIES - -	5	12	23
8. NORTH WESTERN COUNTIES - -	— †	2	2
9. YORKSHIRE - - - - -	5	16 †	20
10. NORTHERN COUNTIES - - -	6	13	12
11. MONMOUTHSHIRE AND WALES -	12 ‡	24 ‡	14

* Dulverton is included with Tiverton in these years.
† Wharfdale is included with Otley and Hunslet in these years.
‡ Pontypridd is included with Cardiff and Merthyr Tydfil in these years.

TABLE 6.—**Mortality** from **Cholera** in EACH of THREE EPIDEMICS—in LONDON, and in CERTAIN DISTRICTS of ENGLAND and WALES in which the EPIDEMIC of **1866** was MOST FATAL in PROPORTION to POPULATION.

DISTRICTS, &c.	ENUMERATED POPULATION.		NUMBER of DEATHS registered from CHOLERA.			MORTALITY from CHOLERA to 10,000 Persons living.		
	1851.	1861.	1849.	1854.	1866.	1849.	1854.	1866.
LONDON - - -	2,362,236	2,803,989	14,137	10,738	5,596	62	43	18
Godstone - - - -	8,868	9,642	5	—	17	6	—	17
Milton - - - -	12,026	14,775	68	116	21	59	91	13
Thanet - - - -	31,793	31,862	203	206	58	64	65	18
Westbourne - - -	6,944	6,957	2	2	16	3	3	23
Portsea Island - - -	72,126	94,828	568	20	143	83	3	13
Isle of Wight - - -	50,324	55,362	152	4	106	31	1	18
Southampton - - -	34,098	43,414	240	48	106	74	13	22
West Ham - - -	34,395	59,319	134	124	389	43	31	50
Rochford - - - -	15,838	18,282	105	45	29	68	27	15
St. Thomas (Devon) -	48,806	48,405	21	4	117	4	1	24
Exeter - - - -	32,823	33,742	44	10	113	14	3	33
Totnes - - - -	34,022	32,942	107	14	146	32	4	45
Gainsborough - - -	27,258	25,973	246	20	29	91	7	11
Northwich - - -	31,202	33,338	46	15	76	15	5	22
Great Boughton - -	52,950	58,501	91	24	137	18	4	22
Wirral - - - -	14,968	18,420	139	43	58	26	7	28
Birkenhead - - -	42,189	61,420			78			11
Liverpool - - - -	258,236	269,742	4,173	1,084	1,487	163	41	54
West Derby - - -	153,279	225,845	1,135	206	502	80	12	18
Ormskirk - - - -	38,307	46,252	76	15	60	21	4	12
Wigan - - - -	77,539	94,561	563	158	137	76	19	13
Goole - - - - -	13,686	15,153	74	19	50	55	14	31
Houghton-le-Spring -	19,564	21,773	22	4	25	12	2	11
Tynemouth - - -	64,248	77,955	815	23	167	132	3	19
Bedwelty - - - -	41,566	47,565	438	11	122	108	3	24
Cardiff - - - -	33,104	58,285	396	225	76	84	42	10
Pontypridd - - -	19,516	30,387			48			13
Merthyr Tydfil - - -	70,675	93,008	1,682	455	229	251	59	22
Bridgend - - - -	23,422	26,465	87	17	80	38	7	28
Neath - - - - -	46,471	58,533	738	54	520	166	11	79
Swansea - - - -	38,420	51,260	262	17	521	59	3	88
Gower - - - -	8,487	8,316			29			35
Llanelly - - - -	23,507	27,979	45	—	232	20	—	76
Carmarthen - - -	38,142	36,675	142	2	143	38	·5	40
Pembroke - - - -	22,960	29,003	11	9	42	5	4	13
Haverfordwest - - -	39,382	37,343	13	40	40	3	10	11
Holywell - - - -	41,047	39,941	86	2	88	21	·5	22
Carnarvon - - - -	30,446	32,425	21	—	75	7	—	22

TABLE 7.—**Mortality** from **Cholera** in LONDON and in the DISTRICTS of ENGLAND which were chiefly attacked, in each of the EPIDEMICS of **1849, 1854,** and **1866,** arranged in the Order of Mortality.

1849.

DISTRICTS, &c.	MORTALITY from CHOLERA in 1849.	
	Deaths Registered.	Deaths to 10,000 Population.
Merthyr Tydfil	1,682	251
Sculcoates and Hull	1,834	200
Salisbury	165	185
Plymouth, East Stonehouse, and Stoke Damerel	1,722	177
Neath	738	166
St. Germans	236	143
Wolverhampton	1,365	138
Liverpool and West Derby	5,308	136
Tynemouth	815	132
Hunslet and Leeds	2,323	125
Gravesend	196	119
Newcastle-under-Lyme	241	117
Gainsborough	246	91
Cardiff	396	84
Portsea Island and Alverstoke	694	83
Bristol and Clifton	1,154	82
Plympton St. Mary	151	77
Abergavenny	438	76
Wigan	563	76
Cockermouth	282	74
Bedminster	281	74
Southampton	210	74
Selby	112	73
Bridgwater	235	71
Teesdale	138	70
Alnwick	142	69
Romford	163	68
Chester-le-Street	134	66
LONDON	14,137	62
Newport	246	60

1854.

DISTRICTS, &c.	MORTALITY from CHOLERA in 1854.	
	Deaths Registered.	Deaths to 10,000 Population.
Milton	116	91
Towcester	86	67
Thanet	206	65
Merthyr Tydfil	455	59
Wisbech	176	49
Gravesend	84	49
Maldon	102	46
Brentford	196	45
Romford	113	45
LONDON	10,738	43
Cardiff	225	42
Richmond	69	41
Stockton and Hartlepool	239	39
Auckland	114	32
West Ham	124	31
Liverpool and West Derby	1,200	30
Brecknock	54	30
Norwich	193	28

Note.—The death-rate from Cholera in 1849 here given will be found to differ from that published in the Cholera Report of 1849, the calculations in that Report having been made prior to the Census of 1851.

1866.

DISTRICTS, &c.	MORTALITY from CHOLERA in 1866.	
	Deaths Registered.	Deaths to 10,000 Population.
Swansea	521	88
Neath	520	79
Llanelly	232	76
West Ham	389	50
Totnes	146	45
Carmarthen	143	40
Liverpool and West Derby	1,989	36
Gower	29	35
Exeter	113	33
Goole	50	31
Bridgend	80	28
Wirral	58	28
Bedwelty	122	24
St. Thomas (Devon)	117	24
Westbourne	16	23
Merthyr Tydfil	229	22
Southampton	106	22
Great Boughton	137	22
Holywell	88	22
Northwich	76	22
Carnarvon	75	22
Tynemouth	167	19
LONDON	5,596	18
Isle of Wight	106	18
Thanet	58	18
Godstone	17	17
Rochford	29	15
Pontypridd	48	13
Portsea Island	143	13
Wigan	137	13
Pembroke	42	13
Milton	21	13
Ormskirk	60	12
Birkenhead	78	11
Haverfordwest	40	11
Gainsborough	29	11

TABLE 8.—ENGLAND. **Deaths** and **Rate of Mortality** from **Cholera** and **Diarrhœa** in **1849, 1854,** and **1866,** of MALES and FEMALES at Different Ages.

AGES.	DEATHS FROM CHOLERA.						DEATHS FROM DIARRHŒA.					
	MALES.			FEMALES.			MALES.			FEMALES.		
	1849.	1854.	1866.	1849.	1854.	1866.	1849.	1854.	1866.	1849.	1854.	1866.
All Ages -	26,108	9,860	6,905	27,185	10,237	7,383	9,637	10,211	8,840	9,250	9,841	8,330
0–	3,866	1,984	1,517	3,470	1,659	1,361	6,393	7,943	7,016	5,652	6,995	6,105
5–	2,458	930	772	2,358	856	692	232	148	134	206	146	142
10–	1,349	456	395	1,217	353	311	109	57	50	110	57	38
15–	2,578	984	547	2,573	936	587	188	113	77	222	141	86
25–	3,837	1,292	824	4,303	1,402	1,043	232	109	86	204	223	150
35–	3,712	1,364	894	4,038	1,575	1,100	259	120	113	325	208	173
45–	3,417	1,153	887	3,387	1,222	883	333	197	175	331	217	190
55–	2,605	919	647	2,909	1,077	704	506	326	304	510	400	329
65–	1,610	546	380	1,954	723	478	679	556	405	773	634	509
75–	576	208	122	827	302	187	521	523	398	601	603	477
85–	70	24	9	97	40	34	119	112	79	124	149	127
95 & upds.	2	..	1	4	2	3	5	7	3	9	8	4
?	23	..	..	18	..	..	1	..	..	3	..	..

AGES.	DEATHS FROM CHOLERA TO 10,000 LIVING.						DEATHS FROM DIARRHŒA TO 10,000 LIVING.					
	MALES.			FEMALES.			MALES.			FEMALES.		
	1849.	1854.	1866.	1849.	1854.	1866.	1849.	1854.	1866.	1849.	1854.	1866.
All Ages -	30·2	10·8	6·8	30·0	10·8	6·8	11·1	11·2	8·6	10·2	10·4	7·6
0–	33·2	16·2	10·3	29·5	13·6	9·3	54·9	64·7	47·8	48·0	57·3	41·7
5–	23·2	8·6	6·2	22·3	7·9	5·6	2·8	1·4	1·1	2·8	1·3	1·1
10–	13·8	4·6	3·5	12·8	3·6	2·8	1·1	·6	·4	1·2	·6	·3
15–	15·4	5·7	2·9	14·2	5·2	3·0	1·1	·7	·4	1·2	·8	·4
25–	29·3	9·5	5·9	30·3	10·2	6·2	1·8	·8	·6	2·1	1·5	·9
35–	38·3	13·0	7·9	40·5	14·0	8·3	2·7	1·1	1·0	3·2	1·8	1·3
45–	49·5	14·9	9·1	46·7	14·9	9·4	4·8	2·5	1·8	4·6	2·7	2·0
55–	58·7	18·0	10·2	60·4	19·6	12·0	11·4	6·4	4·8	10·6	7·3	5·6
65–	64·4	19·7	13·1	67·8	21·8	10·9	27·2	20·1	14·0	26·8	19·2	11·6
75–	59·7	20·8	11·0	71·7	23·6	13·8	54·0	52·3	36·0	52·1	51·8	35·1
85–	49·8	18·9	7·3	48·7	20·8	17·2	84·7	88·0	63·7	62·3	77·4	64·2
95 & upds.	31·1	..	24·6	33·0	20·0	30·3	77·7	136·1	73·8	74·2	79·9	40·4

TABLE 9.—ENGLAND. **Aggregate Deaths** from **Cholera** and **Diarrhœa,** of MALES and FEMALES at DIFFERENT AGES, during the Three Epidemics of **1849, 1854,** and **1866.**

AGES.	DEATHS from CHOLERA and CHOLERAIC DIARRHŒA in the Three Years 1849, 1854, 1866.		DEATHS referred in the Registers directly to CHOLERA (1849, 1854, 1866).		DEATHS referred in the Registers to DIARRHŒA, and taken as caused by CHOLERAIC MATTER (1849, 1854, 1866).		DEATHS registered under the Cause "DIARRHŒA" in the Three Years 1849, 1854, 1866, when Cholera was epidemic.		DEATHS registered under the Cause "DIARRHŒA" in the Three Years 1848, 1853, 1864, when Cholera was not epidemic.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
All Ages -	50,183	52,003	42,963	44,805	7,220	7,198	28,688	27,421	21,468	20,223
0–	12,142	10,830	7,372	6,493	4,770	4,337	21,353	18,755	16,583	14,418
5–	4,426	4,201	4,163	3,908	263	293	574	584	311	291
10–	2,313	1,955	2,201	1,881	112	74	216	205	104	131
15–	4,262	4,267	4,112	4,098	150	169	378	449	228	280
25–	6,151	7,075	5,957	6,841	194	234	427	607	233	433
35–	6,177	7,022	5,974	6,746	203	276	492	706	289	430
45–	5,725	5,784	5,461	5,495	264	289	705	738	441	449
55–	4,545	5,169	4,174	4,692	371	477	1,136	1,239	765	762
65–	2,970	3,730	2,537	3,155	433	575	1,640	1,916	1,207	1,341
75–	1,286	1,721	906	1,316	380	405	1,442	1,741	1,062	1,336
85–	174	239	103	171	71	68	310	400	239	332
95 & upwds.	12	10	3	9	9	1	15	21	6	20

TABLE **10.**—ENGLAND. **Aggregate Annual Mortality** from **Cholera** and **Choleraic Diarrhœa,** of MALES and FEMALES at DIFFERENT AGES, in the Three Epidemics of **1849, 1854,** and **1866.**

AGES.	AVERAGE ANNUAL DEATHS TO 10,000 LIVING.					
	CHOLERA.		CHOLERAIC DIARRHŒA.		CHOLERA and CHOLERAIC DIARRHŒA.	
	Males.	Females.	Males.	Females.	Males.	Females.
All Ages -	15·4	15·3	2·6	2·5	18·0	17·8
0–	19·3	17·0	12·5	11·4	31·8	28·4
5–	12·4	11·7	·8	·9	13·2	12·6
10–	7·2	6·2	·4	·2	7·6	6·4
15–	7·8	7·5	·3	·3	8·1	7·8
25–	14·7	15·1	·5	·5	15·2	15·6
35–	18·9	19·4	·6	·8	19·5	20·2
45–	22·4	21·9	1·1	1·2	23·5	23·1
55–	26·1	28·5	2·3	2·9	28·4	31·4
65–	30·7	29·9	5·2	5·5	35·9	35·4
75–	29·7	34·3	12·5	10·6	42·2	44·9
85–	27·2	29·6	18·8	11·8	46·0	41·4
95 & upwards	20·6	29·8	61·8	3·0	82·4	32·8

DIVISIONS.	Population 1861.	Total Deaths from Cholera and Diarrhœa.	Deaths from each Cause.	Sex.	Ages. All Ages.	Under 5 Years.	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwards
ENGLAND - -	**20,066,224**	**31,548**	Cholera 14,378	Males -	6,995	1,517	772	395	547	824	894	887	647	380	122	9	1
				Females -	7,383	1,361	692	311	587	1,043	1,100	883	704	478	187	34	3
			Diarrh. 17,170	Males -	8,840	7,016	134	50	77	86	113	175	304	405	398	79	3
				Females -	8,330	6,105	142	38	86	130	173	190	329	509	477	127	4
I. LONDON - - -	**2,803,989**	**8,743**	Cholera 5,596	Males -	2,674	699	321	145	182	317	319	298	232	121	35	4	1
				Females -	2,922	589	286	108	228	375	436	328	299	188	66	17	2
			Diarrhœa 3,147	Males -	1,591	1,367	26	7	6	15	15	30	41	41	37	6	-
				Females -	1,556	1,221	33	5	9	22	29	30	56	79	60	12	-
II. SOUTH EASTERN -	**1,847,661**	**1,821**	Cholera 865	Males -	454	83	57	22	33	54	58	68	35	33	9	2	-
				Females -	411	70	46	20	31	44	66	53	29	31	20	1	-
			Diarrhœa 956	Males -	512	346	14	3	9	9	11	15	25	32	32	16	-
				Females -	444	264	15	-	10	11	17	20	22	38	31	15	1
III. SOUTH MIDLAND -	**1,295,497**	**810**	Cholera 111	Males -	55	10	4	2	4	2	10	9	8	4	2	-	-
				Females -	56	18	3	3	3	4	10	5	3	5	2	-	-
			Diarrhœa 699	Males -	369	262	3	3	3	4	7	6	18	23	34	5	1
				Females -	330	208	2	1	5	6	4	9	14	33	43	5	-
IV. EASTERN - - -	**1,142,580**	**1,020**	Cholera 501	Males -	238	56	34	12	22	25	37	22	17	9	4	-	-
				Females -	263	61	18	14	28	38	38	30	15	17	3	-	1
			Diarrhœa 519	Males -	278	181	6	-	5	2	3	5	9	23	35	9	-
				Females -	241	136	4	4	4	3	7	4	8	30	29	12	-
V. SOUTH WESTERN -	**1,835,714**	**1 523**	Cholera 631	Males -	328	70	35	21	22	38	45	26	28	35	6	2	-
				Females -	303	52	30	16	21	27	40	43	32	29	12	1	-
			Diarrhœa 892	Males -	452	309	10	4	6	7	7	9	25	31	36	7	1
				Females -	440	275	12	3	8	9	5	12	17	35	43	20	1

ENGLAND.—**Deaths of Males and Females** REGISTERED from **Cholera and Diarrhœa** at different Ages in the Year **1866** in each of the Registration Divisions—*continued.*

DIVISIONS.	POPULATION 1861.	TOTAL DEATHS from CHOLERA and DIARRHŒA.	DEATHS from EACH CAUSE.	SEX.	Ages. ALL AGES.	Under 5 Years.	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwards
VI. WEST MIDLAND -	**2,436,568**	**2,146**	Cholera 139	Males -	78	20	10	3	3	3	9	12	7	7	4	–	–
				Females -	61	14	7	1	4	4	11	9	2	6	3	–	–
			Diarrhœa 2,007	Males -	*1,051*	*849*	*6*	*6*	*4*	*3*	*7*	*13*	*41*	*63*	*51*	*7*	*1*
				Females -	*956*	*713*	*12*	*3*	*12*	*18*	*22*	*9*	*84*	*61*	*55*	*17*	–
VII. NORTH MIDLAND -	**1,288,928**	**855**	Cholera 83	Males -	49	5	1	–	4	5	5	11	8	6	4	–	–
				Females -	34	9	1	–	–	6	4	5	3	3	3	–	–
			Diarrhœa 772	Males -	*432*	*324*	*3*	*1*	*4*	*1*	*8*	*8*	*16*	*25*	*36*	*6*	–
				Females -	*340*	*229*	*6*	*2*	*8*	*5*	*6*	*13*	*15*	*27*	*22*	*7*	–
VIII. NORTH WESTERN -	**2,935,540**	**7,509**	Cholera 2,991	Males -	1,465	302	148	85	108	187	220	197	128	71	19	–	–
				Females -	1,526	273	141	63	107	272	249	202	136	67	12	4	–
			Diarrhœa 4,518	Males -	*2,305*	*1,959*	*31*	*9*	*22*	*25*	*28*	*50*	*68*	*66*	*39*	*8*	–
				Females -	*2,213*	*1,747*	*27*	*13*	*17*	*37*	*44*	*53*	*85*	*97*	*78*	*15*	–
IX. YORKSHIRE - -	**2,015,541**	**2,322**	Cholera 358	Males -	182	43	7	5	14	15	19	37	24	12	6	–	–
				Females -	176	46	12	5	9	24	19	17	21	15	8	–	–
			Diarrhœa 1,964	Males -	*995*	*791*	*8*	*8*	*5*	*6*	*13*	*20*	*29*	*47*	*59*	*9*	–
				Females -	*969*	*751*	*11*	*1*	*5*	*20*	*19*	*15*	*30*	*32*	*55*	*9*	*1*
X. NORTHERN - -	**1,151,372**	**1,745**	Cholera 610	Males -	288	62	21	16	24	30	42	45	30	10	8	–	–
				Females -	322	56	30	16	28	54	40	40	33	18	7	–	–
			Diarrhœa 1,135	Males -	*568*	*453*	*13*	*3*	*6*	*10*	*7*	*13*	*17*	*20*	*21*	*5*	–
				Females -	*567*	*422*	*6*	*1*	*2*	*9*	*11*	*11*	*29*	*32*	*36*	*7*	*1*
XI. WELSH - - - -	**1,312,834**	**3,054**	Cholera 2,493	Males -	1,184	167	134	84	131	148	130	162	130	72	25	1	–
				Females -	1,309	173	118	65	128	195	187	151	131	99	51	11	–
			Diarrhœa 561	Males -	*287*	*175*	*14*	*6*	*7*	*4*	*7*	*6*	*15*	*34*	*18*	*1*	–
				Females -	*274*	*139*	*14*	*5*	*6*	*10*	*9*	*14*	*19*	*25*	*25*	*8*	–

AGES.	Total Deaths.	Deaths of each Sex.	Duration of Attack.																				
			Hours.				Total under 1 Day.	Days.															
			0	6	12	18		1	2	3	4	5	6	7	8	9	10	14	21	28	35	42 & upds.	Not specd.
All Ages -	**14,378**	Males 6,995	61	582	924	387	1,954	800	408	343	232	153	106	135	56	25	62	38	16	5	2	7	2653
		Females 7,383	36	497	1,031	463	2,027	888	411	312	269	167	133	173	48	32	63	58	16	3	2	7	2774
Under 5 Years	**2,878**	Males 1,517	25	141	163	54	383	136	105	104	56	32	27	39	8	10	14	15	7	2	-	3	576
		Females 1,361	11	111	158	51	331	113	81	75	69	36	19	36	11	5	12	18	8	1	-	4	540
5- -	**1,464**	Males 772	4	87	133	30	254	74	38	31	22	20	7	9	7	-	5	2	1	1	-	1	300
		Females 692	7	95	117	27	246	72	25	19	26	12	12	12	3	1	5	4	-	-	-	-	255
10- -	**706**	Males 395	3	26	61	30	120	57	13	8	9	10	6	10	8	2	3	3	1	-	-	-	145
		Females 311	1	24	59	22	106	35	10	11	15	12	6	12	2	5	5	1	-	-	-	-	91
15- -	**1,134**	Males 547	5	54	80	33	172	47	23	20	10	10	10	13	1	-	8	1	1	-	-	-	231
		Females 587	3	33	81	30	147	67	30	23	19	13	6	17	8	1	6	5	1	-	-	-	244
25- -	**1,867**	Males 824	6	88	109	52	255	90	38	24	27	20	10	12	9	3	10	2	-	-	1	-	323
		Females 1,043	3	47	136	82	268	128	56	30	25	25	26	27	7	5	9	7	1	2	-	-	427
35- -	**1,994**	Males 894	10	62	116	55	243	101	57	51	29	21	8	17	10	3	6	4	2	-	-	1	341
		Females 1,100	3	72	168	66	309	122	57	52	44	23	25	21	10	4	9	6	2	-	1	1	414
45- -	**1,770**	Males 887	6	67	113	60	246	125	57	39	31	20	21	13	5	3	7	2	-	1	-	1	316
		Females 883	1	56	126	50	233	120	60	44	32	16	17	15	4	4	3	4	2	-	-	1	328
55- -	**1,351**	Males 647	1	31	78	38	148	97	46	35	29	14	11	14	5	2	6	1	1	1	-	-	237
		Females 704	4	34	94	73	205	112	50	27	21	14	12	15	-	4	7	8	2	-	-	1	226
65- -	**858**	Males 380	1	16	52	25	94	58	24	20	15	4	3	4	3	1	3	5	3	-	1	1	141
		Females 478	2	15	70	47	134	77	27	23	13	10	8	11	2	3	6	3	-	-	1	-	160
75- -	**309**	Males 122	-	10	17	10	37	13	7	9	4	1	3	4	-	1	-	3	-	-	-	-	40
		Females 187	1	9	20	14	44	30	10	7	5	6	2	6	1	-	1	2	-	-	-	-	73
85- -	**43**	Males 9	-	-	2	-	2	2	-	2	-	1	-	-	-	-	-	-	-	-	-	-	2
		Females 34	-	1	2	1	4	10	5	1	-	-	-	-	-	-	-	-	-	-	-	-	14
95 and upwards	**4**	Males 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
		Females 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2

AGES.	TOTAL DEATHS.	DEATHS OF EACH SEX.	Duration of Attack. — HOURS. 0	6	12	18	Total under 1 Day.	DAYS. 1	2	3	4	5	6	7	8	9	10	14	21	28	35	42 & upds.	Not specd.
All Ages -	**17,170**	Males 8,840	1	27	52	24	104	107	200	285	325	280	179	556	114	58	233	436	294	167	42	324	5,136
		Females 8,330	*1*	*20*	*48*	*23*	*92*	*116*	*173*	*296*	*287*	*220*	*161*	*500*	*121*	*73*	*233*	*427*	*286*	*173*	*89*	*351*	*4,762*
Under 5 Years	**13,121**	Males 7,016	-	18	32	15	65	86	165	241	262	233	148	472	92	43	191	375	246	135	32	236	3,994
		Females 6,105	*1*	*14*	*29*	*6*	*50*	*74*	*126*	*218*	*220*	*165*	*127*	*393*	*84*	*59*	*167*	*350*	*223*	*133*	*47*	*217*	*3,452*
5- -	**276**	Males 134	1	6	4	3	14	4	5	6	5	2	2	5	2	-	-	-	2	1	-	2	84
		Females 142	-	*2*	*3*	*3*	*8*	*8*	*7*	*8*	*7*	*2*	*2*	*5*	*2*	-	*1*	*4*	*1*	*2*	-	*2*	*83*
10- -	**88**	Males 50	-	-	-	-	-	2	4	3	1	-	1	5	1	-	1	1	4	-	-	5	22
		Females 38	-	-	*2*	*1*	*3*	-	*3*	*2*	-	*3*	-	-	-	-	-	*2*	-	-	-	*3*	*22*
15- -	**163**	Males 77	-	-	-	1	1	-	3	5	2	2	1	-	-	-	1	4	1	-	1	6	50
		Females 86	-	-	-	*1*	*1*	*2*	*1*	*2*	*4*	*2*	*2*	*3*	*1*	*1*	*1*	*2*	*2*	-	-	*7*	*55*
25- -	**236**	Males 86	-	-	1	-	1	-	1	3	1	4	3	1	-	-	3	1	2	5	1	3	57
		Females 150	-	-	-	*3*	*3*	*3*	*6*	*2*	*4*	*3*	-	*4*	*1*	*2*	*9*	*3*	*4*	*3*	*2*	*17*	*84*
35- -	**286**	Males 113	-	-	1	-	1	2	2	3	4	4	1	7	2	-	4	3	4	-	1	5	70
		Females 173	-	*2*	*2*	*3*	*7*	*4*	*2*	*3*	*9*	*5*	*4*	*7*	*5*	-	*3*	*8*	*2*	*2*	*3*	*10*	*99*
45- -	**365**	Males 175	-	1	6	1	8	1	1	2	6	1	3	9	3	2	4	5	3	2	2	7	116
		Females 190	-	*1*	*1*	*1*	*3*	*5*	*7*	*7*	*5*	*2*	*5*	*9*	*2*	-	*2*	*7*	*7*	*5*	*1*	*14*	*109*
55- -	**633**	Males 304	-	-	2	2	4	2	4	4	11	12	8	15	5	5	6	11	4	10	2	22	179
		Females 329	-	-	*3*	-	*3*	*5*	*4*	*9*	*9*	*11*	*7*	*15*	*8*	-	*12*	*11*	*6*	*8*	*2*	*22*	*197*
65- -	**914**	Males 405	-	1	4	2	7	7	4	7	15	12	7	21	4	3	10	12	13	6	-	21	256
		Females 509	-	-	*2*	-	*2*	*8*	*8*	*24*	*9*	*6*	*7*	*26*	*10*	*6*	*16*	*16*	*22*	*15*	*2*	*33*	*299*
75- -	**875**	Males 398	-	1	1	-	2	2	9	8	14	8	4	18	4	3	8	21	11	7	3	12	264
		Females 477	-	-	*5*	*4*	*9*	*6*	*6*	*17*	*15*	*17*	*6*	*28*	*7*	*4*	*17*	*18*	*15*	*8*	*1*	*24*	*284*
85- -	**206**	Males 79	-	-	1	-	1	1	2	3	4	2	1	3	1	1	5	2	4	1	-	5	43
		Females 127	-	*1*	*1*	*1*	*3*	*1*	*3*	*3*	*5*	*4*	*1*	*10*	*1*	*1*	*4*	*6*	*4*	*2*	-	*2*	*77*
95 and upwards	**7**	Males 3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1
		Females 4	-	-	-	-	-	-	-	*1*	-	-	-	-	-	-	*1*	-	-	-	*1*	-	*1*

AGES.	TOTAL DEATHS.	DEATHS OF EACH SEX.	Duration of Attack.																				
			HOURS.				Total under 1 Day.	DAYS.															
			0	6	12	18		1	2	3	4	5	6	7	8	9	10	14	21	28	35	42 & upds.	Not specd.
All Ages -	**5,596**	Males 2,674	28	239	404	150	821	322	160	134	95	68	43	58	23	12	24	20	6	2	1	2	883
		Females 2922	14	216	474	188	892	373	178	127	106	70	72	80	20	12	25	27	7	1	1	2	929
Under 5 Years	**1,288**	Males 699	14	66	93	27	200	73	42	46	19	12	12	17	4	5	10	10	4	2	-	1	242
		Females 589	4	51	83	28	166	49	34	36	38	11	12	16	7	2	6	5	5	-	-	2	200
5- -	**607**	Males 321	2	42	66	12	122	38	16	12	11	10	2	5	5	-	2	-	-	-	-	-	98
		Females 286	3	43	55	12	113	30	10	8	10	4	4	5	3	1	2	4	-	-	-	-	92
10- -	**253**	Males 145	2	10	30	6	48	22	4	2	4	8	3	6	-	1	-	2	-	-	-	-	45
		Females 108	1	10	30	6	47	11	2	3	7	4	2	2	-	1	3	-	-	-	-	-	26
15- -	**410**	Males 182	3	17	25	8	53	16	10	6	4	6	5	5	1	-	2	-	-	-	-	-	74
		Females 228	1	17	37	9	64	28	13	13	5	8	3	8	1	-	5	2	-	-	-	-	78
25- -	**692**	Males 317	3	31	45	25	104	35	14	7	12	10	5	7	4	2	5	-	-	-	1	-	111
		Females 375	-	20	60	29	109	51	25	14	8	8	12	13	2	2	1	5	-	1	-	-	124
35- -	**755**	Males 319	2	27	40	21	90	38	29	22	13	7	2	7	4	2	1	-	1	-	-	-	103
		Females 436	2	27	75	26	130	56	30	18	14	12	17	15	4	1	2	4	1	-	-	-	132
45- -	**626**	Males 298	2	17	46	27	92	39	18	11	13	7	7	4	1	-	1	2	-	-	-	1	102
		Females 328	-	26	50	20	96	42	23	16	17	7	10	7	2	2	1	2	1	-	-	-	102
55- -	**531**	Males 232	-	15	36	9	60	39	15	15	11	6	5	6	2	1	3	1	1	-	-	-	67
		Females 299	2	14	47	31	94	59	20	11	4	7	6	8	-	2	2	3	-	-	-	-	83
65- -	**309**	Males 121	-	10	17	11	38	19	11	6	7	2	-	1	2	-	-	2	-	-	-	-	33
		Females 188	-	4	30	20	54	35	12	5	2	5	5	2	1	1	3	1	-	-	1	-	61
75- -	**101**	Males 35	-	4	4	4	12	3	1	6	1	-	2	-	-	1	-	3	-	-	-	-	6
		Females 66	1	4	7	7	19	7	5	3	1	4	1	3	-	-	-	1	-	-	-	-	22
85- -	**21**	Males 4	-	-	2	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
		Female 17	-	-	-	-	-	5	4	-	-	-	-	-	-	-	-	-	-	-	-	-	8
95 and upwards	**3**	Males 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
		Females 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1

AGES.	Total Deaths.	Deaths of each Sex.	Duration of Attack.																				
			Hours.				Total under 1 Day.	Days.															
			0	6	12	18		1	2	3	4	5	6	7	8	9	10	14	21	28	35	42 & upds.	Not specd.
All Ages -	**3,147**	Males 1591	1	6	11	2	20	31	57	66	83	65	46	126	29	17	53	65	52	20	6	39	816
		Females *1556*	*1*	*4*	*13*	*2*	*20*	*25*	*51*	*82*	*68*	*54*	*39*	*112*	*23*	*15*	*50*	*98*	*50*	*16*	*11*	*51*	*791*
Under 5 Years	**2,588**	Males 1,367	–	5	7	2	14	28	52	61	72	58	38	116	24	13	50	63	47	16	3	32	680
		Females *1,221*	*1*	*2*	*9*	*1*	*13*	*20*	*41*	*70*	*55*	*48*	*34*	*94*	*13*	*15*	*39*	*84*	*42*	*14*	*10*	*42*	*587*
5– -	**59**	Males 26	1	1	3	–	5	1	1	2	3	1	1	–	–	–	–	–	–	1	–	–	11
		Females *33*	–	–	*1*	–	*1*	–	*3*	*2*	–	–	*1*	*2*	–	–	–	*1*	*1*	–	–	*1*	*21*
10– -	**12**	Males 7	–	–	–	–	–	–	2	–	–	–	1	–	–	–	–	–	–	–	–	–	4
		Females *5*	–	–	–	–	–	–	–	*1*	–	–	–	–	–	–	–	*1*	–	–	–	–	*3*
15– -	**15**	Males 6	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	1	–	3
		Females *9*	–	–	–	–	–	*1*	*1*	–	–	–	–	–	–	–	–	–	–	–	–	–	*7*
25– -	**37**	Males 15	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	2	–	–	10
		Females *22*	–	–	–	–	–	*1*	*1*	*1*	*1*	–	–	*2*	–	–	*1*	*1*	–	–	–	–	*14*
35– -	**44**	Males 15	–	–	–	–	–	–	–	–	1	–	–	2	–	–	–	–	1	–	–	1	10
		Females *29*	–	–	–	–	–	–	–	*1*	*3*	*1*	*1*	*3*	–	–	*1*	*2*	–	–	*1*	–	*16*
45– -	**60**	Males 30	–	–	1	–	1	–	1	1	2	–	–	2	3	–	–	–	1	–	–	3	16
		Females *30*	–	*1*	*1*	–	*2*	–	–	–	*1*	*1*	*1*	*1*	*1*	–	–	*2*	*1*	–	–	–	*20*
55– -	**97**	Males 41	–	–	–	–	–	–	–	–	–	1	1	1	1	1	2	1	1	–	–	1	31
		Females *56*	–	–	*1*	–	*1*	*2*	*2*	*2*	*3*	*3*	*1*	*3*	*3*	–	*4*	*2*	–	*1*	–	*1*	*28*
65– -	**120**	Males 41	–	–	–	–	–	2	–	1	1	2	2	5	1	2	–	1	1	–	–	1	22
		Females *79*	–	–	*1*	–	*1*	–	*2*	*2*	*1*	–	*1*	*3*	*4*	–	*3*	*2*	*5*	*1*	–	*4*	*50*
75– -	**97**	Males 37	–	–	–	–	–	–	–	1	4	1	1	–	–	1	–	–	1	1	2	–	25
		Females *60*	–	–	–	*1*	*1*	*1*	*1*	*3*	*3*	*1*	–	*2*	*2*	–	*2*	*3*	*1*	–	–	*2*	*38*
85– -	**18**	Males 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	4
		Females *12*	–	*1*	–	–	*1*	–	–	–	*1*	–	–	*2*	–	–	–	–	–	–	–	*1*	*7*
95 and upwards	**—**	Males —	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		Females —	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE **16**.—ENGLAND. **Occupations** of **Males** DYING at different AGES from **Cholera** in the Year **1866**.

OCCUPATIONS.	ALL AGES.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
TOTAL	6995	1517	772	395	547	824	894	887	647	380	122	9	1
I.—*Persons engaged in the* GENERAL *or* LOCAL GOVERNMENT *of the Country.*													
1. *National Government.*													
Post Office	6	–	–	–	–	1	2	1	–	2	–	–	–
Inland Revenue	1	–	–	–	–	–	–	–	1	–	–	–	–
Customs	6	–	–	–	–	3	1	2	–	–	–	–	–
Government Messengers, Workmen	1	–	–	–	–	–	–	–	1	–	–	–	–
Dockyard Artificers	16	–	–	–	1	6	6	1	1	1	–	–	–
Other Government Officers	1	–	–	–	–	–	1	–	–	–	–	–	–
2. *Local Government.*													
Police	13	–	–	–	2	6	2	2	–	1	–	–	–
Union and Parish Officer	1	–	–	–	–	–	–	–	1	–	–	–	–
Other Local Officers	1	–	–	–	–	–	–	1	–	–	–	–	–
II.—*Persons engaged in the* DEFENCE *of the Country.*													
1. *Army at Home.*													
Soldier	14	–	–	–	2	8	2	1	–	–	1	–	–
Chelsea Pensioner	8	–	–	–	–	–	–	2	1	1	2	2	–
Others connected with the Army	1	–	–	–	–	–	–	1	–	–	–	–	–
2. *Navy (Ashore or in Port).*													
Navy Officer	1	–	–	–	–	–	–	–	1	–	–	–	–
Seaman, R.N.	4	–	–	–	2	2	–	–	–	–	–	–	–
Royal Marine	4	–	–	–	–	4	–	–	–	–	–	–	–
Greenwich Pensioner	7	–	–	–	–	–	1	1	1	2	2	–	–
Others connected with the Navy	3	–	–	–	–	–	–	2	–	–	1	–	–
III.—*Persons engaged in the* LEARNED PROFESSIONS, *or in* LITERATURE, ART, *and* SCIENCE (*with their immediate subordinates*).													
1. *Clergymen, Ministers, and Church Officers.*													
Clergyman	1	–	–	–	–	–	–	1	–	–	–	–	–
Protestant Minister	4	–	–	–	–	–	–	–	–	2	2	–	–
Other Religious Teachers	2	–	–	–	–	–	2	–	–	–	–	–	–
Parish Clerk	1	–	–	–	–	–	–	1	–	–	–	–	–
Other Church Officers	1	–	–	–	–	–	–	–	–	1	–	–	–
2.—*Lawyers, Law Court Officers, and Law Stationers.*													
Solicitor	3	–	–	–	–	–	–	2	1	–	–	–	–
Officers of Law Court	3	–	–	–	–	–	–	–	2	1	–	–	–
Law Clerk	2	–	–	–	–	1	–	–	1	–	–	–	–
3. *Physicians, Surgeons, and Druggists.*													
Physician	2	–	–	–	–	–	–	–	1	1	–	–	–
Surgeon, Apothecary	3	–	–	–	–	1	–	1	1	–	–	–	–
Dentist	1	–	–	–	–	–	1	–	–	–	–	–	–
Druggist	7	–	–	–	–	1	2	2	1	1	–	–	–
4. *Authors and Literary Persons.*													
Author, Editor, Writer	2	–	–	–	–	–	1	1	–	–	–	–	–
5. *Artists.*													
Artist, Painter	2	–	–	–	–	–	–	1	–	–	1	–	–
Engraver	2	–	–	–	–	–	–	–	2	–	–	–	–
Photographic Artist	2	–	–	–	–	–	2	–	–	–	–	–	–
6. *Musicians, Teachers of Music.*													
Musician	10	–	–	–	–	3	3	1	2	1	–	–	–
7. *Actors, &c.*													
Persons engaged about Theatres, Exhibitions	6	–	–	–	1	2	1	1	–	1	–	–	–
8. *Teachers.*													
Schoolmaster	4	–	–	–	1	–	1	–	1	1	–	–	–

ENGLAND.—Occupations of Males dying at different Ages from Cholera in the Year 1866—*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
IV.—*Persons returned (only) as* Children *or* Relatives, *and* Scholars.													
3. *Children and Relatives at home, not otherwise described.*													
Son, Grandson, Brother, Nephew	2690	1517	771	377	25	-	-	-	-	-	-	-	-
4. *Scholars (so described).*													
Scholar	2	-	-	1	1	-	-	-	-	-	-	-	-
V.—*Persons engaged in entertaining and performing* Personal Offices *for man.*													
1. *In Board and Lodging.*													
Innkeeper, Hotel-keeper	9	-	-	-	-	-	1	3	3	1	1	-	-
Publican	27	-	-	-	-	2	6	8	8	3	-	-	-
Beerseller	6	-	-	-	-	2	-	4	-	-	-	-	-
Lodging, Boarding-house, Keeper	2	-	-	-	-	1	-	1	-	-	-	-	-
Coffee-house, Eating-house, Keeper	3	-	-	-	-	-	-	2	1	-	-	-	-
Cook (not Domestic Servant)	1	-	-	-	-	-	1	-	-	-	-	-	-
2. *In Attendance (Domestic Servants), &c.*													
Domestic Servant (General)	6	-	-	-	-	2	1	1	-	1	1	-	-
Coachman	1	-	-	-	-	-	-	-	1	-	-	-	-
Gardener	2	-	-	-	-	-	1	-	1	-	-	-	-
Inn Servant	9	-	-	-	6	1	-	1	1	-	-	-	-
Hospital, Lunatic Asylum,—Attendants, Nurses	1	-	-	-	-	-	-	-	1	-	-	-	-
VI.—*Persons who* Buy *or* Sell, Keep *or* Lend *Money, Houses, or Goods of various kinds*													
1. *Mercantile Men.*													
Merchant	3	-	-	-	-	-	1	-	1	-	1	-	-
Banker	1	-	-	-	-	-	-	-	1	-	-	-	-
Insurance, Benefit Society,—Officer	1	-	-	-	-	-	-	-	1	-	-	-	-
Ship Broker, Agent	1	-	-	-	-	-	-	-	-	1	-	-	-
Broker	2	-	-	-	-	-	2	-	-	-	-	-	-
Agent, Factor	4	-	-	-	-	2	1	1	-	-	-	-	-
Coal, Colliery,—Agent, Factor	1	-	-	-	-	-	-	-	1	-	-	-	-
Auctioneer, Appraiser, Valuer	1	-	-	-	-	1	-	-	-	-	-	-	-
Accountant	1	-	-	-	-	-	1	-	-	-	-	-	-
Commercial Clerk	41	-	-	-	4	9	6	10	7	4	1	-	-
Commercial Traveller	13	-	-	-	1	2	2	4	4	-	-	-	-
Other Mercantile Men	2	-	-	-	-	-	-	-	2	-	-	-	-
2. *Other General Dealers.*													
Pawnbroker	2	-	-	-	-	-	1	1	-	-	-	-	-
Marinestore dealer	4	-	-	-	-	-	2	1	1	-	-	-	-
Gen. Dealer, Huckster, Costermonger	18	-	-	-	3	2	2	8	2	1	-	-	-
Shopkeeper (branch undefined)	4	-	-	-	-	-	-	1	1	2	-	-	-
Hawker, Pedlar	32	-	-	1	5	6	5	9	4	2	-	-	-
VII.—*Persons engaged in the* Conveyance *of Men, Animals, Goods, and Messages.*													
1. *Carriers on Railways.*													
Railway Engine Driver, Stoker	12	-	-	-	3	3	2	2	2	-	-	-	-
Railway Officer, Clerk, Station-master	7	-	-	-	1	-	-	2	4	-	-	-	-
Railway Servant, Porter, Gatekeeper	16	-	-	-	4	4	4	1	3	-	-	-	-
Railway Police	1	-	-	-	1	-	-	-	-	-	-	-	-
2. *Carriers on Roads.*													
Toll Collector, Turnpike-gate Keeper	1	-	-	-	-	-	-	-	1	-	-	-	-
Coach, Omnibus, Cab,—Owner	1	-	-	-	-	-	1	-	-	-	-	-	-
Coachman (not domestic)	7	-	-	-	3	-	1	1	1	1	-	-	-
Cabman, Flyman	12	-	-	-	1	3	2	4	2	-	-	-	-
Carman, Carrier, Carter, Drayman	86	-	-	1	4	16	29	18	11	5	2	-	-
Others engaged in Road conveyance	1	-	-	-	-	-	-	-	1	-	-	-	-
3. *Carriers on Canals and Rivers.*													
Canal and inland navigation service	5	-	-	-	-	-	3	-	-	2	-	-	-
Barge, Lighter, Water,—man	56	-	-	-	17	10	12	9	2	4	2	-	-

ENGLAND.—Occupations of Males dying at different Ages from Cholera in the Year 1866—*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
4. Carriers on Seas and Rivers.													
Shipowner	3	–	–	–	–	–	–	–	3	–	–	–	–
Seaman (Merchant Service)	203	–	–	–	59	59	34	27	14	5	5	–	–
Pilot	4	–	–	–	–	1	1	1	–	1	–	–	–
Boatman on Seas	9	–	–	–	1	1	1	1	2	3	–	–	–
Harbour, Dock Servant, Dock Labourer	91	–	–	–	5	19	24	24	13	4	2	–	–
Wharfinger	1	–	–	–	–	–	–	–	–	–	1	–	–
Others connected with Seas and Rivers	28	–	–	–	3	6	11	5	2	1	–	–	–
5. Engaged in Storage.													
Warehouseman (not Manchester)	7	–	–	–	–	3	1	–	3	–	–	–	–
Others connected with Storage	3	–	–	–	–	–	1	1	–	1	–	–	–
6. Messengers and Porters.													
Messenger, Porter (not Government), Errand Boy	65	–	1	1	5	13	14	10	15	5	1	–	–
VIII.—*Persons possessing or working the* Land, *and engaged in growing* Grain, Fruits, Grasses, Animals, *and other products.*													
1. In Fields and Pastures.													
Land Proprietor	4	–	–	–	–	–	–	–	–	2	2	–	–
Farmer, Grazier	58	–	–	–	–	4	1	16	16	15	6	–	–
Agricultural Labourer (out-door)	152	–	–	–	11	15	24	33	28	28	12	1	–
Farm Servant (in-door)	3	–	–	–	1	–	–	–	2	–	–	–	–
Land Surveyor, Land Estate Agent	2	–	–	–	–	–	–	1	1	–	–	–	–
2. In Woods.													
Woodman	1	–	–	–	–	1	–	–	–	–	–	–	–
Others connected with Arboriculture	1	–	–	–	–	–	–	–	1	–	–	–	–
3. In Gardens.													
Gardener (not Domestic Servant)	27	–	–	–	3	2	3	4	5	7	2	1	–
IX.—*Persons engaged about* Animals.													
Horse—Proprietor, Dealer	2	–	–	–	–	–	–	–	1	–	1	–	–
Horsekeeper, Groom, Jockey	17	–	–	–	1	5	3	5	1	2	–	–	–
Farrier, Veterinary Surgeon	10	–	–	–	–	1	4	2	1	2	–	–	–
Cattle, Sheep—Dealer, Salesman	1	–	–	–	–	–	–	1	–	–	–	–	–
Drover	8	–	–	–	1	3	1	–	1	2	–	–	–
Pig—Merchant, Dealer	2	–	–	–	–	–	1	–	–	1	–	–	–
Vermin Destroyer, Rat-catcher	2	–	–	–	–	–	–	–	–	1	1	–	–
Fisherman	24	–	–	–	2	2	6	6	2	5	1	–	–
Others engaged about Animals	5	–	–	–	–	2	1	–	1	1	–	–	–
X.—*Persons engaged in* Art *and* Mechanic *Productions, in which matters of various kinds are employed in combination.*													
1. In Books.													
Bookseller, Publisher	3	–	–	–	–	–	–	1	–	2	–	–	–
Bookbinder	3	–	–	–	–	1	–	1	1	–	–	–	–
Printer	10	–	–	–	2	3	2	1	1	1	–	–	–
Newspaper Agent, Vendor, Newspaper Keeper	1	–	–	–	–	–	–	–	1	–	–	–	–
Others engaged about Publications	1	–	–	–	–	–	–	–	–	1	–	–	–
2. In Musical Instruments.													
Musical Instrument—Maker, Dealer	4	–	–	–	–	–	1	1	2	–	–	–	–
3. In Prints and Pictures.													
Others connected with Prints & Pictures	1	–	–	–	–	1	–	–	–	–	–	–	–
4. Carving and Figures.													
Wood-carver	1	–	–	–	–	1	–	–	–	–	–	–	–
5. In Tackle for Sports and Games.													
Toy—Maker, Dealer	1	–	–	–	–	–	1	–	–	–	–	–	–
6. In Designs, Medals, and Dies.													
Pattern Designer	1	–	–	–	–	1	–	–	–	–	–	–	–
7. In Watches and Philosophical Instruments.													
Watchmaker, Clockmaker	12	–	–	–	1	2	1	4	–	3	1	–	–
Optician, Spectacle-maker	3	–	–	–	–	–	2	–	–	1	–	–	–
Other Philosophical Instrument-makers	2	–	–	–	–	–	1	–	–	1	–	–	–

ENGLAND.—Occupations of Males dying at different Ages from Cholera in the Year 1866—*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
9. *In Arms.*													
Gunsmith, Gun Manufacturer	9	–	–	–	2	2	–	2	1	1	–	–	1
10. *In Machines and Tools.*													
Engine and Machine Maker	47	–	–	–	7	10	10	15	5	–	–	–	–
Tool—Maker, Dealer	1	–	–	–	–	–	–	–	1	–	–	–	–
File-maker	4	–	–	–	–	1	2	1	–	–	–	–	–
Saw—Smith, Maker	1	–	–	–	–	–	1	–	–	–	–	–	–
Cutler	2	–	–	–	–	–	–	–	1	1	–		–
Others engaged about Tools and Machinery	7	–	–	–	–	1	3	1	1	–	1	–	–
11. *In Carriages.*													
Coachmaker	14	–	–	–	1	3	2	3	5	–	–	–	–
Others engaged about Carriages	1	–	–	–	–	–	1	–	–	–	–	–	–
12. *In Harness.*													
Saddler, Harness-maker	6	–	–	–	–	–	3	1	1	1	–	–	–
13. *In Ships.*													
Shipbuilder, Shipwright	57	–	–	–	10	13	11	12	7	3	1	–	–
Block, Oar, Mast,—Maker	4	–	–	–	–	2	1	1	–	–	–	–	–
Boat, Barge—Builder	6	–	–	–	–	1	3	2	–	–	–	–	–
Sailmaker	2	–	–	–	–	–	1	–	1	–	–	–	–
Others engaged in fitting Ships	12	–	–	–	2	4	1	3	2	–	–	–	–
14. *In Houses and Buildings.*													
House Proprietor	4	–	–	–	–	–	–	1	–	2	1	–	–
House Agent, Rent Collector	4	–	–	–	–	–	–	2	1	1	–	–	–
Architect	2	–	–	–	–	–	1	–	–	–	1	–	–
Surveyor	1	–	–	–	–	–	1	–	–	–	–	–	–
Builder	21	–	–	–	1	3	4	6	5	2	–	–	–
Carpenter, Joiner	116	–	–	1	12	24	21	24	20	12	2	–	–
Bricklayer	67	–	–	–	14	9	20	6	11	7	–	–	–
Mason, Pavior	49	–	–	–	8	6	13	14	6	2	–	–	–
Slater, Tiler	2	–	–	–	–	1	1	–	–	–	–	–	–
Plasterer	18	–	–	–	3	4	4	4	3	–	–	–	–
Paperhanger	1	–	–	–	1	–	–	–	–	–	–	–	–
Plumber, Painter, Glazier	47	–	–	–	7	10	8	13	7	2	–	–	–
Others engaged in Houses & Buildings	2	–	–	–	–	–	–	1	1	–	–	–	–
15. *In Furniture.*													
Cabinet-maker, Upholsterer	34	–	–	–	5	5	7	8	7	2	–	–	–
Undertaker	3	–	–	–	–	–	1	1	1	–	–	–	–
Chair-maker	8	–	–	–	2	1	1	–	3	1	–	–	–
Picture Frame Maker	2	–	–	–	1	–	–	–	1	–	–	–	–
Carver, Gilder	5	–	–	–	2	–	2	–	1	–	–	–	–
Furniture Broker	6	–	–	–	–	1	–	4	1	–	–	–	–
Others dealing in Furniture	2	–	–	–	1	1	–	–	–	–	–	–	–
16. *In Implements.*													
Wheelwright	10	–	–	–	–	2	3	2	–	1	1	1	–
Millwright	3	–	–	–	–	1	–	1	–	1	–	–	–
17. *In Chemicals.*													
Manufacturing Chemist, Labourer at Chemical Works	7	–	–	–	–	1	2	2	2	–	–	–	–
Dye, Colour—Manufacturer	1	–	–	1	–	–	–	–	–	–	–	–	–
Dyer, Scourer, Calenderer	8	–	–	–	1	1	2	2	2	–	–	–	–
Others manufacturing Chemicals	5	–	–	–	–	–	–	2	1	1	1	–	–
XI.—*Persons working and dealing in the* Textile Fabrics, *and in* Dress.													
1. *In Wool and Worsted.*													
Woollen Cloth Manufacture	7	–	–	–	–	–	–	5	1	1	–	–	–
Worsted Manufacture	6	–	–	–	1	1	–	3	–	–	1	–	–
Flannel Manufacture	2	–	–	–	–	–	1	–	–	1	–	–	–
Carpet, Rug—Manufacturer	3	–	–	–	1	–	1	1	–	–	–	–	–
Others	1	–	–	–	–	1	–	–	–	–	–	–	–
2. *In Silk.*													
Silk Manufacture	37	–	–	–	–	3	2	5	11	12	4	–	–
Silk—Dyer, Printer	2	–	–	–	–	1	–	–	1	–	–	–	–
3. *In Cotton and Flax.*													
Lace Manufacture	1	–	–	–	–	–	1	–	–	–	–	–	–
Cotton Manufacture	41	–	–	–	6	6	5	11	8	4	1	–	–
Fustian Manufacture	1	–	–	–	–	–	–	1	–	–	–	–	–
Calico, Cotton—Printer	1	–	–	–	–	–	–	–	1	–	–	–	–
Calico, Cotton—Dyer	1	–	–	–	–	–	1	–	–	–	–	–	–
Others	1	–	–		–	–	–	–	–	–	–	–	–

ENGLAND.—Occupations of Males dying at different Ages from Cholera in the Year 1866—*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
4. In Mixed Materials.													
Packer and Presser	3	–	–	–	–	–	–	2	1	–	–	–	–
Weaver (not otherwise defined)	2	–	–	–	–	–	1	–	1	–	–	–	–
Draper, Linen-draper, Mercer	9	–	–	–	–	2	3	3	1	–	–	–	–
Others	2	–	–	–	1	–	–	–	–	–	1	–	–
5. In Dress.													
Hair-dresser, Wig-maker	10	–	–	–	2	–	2	2	1	3	–	–	–
Hatter, Hat Manufacturer	7	–	–	–	1	1	1	1	2	1	–	–	–
Straw-hat, Bonnet—Maker	1	–	–	–	–	–	1	–	–	–	–	–	–
Furrier	2	–	–	–	1	–	–	–	1	–	–	–	–
Tailor	62	–	–	–	9	7	12	14	11	8	1	–	–
Clothes Dealer, Salesman, Outfitter	2	–	–	–	–	–	–	–	1	1	–	–	–
Hose Manufacture	1	–	–	–	–	–	–	–	–	–	1	–	–
Hosier, Haberdasher	1	–	–	–	–	–	–	1	–	–	–	–	–
Shoemaker, Bootmaker	111	–	–	1	6	10	20	32	20	16	6	–	–
Patten, Clog—Maker	2	–	–	–	–	–	–	1	1	–	–	–	–
Umbrella, Parasol, Stick—Maker	4	–	–	–	–	2	2	–	–	–	–	–	–
Others providing Dress	4	–	–	–	–	2	–	–	2	–	–	–	–
6. Hemp and other Fibrous Materials.													
Mat—Maker, Seller	2	–	–	–	–	–	1	–	1	–	–	–	–
Rope, Cord—Maker	10	–	–	–	2	2	1	1	2	1	1	–	–
Canvas—Maker, Dealer	1	–	–	–	–	–	–	1	–	–	–	–	–
Others working and dealing in Hemp	1	–	–	–	–	–	1	–	–	–	–	–	–
XII.—*Persons working and dealing in* Food *and* Drinks.													
1. In Animal Food.													
Cowkeeper, Milkseller	9	–	–	–	–	2	1	5	1	–	–	–	–
Cheesemonger	2	–	–	–	1	1	–	–	–	–	–	–	–
Butcher, Meat Salesman	45	–	–	–	6	5	12	7	9	5	1	–	–
Provision—Curer, Dealer	3	–	–	–	1	–	1	1	–	–	–	–	–
Poulterer, Game-dealer	2	–	–	–	–	–	–	–	1	–	1	–	–
Fishmonger	10	–	–	–	1	1	3	2	3	–	–	–	–
2. In Vegetable Food.													
Corn—Merchant, Dealer	5	–	–	–	–	2	–	1	1	1	–	–	–
Miller	6	–	–	–	–	1	2	1	1	–	1	–	–
Flour—Dealer, Agent	2	–	–	–	–	1	–	–	1	–	–	–	–
Baker	21	–	–	–	3	4	1	7	4	2	–	–	–
Confectioner, Pastry-cook	2	–	–	–	–	–	1	–	–	1	–	–	–
Greengrocer, Fruiterer	14	–	–	–	–	7	1	3	3	–	–	–	–
Fruit and Flower—Hawker, Vender	3	–	–	–	–	1	1	1	–	–	–	–	–
Potato Merchant	1	–	–	–	–	–	1	–	–	–	–	–	–
3. In Drinks and Stimulants.													
Maltster	3	–	–	–	–	–	–	–	1	1	1	–	–
Brewer and others engaged in Brewing	9	–	–	–	2	2	3	2	–	–	–	–	–
Wine and Spirit Merchant	4	–	–	–	–	1	1	1	1	–	–	–	–
Distiller, Rectifier (engaged in distilling)	2	–	–	–	–	–	1	–	1	–	–	–	–
Cellarman	2	–	–	–	1	1	–	–	–	–	–	–	–
Ginger-beer, Soda, Mineral Water,—Manufacture	2	–	–	–	–	–	–	1	1	–	–	–	–
Sugar Refiner	10	–	–	–	–	2	4	2	1	1	–	–	–
Grocer, Tea Dealer	19	–	–	–	4	4	3	1	4	–	2	1	–
Tobacco, Cigar, Snuff—Manufacture	2	–	–	–	1	1	–	–	–	–	–	–	–
Tobacconist	2	–	–	–	–	1	–	1	–	–	–	–	–
Other Dealers in Drinks and Stimulants	1	–	–	–	–	–	–	–	–	1	–	–	–
XIII.—*Persons working and dealing in* Animal Substances.													
1. In Grease, Gut, Bones, Horn, Ivory, Whalebone.													
Soap-boiler	3	–	–	–	–	1	1	1	–	–	–	–	–
Tallow Chandler	6	–	–	–	–	1	1	1	2	1	–	–	–
2. In Skins, Feathers, and Quills.													
Fellmonger	1	–	–	–	–	–	–	1	–	–	–	–	–
Skinner	1	–	–	–	–	–	–	–	1	–	–	–	–
Tanner	7	–	–	–	–	1	1	1	3	–	1	–	–
Currier	9	–	–	–	–	2	2	2	3	–	–	–	–
3. In Hair.													
Hair, Bristle—Manufacture	1	–	–	–	–	1	–	–	–	–	–	–	–
Brush, Broom—Maker	6	–	–	–	–	–	–	1	2	3	–	–	–
Others dealing in Hair, Fur, Feathers	1	–	–	–	–	1	–	–	–	–	–	–	–

ENGLAND.—Occupations of Males dying at different Ages from Cholera in the Year 1866—con

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwards
XIV.—*Persons working and dealing in* Vegetable Substances.													
1. *In Gums and Resins.*													
Oil and Colourman	1	-	-	-	-	-	-	-	1	-	-	-	-
French Polisher	3	-	-	-	1	1	-	1	-	-	-	-	-
Japanner	1	-	-	-	-	-	-	-	1	-	-	-	-
2. *In Wood.*													
Timber—Merchant, Dealer	4	-	-	-	-	1	1	1	1	-	-	-	-
Wood Dealer	1	-	-	-	-	1	-	-	-	-	-	-	-
Sawyer	40	-	-	-	3	4	8	17	5	3	-	-	-
Lath Maker	1	-	-	-	-	1	-	-	-	-	-	-	-
Turner	4	-	-	-	1	-	2	1	-	-	-	-	-
Box-maker	2	-	-	-	-	-	1	-	-	1	-	-	-
Cooper	23	-	-	-	4	3	6	5	-	4	1	-	-
Others	1	-	-	-	-	-	-	1	-	-	-	-	-
3. *In Bark.*													
Cork—Cutter, Manufacturer	3	-	-	-	-	1	1	-	1	-	-	-	-
Others working in Bark	1	-	-	-	-	-	1	-	-	-	-	-	-
4. *In Cane, Rush, and Straw.*													
Basket Maker	5	-	-	-	-	-	-	3	-	1	1	-	-
Hay and Straw Dealer	1	-	-	-	-	-	1	-	-	-	-	-	-
Thatcher	3	-	-	-	-	-	1	-	2	-	-	-	-
Others working in Cane, Rush, Straw	3	-	-	-	-	1	1	-	-	-	1	-	-
5. *In Paper.*													
Rag—Gatherer, Dealer	3	-	-	-	-	-	-	1	1	1	-	-	-
Paper Manufacture	3	-	-	-	-	-	-	1	1	1	-	-	-
Stationer (not Law)	3	-	-	-	-	3	-	-	-	-	-	-	-
Paper Stainer	1	-	-	-	-	-	-	-	1	-	-	-	-
Others working in Paper	3	-	-	1	-	2	-	-	-	-	-	-	-
XV.—*Persons working and dealing in* Minerals.													
1. *Miners.*													
Coal Miner	254	-	-	4	39	54	54	48	36	15	4	-	-
Copper Miner	2	-	-	-	-	1	-	1	-	-	-	-	-
Tin Miner	1	-	-	-	-	-	1	-	-	-	-	-	-
Lead Miner	2	-	-	-	-	-	1	-	-	1	-	-	-
Iron Miner	12	-	-	-	4	-	3	1	1	2	1	-	-
Others	1	-	-	-	-	-	-	1	-	-	-	-	-
2. *In Coal.*													
Coal—Merchant, Dealer	8	-	-	-	-	-	1	3	3	1	-	-	-
Coalheaver, Labourer	22	-	-	-	1	3	6	8	-	3	1	-	-
Coke—Burner, Dealer	3	-	-	-	-	1	2	-	-	-	-	-	-
Chimney Sweeper	7	-	-	-	-	1	3	-	1	2	-	-	-
Gas Works Service	13	-	-	-	1	7	3	1	1	-	-	-	-
Others working in Coal	5	-	-	-	1	4	-	-	-	-	-	-	-
3. *In Stone, Clay.*													
Stone Quarrier	7	-	-	-	-	1	-	3	2	1	-	-	-
Stone—Cutter, Dresser, Polisher	5	-	-	-	-	2	2	-	1	-	-	-	-
Slate Quarrier	4	-	-	-	-	2	-	1	1	-	-	-	-
Limestone—Quarrier, Burner	4	-	-	-	-	1	1	-	2	-	-	-	-
Brick—Maker, Dealer	25	-	-	-	3	7	3	4	2	4	2	-	-
Railway Labourer	36	-	-	-	2	13	11	8	1	1	-	-	-
Platelayer	2	-	-	-	-	-	1	-	1	-	-	-	-
Excavator, Navvy	16	-	-	-	2	6	4	-	4	-	-	-	-
Road Labourer	2	-	-	-	-	-	-	1	-	1	-	-	-
Scavenger	9	-	-	-	-	3	3	2	1	-	-	-	-
Dust Collector	5	-	-	-	1	-	1	1	2	-	-	-	-
Others working in Stone, Clay	5	-	-	-	-	3	1	-	1	-	-	-	-
4. *In Earthenware.*													
Earthenware Manufacture	6	-	-	-	-	2	2	1	1	-	-	-	-
Tobacco-pipe Maker	5	-	-	-	-	-	2	1	1	1	-	-	-
Earthenware and Glass Dealer	4	-	-	-	-	-	1	1	1	1	-	-	-
5. *In Glass.*													
Glass Manufacture	4	-	-	-	-	3	1	-	-	-	-	-	-
6. *In Salt.*													
Salt Manufacture	15	-	-	-	2	3	6	2	1	1	-	-	-
Other Dealers in Salt	3	-	-	-	-	-	1	-	-	1	1	-	-

ENGLAND.—Occupations of Males dying at different Ages from Cholera in the Year 1866—*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
7. In Water.													
Waterworks Service	1	–	–	–	–	–	1	–	–	–	–	–	–
Others working or dealing in Water	3	–	–	–	–	2	1	–	–	–	–	–	–
8. In Gold, Silver, and Precious Stones.													
Goldsmith, Silversmith, Jeweller	9	–	–	–	–	–	2	2	2	3	–	–	–
9. In Copper.													
Copper Manufacture	25	–	–	–	5	5	3	5	6	1	–	–	–
Coppersmith	1	–	–	–	–	1	–	–	–	–	–	–	–
10. In Tin and Quicksilver.													
Tin Manufacture	17	–	–	–	3	10	1	2	1	–	–	–	–
Tinman, Tin-worker, Tinker	7	–	–	–	1	1	4	1	–	–	–	–	–
Tinplate Worker	7	–	–	–		1	3	–	1	1	–	–	–
11. In Zinc.													
Zinc Manufacture	1	–	–	–	–	–	–	1	–	–	–	–	–
12. In Lead and Antimony.													
Lead Manufacture	5	–	–	–	–	3	–	1	1	–	–	–	–
Type Founder	4	–	–	–	–	1	1	1	–	–	1	–	–
Others working & dealing in Lead, &c.	1	–	–	–	–	1	–	–	–	–	–	–	–
13. In Brass and other mixed Metals.													
Brass—Founder, Moulder, Manufacturer	3	–	–	–	–	1	2	–	–	–	–	–	–
Brazier	1	–	–	–	–	–	–	–	–	1	–	–	–
Gasfitter	2	–	–	–	–	2	–	–	–	–	–	–	–
Wire—Maker, Drawer	1	–	–	–	–	–	–	–	1	–	–	–	–
Wire—Worker, Weaver	2	–	–	–	–	–	–	–	1	–	1	–	–
Others working in mixed Metals	3	–	–	–	1	–	1	–	–	–	1	–	–
14. In Iron and Steel.													
Iron—Manufacture, Moulder, Founder	147	–	–	1	36	32	26	29	15	4	4	–	–
Whitesmith	8	–	–	–	–	1	–	3	1	2	1	–	–
Blacksmith	89	–	–	1	13	11	23	19	13	6	3	–	–
Nail Manufacturer	3	–	–	–	–	1	1	1	–	–	–	–	–
Anchorsmith, Chainsmith	2	–	–	–	1	–	–	1	–	–	–	–	–
Boiler-maker	22	–	–	–	2	5	7	6	1	1	–	–	–
Ironmonger	3	–	–	–	–	–	1	1	1	–	–	–	–
Others working in Iron, Steel	5	–	–	–	1	2	–	–	1	1	–	–	–
XVI.—Labourers *and* Others (*Branch of Labour undefined*).													
1. General Labourers.													
General Labourer, Labourer (branch undefined)	689	–	–	2	79	137	166	138	93	57	15	2	–
2. Other Persons of indefinite Occupations.													
Mechanic (branch undefined)	1	–	–	–	–	–	–	–	–	1	–	–	–
Shopman (branch undefined)	2	–	–	–	–	–	–	1	–	1	–	–	–
Apprentice (branch undefined)	1	–	–	–	1	–	–	–	–	–	–	–	–
Emigrant	17	–	–	–	3	8	4	1	1	–	–	–	–
Other indefinite Occupations	38	–	–	–	6	10	12	5	2	3	–	–	–
XVII.—*Persons of* Rank *or* Property *not returned under any Office or Occupation.*													
Gentleman, Independent	14	–	–	–	1	–	1	2	5	4	1	–	–
Annuitant	2	–	–	–	–	–	–	–	–	2	–	–	–
XVIII.—*Persons* supported by the Community *and of* no specified Occupation.													
1. On Income from voluntary Sources, and Rates.													
Alms person (no stated occupation)	2	–	–	–	–	–	–	–	1	–	–	1	–
Others supported by Community	4	–	–	–	–	–	–	2	1	1	–	–	–
2. Prisoners and others of Criminal Class.													
Prisoner (no stated Occupation)	5	–	–	1	1	–	2	1	–	–	–	–	–
No stated Occupation or Condition	76	–	–	–	14	15	14	22	8	3	–	–	–

TABLE **17.**—ENGLAND. **Occupations** of **Females** DYING at different AGES from **Choler** in the Year **1866.**

OCCUPATIONS.	ALL AGES.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	9
TOTAL	7383	1361	692	311	587	1043	1100	883	704	478	187	34	3
I.—*Persons engaged in the* GENERAL *or* LOCAL GOVERNMENT *of the Country.*													
1. *National Government.*													
Others employed by Government	1	–	–	–	1	–	–	–	–	–	–	–	–
III.—*Persons employed in connexion with the* LEARNED PROFESSIONS.													
3. *Physic.*													
Midwife	1	–	–	–	–	–	–	–	–	1	–	–	–
8. *Teachers.*													
Schoolmistress	5	–	–	–	–	1	2	–	1	1	–	–	–
IV.—*Persons engaged in the Domestic Offices or Duties of* WIVES, MOTHERS, MISTRESSES *of* FAMILIES, CHILDREN, RELATIVES *(not otherwise described).*													
1. *Wives (not otherwise described).*													
Wives	2846	–	–	–	210	744	825	538	334	161	29	5	–
2. *Widows (not otherwise described).*													
Widows	1064	–	–	–	10	50	109	212	269	250	139	22	3
3. *Children and Relatives at Home (not otherwise described).*													
Daughter, Granddaughter, Sister, Niece	2551	1361	692	305	193	–	–	–	–	–	–	–	–
4. *Scholars (so described).*													
Scholars	1	–	–	1	–	–	–	–	–	–	–	–	–
V.—*Persons engaged in entertaining and performing* PERSONAL OFFICES *for Man.*													
1. *In Board and Lodging.*													
Innkeeper's, Hotelkeeper's—Wife	10	–	–	–	–	–	5	2	–	2	1	–	–
Publican's, Beerseller's—Wife	35	–	–	–	1	10	8	13	2	1	–	–	–
Lodging, Boarding-house—Keeper	1	–	–	–	–	–	–	–	1	–	–	–	–
Lodging-house Keeper's Wife	4	–	–	–	–	–	2	–	2	–	–	–	–
Coffee, Eating House—Keeper	1	–	–	–	–	–	1	–	–	–	–	–	–
Officer of Charitable Institution	1	–	–	–	–	–	–	1	–	–	–	–	–
2. *Attendance (Domestic Servants, &c.)*													
Domestic Servant (General)	123	–	–	1	54	31	11	15	4	6	5	1	–
Housekeeper	7	–	–	–	–	4	–	1	1	1	–	–	–
Cook	3	–	–	–	1	–	–	–	1	1	–	–	–
Housemaid	2	–	–	–	1	–	–	–	–	1	–	–	–
Nurse	2	–	–	–	–	1	–	1	–	–	–	–	–
Laundry Maid	1	–	–	–	–	–	1	–	–	–	–	–	–
Inn Servant	4	–	–	–	–	2	1	1	–	–	–	–	–
Hospital, Lunatic Asylum,—Attendant, Nurse	2	–	–	–	–	–	–	2	–	–	–	–	–
Nurse not (domestic Servant)	22	–	–	–	1	4	4	3	2	7	1	–	–
Charwoman	63	–	–	–	9	9	12	10	12	5	5	1	–
VI.—*Persons who* BUY *or* SELL, KEEP *or* LEND *Money, Houses, or Goods of various Kinds.*													
2. *Other General Dealers.*													
Shopkeeper (branch undefined)	2	–	–	–	–	–	–	1	–	–	1	–	–
Shopkeeper's Wife	1	–	–	–	–	–	–	1	–	–	–	–	–
Hawker and Pedler	10	–	–	–	2	1	3	2	2	–	–	–	–
Other General Dealers	2	–	–	–	–	1	–	1	–	–	–	–	–
VII.—*Persons engaged in the* CONVEYANCE *of Men, Animals, Goods, and Messages.*													
2. *On Roads.*													
Carrier, Carter	1	–	–	–	–	1	–	–	–	–	–	–	–

ENGLAND.–Occupations of Females dying at different Ages from Cholera in the Year 1866—*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
4. On Seas and Rivers.													
Others connected with Sea Navigation	1	–	–	–	–	–	–	1	–	–	–	–	–
5. Engaged in Storage.													
Warehousewoman (not Manchester)	1	–	–	–	–	1	–	–	–	–	–	–	–
VIII.—*Persons possessing or working the* Land, *and engaged in growing* Grain, Fruits, Grasses, Animals, *and other products.*													
1. In Fields and Pastures.													
Farmer's, Grazier's—Wife	20	–	–	–	–	3	2	3	7	4	1	–	–
Farmer, Grazier's Daughter, Grazier's Daughter, Sister, Niece	8	–	–	–	4	1	–	1	1	–	1	–	–
Agricultural Labourer (out-door)	4	–	–	–	2	1	1	–	–	–	–	–	–
Farm Servant (in-door)	3	–	–	–	–	2	–	–	1	–	–	–	–
IX.—*Persons engaged about* Animals.													
Fisherwoman	1	–	–	–	–	–	–	–	–	–	1	–	–
X.—*Persons engaged in* Art *and* Mechanic *Productions.*													
1. In Books.													
Bookbinder	2	–	–	–	–	1	1	–	–	–	–	–	–
3. In Tackle for Sports and Games.													
Bow, Bat, Ball, Tackle, &c. Maker	1	–	–	–	1	–	–	–	–	–	–	–	–
17. In Chemicals.													
Others engaged in manufacturing Chemicals	1	–	–	–	1	–	–	–	–	–	–	–	–
XI.—*Persons working and dealing in the* Textile Fabrics, *and in* Dress.													
1. In Wool and Worsted.													
Worsted Manufacture	2	–	–	–	1	–	1	–	–	–	–	–	–
Others working and dealing in Wool	1	–	–	–	–	–	–	–	1	–	–	–	–
2. In Silk.													
Silk Manufacture	1	–	–	–	–	–	1	–	–	–	–	–	–
3. In Cotton and Flax.													
Lace Manufacture	1	–	–	–	–	–	–	1	–	–	–	–	–
Cotton Manufacture	14	–	–	2	7	3	1	1	–	–	–	–	–
5. In Dress.													
Straw Plait Manufacture	1	–	–	–	1	–	–	–	–	–	–	–	–
Bonnet Maker	1	–	–	–	–	1	–	–	–	–	–	–	–
Cap Maker	2	–	–	–	–	–	1	–	1	–	–	–	–
Furrier	1	–	–	–	–	1	–	–	–	–	–	–	–
Tailor	8	–	–	–	1	–	2	2	1	2	–	–	–
Milliner, Dressmaker	11	–	–	–	2	4	1	2	2	–	–	–	–
Shirtmaker, Seamstress	49	–	–	–	11	13	9	5	4	6	–	1	–
Staymaker	1	–	–	–	1	–	–	–	–	–	–	–	–
Shoemaker, Bootmaker	5	–	–	–	2	1	2	–	–	–	–	–	–
Shoemaker's Wife	88	–	–	–	3	26	27	15	11	4	1	1	–
Umbrella, Parasol, Stick—Maker	1	–	–	–	–	–	–	–	–	1	–	–	–
Washerwoman, Laundress, Mangler	19	–	–	1	4	6	4	1	2	–	–	1	–
6. In Hemp and other Fibrous Materials.													
Rope, Cord—Maker	2	–	–	–	–	–	1	–	–	1	–	–	–
Net-maker	1	–	–	–	1	–	–	–	–	–	–	–	–
Other workers in Hemp	1	–	–	–	1	–	–	–	–	–	–	–	–
XII.—*Persons working and dealing in* Food *and* Drinks.													
1. In Animal Food.													
Butcher	1	–	–	–	–	–	–	–	1	–	–	–	–
Butcher's Wife	15	–	–	–	1	4	3	3	2	1	1	–	–
Provision—Curer, Dealer	2	–	–	–	–	–	1	–	1	–	–	–	–
Fishmonger, Dealer, Seller	1	–	–	–	–	1	–	–	–	–	–	–	–
2. In Vegetable Food.													
Baker	1	–	–	–	–	1	–	–	–	–	–	–	–
Others dealing in Vegetable Food	1	–	–	–	–	–	–	–	1	–	–	–	–

ENGLAND.–Occupations of Females dying at different Ages from Cholera in the Year 1866–*cont.*

Occupations.	All Ages.	0–	5–	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 & upwds.
3. *In Drinks and Stimulants.*													
Grocer, Tea Dealer	1	–	–	–	–	–	–	1	–	–	–	–	–
Tobacco, Cigar, Snuff—Manufacture	1	–	–	–	1	–	–	–	–	–	–	–	–
XIII.—*Persons working and dealing in* Animal Substances.													
1. *In Grease, Gut, Bones, Horn, Ivory, Whalebone.*													
Others dealing in Grease, &c.	1	–	–	–	1	–	–	–	–	–	–	–	–
2. *In Skins, Feathers, and Quills.*													
Others engaged about Skins & Feathers	1	–	–	–	1	–	–	–	–	–	–	–	–
3. *In Hair.*													
Brush, Broom—Maker	1	–	–	–	–	–	1	–	–	–	–	–	–
XIV.—*Persons working and dealing in* Vegetable Substances.													
1. *In Gums and Resins.*													
French Polisher	1	–	–	–	–	–	–	1	–	–	–	–	–
2. *In Wood.*													
Box Maker	1	–	–	–	–	–	–	1	–	–	–	–	–
4. *In Cane, Rush, and Straw.*													
Basket Maker	1	–	–	–	1	–	–	–	–	–	–	–	–
5. *In Paper.*													
Rag-gatherer, Dealer	3	–	–	–	1	–	–	–	1	1	–	–	–
XV.—*Persons working and dealing in* Minerals.													
3. *In Stone, Clay.*													
Brick Maker—Dealer	2	–	–	–	1	–	1	–	–	–	–	–	–
4. *In Earthenware.*													
Earthenware Manufacture	1	–	–	–	–	–	–	–	1	–	–	–	–
10. *In Tin and Quicksilver.*													
Tin Manufacture	6	–	–	–	3	3	–	–	–	–	–	–	–
14. *In Iron and Steel.*													
Others working and dealing in Iron, Steel	3	–	–	–	–	1	1	1	–	–	–	–	–
XVI.—Labourers *and* Others (*Branch of Labour undefined*).													
1. *General Labourers.*													
Labourer (branch undefined)	5	–	–	1	4	–	–	–	–	–	–	–	–
2. *Other Persons of indefinite Occupations.*													
Emigrant	4	–	–	–	–	3	–	1	–	–	–	–	–
Others of indefinite Occupation	3	–	–	–	1	1	–	–	1	–	–	–	–
XVII.—*Persons of* Rank *or* Property *not returned under any* Office *or* Occupation.													
Gentlewoman, Independent	5	–	–	–	1	–	1	1	1	1	–	–	–
Annuitant	1	–	–	–	–	–	–	1	–	–	–	–	–
XVIII.—*Persons* supported by the Community *and of* no specified Occupation.													
1. *On Income from voluntary Sources, and Rates.*													
Pauper (of no stated Occupation)	2	–	–	–	–	–	–	–	1	1	–	–	–
Prostitute	2	–	–	–	1	1	–	–	–	–	–	–	–
No stated Occupation or Condition	294	–	–	–	44	105	54	37	32	19	1	2	–

TABLE **18.**—ENGLAND. **Proportion of Deaths** by **Cholera** in **1866** to 10,000 living in 1861, of different **Occupations.**

Occupations.	Living in 1861.	Deaths from Cholera in 1866.	Deaths to 10,000 living.
MALES.			
Clergymen	19,195	1	1
Protestant Ministers	7,840	4	5
Solicitors	11,386	3	3
Barristers	3,071	-	-
Physicians and Surgeons	14,415	5	3
Chemists and Druggists	16,026	7	4
Musicians (not Teachers), Vocalists	7,848	10	13
Schoolmasters	18,470	4	2
Hotel Keepers, Inn Keepers, Publicans, Licensed Victuallers	52,735	36	7
Beersellers	11,751	6	5
Merchants	12,944	3	2
Bankers	1,363	1	8
Commercial Clerks	55,657	41	7
Commercial Travellers	10,754	13	12
Railway Officers and Men	53,385	36	7
Cabmen, Flymen	9,055	12	13
Carmen, Carriers, Carters, Draymen	67,070	86	13
Barge, Lighter, Water—men	31,221	56	18
Seamen, Merchant Service	94,665	203	21
Land Proprietors	15,131	4	3
Farmers, Graziers	226,957	58	3
Agricultural Labourers (Out-door)	914,301	152	2
Gardeners (not domestic)	76,760	27	4
Booksellers, Publishers	7,202	3	4
Printers	30,171	10	3
Watchmakers, Clockmakers	20,221	12	6
Engine and Machine Makers	60,807	47	8
Coachmakers	18,653	14	8
Builders	15,658	21	13
Carpenters, Joiners	177,818	116	7
Bricklayers	79,423	67	8
Masons, Paviors	84,403	49	6
Plasterers	18,532	18	10
Plumbers, Painters, Glaziers	74,172	47	6
Cabinet-makers, Upholsterers	35,038	34	10
Undertakers	1,156	3	26
Wheelwrights	29,987	10	3
Woollen Cloth Manufacturers	81,204	7	1
Silk Manufacturers	35,115	37	11
Cotton Manufacturers	197,572	41	2
Hair-dressers, Wig-makers	10,652	10	11
Tailors	109,004	62	6
Shoemakers, Bootmakers	211,223	111	5
Rope, Cord—Makers, Dealers	11,762	10	9
MALES—*continued.*			
Cowkeepers, Milksellers	13,841	9	7
Butchers, Meat Salesmen	65,595	45	7
Fishmongers	9,152	10	11
Bakers	47,949	21	4
Greengrocers, Fruiterers	12,649	14	11
Sugar Refiners	2,790	10	36
Grocers, Tea Dealers	73,739	19	3
Tallow Chandlers	4,467	6	13
Curriers	12,839	9	7
Sawyers	31,635	40	13
Coopers	17,720	23	13
Coal Miners	246,613	254	10
Copper and Tin Miners	32,041	3	1
Iron Miners	20,626	12	6
Coalheavers, Labourers	13,647	22	16
Gasworks Service	8,663	13	15
Brick Makers, Dealers	37,768	25	7
Railway Labourers	27,769	36	13
Excavators, Navvies	8,780	16	18
Earthenware Manufacturers	26,138	6	2
Glass Manufacturers	13,809	4	3
Salt Manufacturers	2,016	15	74
Copper Manufacturers	3,827	25	65
Tin Manufacturers	3,266	17	52
Lead Manufacturers	2,797	5	18
Iron Manufacturers, Moulders, Founders	123,430	147	12
Blacksmiths	107,770	89	8
Boiler-makers	13,016	22	17
General Labourers	306,544	689	22
FEMALES.			
Innkeepers' Wives	16,127	10	6
Publicans' Wives	29,743	35	12
Farmers' Wives	163,765	20	1
Butchers' Wives	25,297	15	6
Shoemakers' Wives	79,649	88	11
Schoolmistresses	37,669	5	1
Domestic and other Servants	976,931	147	2
Nurses	27,618	24	9
Charwomen	65,273	63	10
Hawkers, Pedlers	8,088	10	12
Cotton Manufacturers	259,074	14	1
Milliners	286,298	11	·4
Shirtmakers, Seamstresses	76,015	49	6
Laundresses and Washerwomen	166,442	19	1

TABLE 19.—ENGLAND.—**Deaths** from **Cholera** and **Diarrhœa** occurring **on each Day** of each of the TWELVE MONTHS of **1866.**

MONTHS.	TOTAL DEATHS FROM CHOLERA & DIARRHŒA.	TOTAL DEATHS FROM EACH CAUSE.	DAYS OF THE MONTH.																													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Year - -	**31,468**	Cholera 14,376	515	498	459	414	464	451	419	488	477	427	419	447	466	360	396	428	443	434	431	436	461	460	504	501	580	543	458	507	540	527	423
		Diarrh. *17,092*	*563*	*580*	*608*	*579*	*571*	*546*	*563*	*568*	*551*	*541*	*551*	*603*	*539*	*489*	*536*	*579*	*515*	*565*	*515*	*543*	*553*	*546*	*563*	*556*	*530*	*560*	*577*	*635*	*532*	*554*	*361*
January -	**706**	Cholera 13	-	-	-	1	-	1	-	1	1	-	-	-	-	-	-	-	1	-	1	1	-	1	1	1	1	1	-	-	-	-	1
		Diarrhœa *693*	*20*	*19*	*15*	*23*	*23*	*21*	*24*	*23*	*27*	*19*	*20*	*22*	*30*	*18*	*27*	*19*	*16*	*16*	*21*	*33*	*18*	*24*	*19*	*28*	*27*	*27*	*28*	*23*	*27*	*16*	*20*
February	**690**	Cholera 14	-	-	-	1	1	1	4	-	-	-	1	2	-	-	-	-	1	-	1	-	1	-	-	-	1	-	-	-	-	-	-
		Diarrhœa *676*	*27*	*25*	*24*	*18*	*23*	*21*	*21*	*24*	*22*	*32*	*25*	*31*	*34*	*24*	*20*	*18*	*23*	*22*	*17*	*26*	*26*	*27*	*20*	*27*	*18*	*30*	*24*	*27*	-	-	-
March -	**755**	Cholera 11	-	-	-	1	-	-	-	-	2	-	-	-	1	-	1	-	-	-	-	1	-	-	-	1	-	-	1	1	-	2	-
		Diarrhœa *744*	*22*	*27*	*32*	*24*	*19*	*19*	*22*	*25*	*20*	*24*	*24*	*31*	*21*	*20*	*25*	*29*	*25*	*24*	*24*	*23*	*22*	*26*	*28*	*25*	*18*	*26*	*19*	*32*	*20*	*26*	*22*
April - -	**617**	Cholera 11	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	1	-	2	1	-	-	1	-	1	-
		Diarrhœa *606*	*20*	*13*	*17*	*17*	*16*	*23*	*16*	*22*	*18*	*16*	*19*	*19*	*26*	*22*	*16*	*21*	*18*	*24*	*22*	*24*	*22*	*21*	*18*	*20*	*23*	*20*	*23*	*29*	*22*	*17*	-
May - -	**757**	Cholera 88	1	2	2	1	2	5	3	1	5	8	6	2	9	8	5	2	3	2	3	3	2	1	2	-	2	2	1	2	-	2	1
		Diarrhœa *669*	*10*	*30*	*17*	*19*	*18*	*24*	*17*	*19*	*17*	*20*	*29*	*27*	*28*	*20*	*24*	*31*	*23*	*22*	*19*	*15*	*25*	*15*	*25*	*23*	*17*	*20*	*26*	*27*	*26*	*18*	*18*
June - -	**1,017**	Cholera 88	4	1	-	1	1	3	3	1	-	3	1	6	4	-	-	3	6	2	3	1	4	3	4	3	5	2	3	4	9	8	-
		Diarrhœa *929*	*22*	*24*	*19*	*23*	*12*	*20*	*24*	*23*	*33*	*28*	*17*	*26*	*33*	*31*	*33*	*32*	*35*	*35*	*33*	*17*	*27*	*35*	*41*	*43*	*32*	*49*	*34*	*48*	*39*	*61*	-
July - -	**6,426**	Cholera 3,059	10	7	7	5	10	8	10	11	11	11	16	31	36	34	44	61	92	102	132	121	157	155	191	205	248	211	206	226	230	222	249
		Diarrhœa *3,367*	*54*	*64*	*74*	*59*	*66*	*66*	*71*	*77*	*87*	*82*	*92*	*108*	*76*	*86*	*88*	*97*	*86*	*124*	*106*	*119*	*147*	*133*	*154*	*144*	*150*	*157*	*153*	*167*	*161*	*176*	*143*
August -	**7,622**	Cholera 4,236	259	233	196	165	193	178	166	185	180	146	135	143	125	99	125	118	126	126	74	101	91	106	115	94	80	121	97	110	129	99	121
		Diarrhœa *3,386*	*154*	*147*	*163*	*170*	*143*	*132*	*115*	*119*	*124*	*114*	*111*	*116*	*109*	*78*	*110*	*93*	*98*	*91*	*95*	*85*	*81*	*74*	*98*	*78*	*82*	*87*	*101*	*115*	*101*	*94*	*108*
September	**6,271**	Cholera 3,616	108	100	117	111	110	117	99	132	129	127	163	136	169	104	123	137	118	125	127	122	130	111	117	125	144	117	78	96	105	119	-
		Diarrhœa *2,655*	*110*	*96*	*113*	*104*	*114*	*97*	*120*	*110*	*97*	*84*	*79*	*108*	*75*	*80*	*85*	*103*	*91*	*83*	*87*	*90*	*79*	*78*	*68*	*78*	*79*	*76*	*77*	*80*	*55*	*59*	-
October -	**4,043**	Cholera 2,417	85	102	84	79	105	96	100	120	95	92	67	103	93	87	78	84	74	48	74	68	58	69	56	60	79	71	58	56	60	65	51
		Diarrhœa *1,626*	*53*	*58*	*66*	*62*	*56*	*60*	*64*	*60*	*52*	*61*	*58*	*53*	*53*	*51*	*58*	*66*	*50*	*60*	*53*	*55*	*54*	*54*	*38*	*47*	*37*	*26*	*47*	*38*	*45*	*43*	*48*
November	**1,707**	Cholera 661	40	47	44	43	35	33	28	33	45	36	26	21	19	19	13	16	17	18	10	14	10	12	9	8	15	15	10	10	6	9	-
		Diarrhœa *1,046*	*45*	*54*	*36*	*33*	*52*	*38*	*43*	*34*	*28*	*38*	*49*	*30*	*29*	*32*	*50*	*39*	*32*	*34*	*20*	*34*	*25*	*39*	*29*	*31*	*29*	*24*	*25*	*31*	*25*	*38*	-
December	**857**	Cholera 162	7	6	8	6	7	9	6	4	8	4	4	3	10	9	7	7	5	11	6	4	6	1	9	2	4	3	4	1	1	-	-
		Diarrhœa *693*	*26*	*23*	*32*	*27*	*29*	*23*	*26*	*32*	*26*	*23*	*28*	*33*	*25*	*27*	*20*	*31*	*18*	*30*	*18*	*22*	*27*	*20*	*25*	*12*	*18*	*18*	*20*	*18*	*11*	*6*	*2*

NOTE.—Two deaths from Cholera and 28 from Diarrhœa are not included in the Table as they occurred in the year 1865, although registered in 1866, nor does the Table include the few cases of Cholera and Diarrhœa which occurred in January 1867, although registered in 1866.

MONTHS.	Deaths from Cholera & Diarrhœa.	Total Deaths from each Cause.	Days of the Month.																														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Year	**8,733**	Cholera 5,595	238	226	197	170	211	189	156	179	172	152	129	159	132	105	123	131	155	150	157	173	176	172	199	211	248	226	194	204	227	210	224
		Diarrhœa 3,138	102	93	127	98	94	102	94	96	102	85	76	103	88	92	101	90	101	98	97	96	122	103	101	107	114	114	121	128	106	115	72
January	**53**	Cholera 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	1	–	–	–	–	–
		Diarrhœa 50	1	1	2	–	1	1	3	4	1	1	–	–	1	2	1	1	–	2	3	3	–	1	2	1	3	5	3	3	3	–	1
February	**83**	Cholera 3	–	–	–	–	–	–	2	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		Diarrhœa 80	2	3	5	2	–	1	3	2	2	6	4	5	4	6	3	1	3	–	3	2	1	3	–	6	3	3	4	3	–	–	–
March	**68**	Cholera 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
		Diarrhœa 67	1	4	5	2	1	2	3	2	–	2	2	2	–	2	1	2	2	–	5	1	4	3	2	2	3	2	4	3	2	3	–
April	**72**	Cholera 4	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	1	–	–	–
		Diarrhœa 68	2	–	3	1	2	3	2	1	4	2	1	2	3	2	1	2	3	4	–	3	4	2	1	2	4	3	5	2	2	2	–
May	**73**	Cholera 6	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	1	1	–	–		–	–	–	1	–	–	1
		Diarrhœa 67	1	3	2	2	5	2	–	1	3	–	1	3	2	1	–	3	2	2	4	–	5	1	3	4	2	1	5	4	4	–	1
June	**191**	Cholera 21	1	1	–	–	–	1	–	–	–	–	–	2	1	–	–	–	–	–	–	–	2	1	–	–	3	–	2	1	3	3	–
		Diarrhœa 170	1	2	1	6	1	2	1	4	4	2	–	4	7	2	5	9	8	6	6	1	5	9	8	9	9	9	9	14	6	20	–
July	**3,028**	Cholera 1,966	3	2	–	–	3	1	2	3	5	–	5	11	20	15	14	29	56	63	88	79	105	104	130	139	172	146	133	152	152	142	192
		Diarrhœa 1,062	10	14	18	14	15	20	15	16	28	20	23	29	21	29	30	27	29	40	33	43	69	46	48	54	50	62	49	53	53	60	44
August	**2,928**	Cholera 2,098	186	158	132	113	134	122	94	109	98	77	73	77	56	47	69	61	49	49	32	40	32	36	33	27	24	35	33	23	32	24	23
		Diarrhœa 830	46	41	57	44	30	43	31	33	37	29	21	31	25	19	31	19	27	20	16	20	17	18	19	15	20	13	25	23	20	19	21
September	**1,104**	Cholera 717	25	22	27	23	25	26	21	27	22	30	25	31	22	17	22	18	24	24	24	29	23	22	24	26	26	29	14	19	21	29	–
		Diarrhœa 387	23	15	13	14	20	15	19	22	12	14	10	13	9	12	16	13	16	10	16	11	8	7	9	9	11	10	7	13	14	6	–
October	**826**	Cholera 646	18	30	28	20	41	31	29	27	33	31	24	33	30	24	17	21	23	10	12	23	11	8	11	19	21	15	11	7	19	11	8
		Diarrhœa 180	11	4	11	9	8	7	10	3	5	5	6	5	7	10	6	9	4	8	7	6	4	5	3	3	3	3	7	2	2	2	5
November	**231**	Cholera 122	4	13	10	13	7	7	8	13	13	13	2	3	3	2	1	2	1	3	–	1	1	–	–	–	1	–	1	–	–	–	–
		Diarrhœa 109	4	5	8	3	7	5	3	4	3	2	6	3	5	5	3	2	5	5	4	4	3	5	2	2	3	1	1	3	–	3	–
December	**76**	Cholera 8	–	–	–	1	1	–	–	–	1	1	–	–	–	–	–	–	1	1	1	–	–	–	1	–	–	–	–	–	–	–	–
		Diarrhœa 68	–	1	2	1	4	1	4	4	3	2	2	6	4	2	4	2	2	1	–	2	2	3	4	–	3	2	2	5	–	–	–

Note.—One death from Cholera and nine from Diarrhœa are not included in this Table as they occurred in the year 1865, although registered in 1866, nor does the Table include the few cases of Cholera and Diarrhœa which were registered in January 1867, although occurring in December 1866.

of each of the TWELVE MONTHS of **1866.**

MONTHS.	TOTAL DEATHS FROM CHOLERA & DIARRHŒA.	TOTAL DEATHS FROM EACH CAUSE.	DAYS OF THE MONTH.																													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Year - -	**5,300**	Cholera 4,330	192	180	145	141	157	144	106	126	122	97	102	107	80	63	83	90	114	118	128	138	142	140	165	180	197	189	160	187	188	162	187
		Diarrhœa 970	29	35	41	37	27	29	31	38	28	25	21	42	15	24	28	27	28	29	22	33	31	32	37	32	38	38	29	37	33	47	27
January -	**8**	Cholera 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
		Diarrhœa 7	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	1	1	-	1	-	-
February	**15**	Cholera -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Diarrhœa 15	-	1	-	1	-	1	2	-	1	-	-	1	-	2	2	1	-	-	-	-	-	1	-	1	-	-	1	-	-	-	-
March -	**15**	Cholera -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Diarrhœa 15	-	-	1	1	-	-	1	1	-	-	-	1	-	-	-	-	2	-	1	-	2	-	1	1	-	-	-	-	1	2	-
April - -	**21**	Cholera 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-
		Diarrhœa 19	-	-	1	-	-	1	1	1	-	-	1	1	1	-	-	1	3	-	-	1	1	1	-	-	1	1	1	1	1	-	-
May - -	**22**	Cholera 4	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
		Diarrhœa 18	-	2	-	-	-	-	-	1	2	-	-	3	-	-	-	1	-	-	-	-	2	-	-	1	-	-	3	-	2	1	-
June - -	**57**	Cholera 8	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	1	-	2	-	1	1	-
		Diarrhœa 49	1	-	-	2	-	-	1	1	1	1	-	2	2	1	1	3	2	4	2	-	1	1	4	-	3	2	1	5	2	6	-
July - -	**2,305**	Cholera 1,960	-	2	-	-	-	-	1	-	2	-	4	8	16	11	13	31	54	63	89	84	104	103	132	150	170	157	130	160	154	144	178
		Diarrhœa 345	1	2	3	3	4	4	2	4	8	5	6	10	3	5	7	8	7	14	10	18	21	18	21	17	25	23	11	21	17	29	18
August -	**2,171**	Cholera 1,849	173	162	122	113	127	117	87	98	94	70	71	72	48	41	55	45	40	40	26	34	27	27	21	22	12	24	22	17	23	12	7
		Diarrhœa 322	17	21	25	23	13	13	13	22	12	11	6	15	5	7	13	9	9	7	3	11	2	6	7	8	5	6	9	6	5	6	7
September	**402**	Cholera 286	12	6	11	14	16	13	9	12	11	13	15	12	11	8	9	6	10	12	9	12	6	8	9	3	8	6	6	7	7	5	-
		Diarrhœa 116	4	8	4	7	8	6	3	6	2	6	4	7	3	5	4	3	5	1	3	1	-	3	3	4	3	4	2	2	4	1	-
October -	**217**	Cholera 175	6	6	10	8	14	10	8	11	8	8	11	11	4	3	5	6	10	2	4	7	2	2	2	5	5	1	-	2	3	-	1
		Diarrhœa 42	5	-	3	-	2	3	4	1	2	2	1	2	1	1	-	1	-	2	3	1	-	2	-	-	1	1	-	1	-	1	2
November	**56**	Cholera 41	1	4	2	5	-	3	1	5	7	5	1	1	1	-	1	2	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-
		Diarrhœa 15	1	-	3	-	-	1	3	-	-	-	2	-	-	1	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-
December	**11**	Cholera 4	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
		Diarrhœa 7	-	-	1	-	-	-	1	1	-	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-

does the Table include the few cases of Cholera and Diarrhœa which were registered in January 1867, although occurring in December 1866.

MONTHS.	TOTAL DEATHS FROM CHOLERA & DIARRHŒA.	TOTAL DEATHS FROM EACH CAUSE.	DAYS OF THE MONTH.																														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Year - -	**3,886**	Cholera 1,654	63	65	59	43	66	56	59	67	59	56	35	62	58	44	48	46	49	45	38	49	48	48	48	51	65	62	46	41	61	65	52
		Diarrhœa 2,232	76	59	90	64	70	75	66	60	75	63	56	63	73	71	74	70	73	70	76	63	92	75	66	78	76	76	92	93	77	72	48
January -	**45**	Cholera 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
		Diarrhœa 43	1	-	2	-	1	1	3	4	1	1	-	-	1	1	1	1	-	2	3	2	-	1	1	1	3	4	2	3	2	-	1
February	**70**	Cholera 3	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Diarrhœa 67	2	2	5	1	-	1	1	2	1	6	4	4	4	4	1	-	3	-	3	2	1	3	-	5	3	3	3	3	-	-	-
March -	**53**	Cholera 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
		Diarrhœa 52	1	4	4	1	1	2	2	1	-	2	2	1	-	2	1	2	-	-	4	1	2	3	1	1	3	2	4	3	1	1	-
April - -	**51**	Cholera 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
		Diarrhœa 49	2	-	2	1	2	2	1	-	4	2	-	1	2	2	1	1	-	4	-	2	3	1	1	2	3	2	4	1	1	2	-
May - -	**54**	Cholera 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-
		Diarrhœa 52	1	1	2	2	5	2	-	-	2	-	1	-	2	1	-	2	2	2	4	-	3	1	3	3	2	1	2	4	3	-	1
June - -	**136**	Cholera 13	1	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-	2	-	-	1	2	2	-
		Diarrhœa 123	-	2	1	4	1	2	-	3	3	1	-	2	5	1	4	6	6	2	5	1	4	8	4	9	6	7	8	10	4	14	-
July - -	**964**	Cholera 226	3	-	-	-	3	1	1	3	3	-	1	5	5	5	2	3	5	6	7	6	13	13	12	8	16	14	15	15	17	15	29
		Diarrhœa 738	9	12	16	11	11	16	13	12	20	15	18	20	18	24	24	21	22	27	23	25	48	30	27	39	25	39	38	33	39	34	29
August -	**932**	Cholera 396	30	14	17	12	17	14	16	22	11	8	8	13	13	7	20	16	14	13	6	8	7	12	12	6	12	11	11	6	12	12	16
		Diarrhœa 536	32	21	34	24	20	30	19	12	25	21	15	17	20	14	18	13	18	13	13	9	16	13	14	8	15	7	16	17	15	13	14
September	**725**	Cholera 448	13	16	16	11	10	15	12	16	13	17	11	19	11	9	14	12	14	15	16	18	17	15	15	23	18	23	8	13	14	24	-
		Diarrhœa 277	19	7	10	7	12	10	17	16	10	8	6	6	6	8	12	12	11	9	13	10	8	4	6	5	8	6	5	11	10	5	-
October -	**614**	Cholera 475	12	25	18	12	28	21	21	17	25	23	14	22	26	21	12	15	13	8	8	16	9	6	9	14	16	14	11	5	16	11	7
		Diarrhœa 139	6	4	8	9	6	4	6	3	3	3	5	3	6	9	6	8	4	6	4	5	4	3	3	3	2	2	7	1	2	1	3
November	**177**	Cholera 82	3	9	8	8	7	4	7	9	6	8	1	2	2	2	-	-	1	3	-	1	-	-	-	-	-	-	1	-	-	-	-
		Diarrhœa 95	3	5	5	3	7	4	1		3	2	4	3	5	4	2	2	5	4	4	4	2	5	2	2	3	1	1	3	-	2	-
December	**65**	Cholera 4	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
		Diarrhœa 61	-	1	1	1	4	1	3	3	3	2	1	6	4	1	4	2	2	1	-	2	1	3	4	-	3	2	2	4	-	-	-

Note.—One death from Cholera and six from Diarrhœa are not included in this Table as they occurred in the year 1865, although registered in 1866, nor does the Table include the few cases of Cholera and Diarrhœa which were registered in January 1867, although many occurred in December 1866.

TABLE **23.—Deaths** from **Cholera** occurring **on each Day** during the **13 Weeks** ending 29th September 1866 in the **Water-Fields** of the several LONDON WATER COMPANIES.

Days.	Grand Junction, West Middlesex, and Chelsea.	Grand Junction, New River, West Middlesex, and Chelsea.	Southwark and Lambeth.	Southwark, Lambeth, and Kent.	New River.	New River and East London.	East London.	Total of London.	East London (*including West Ham*).	Total of London (*including West Ham*).
July 1	1	—	1	—	1	—	—	3	—	3
2	—	—	—	—	2	—	—	2	—	2
3	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—
5	—	—	1	—	2	—	—	3	—	3
6	—	—	1	—	—	—	—	1	—	1
7	—	—	—	—	1	—	1	2	*1*	2
8	1	—	2	—	—	—	—	3	—	3
9	3	—	—	—	1	—	1	5	*1*	5
10	—	—	—	—	—	—	—	—	—	—
11	1	—	—	—	—	—	4	5	*4*	5
12	—	—	1	—	3	—	7	11	*9*	13
13	2	—	3	—	2	1	12	20	*13*	21
14	—	—	5	—	—	—	10	15	*11*	16
15	1	—	1	—	1	—	11	14	*12*	15
16	1	—	—	—	1	4	23	29	*28*	34
17	—	—	2	1	1	2	50	56	*53*	59
18	1	—	3	1	1	3	54	63	*59*	68
19	4	—	3	—	1	4	76	88	*85*	97
20	2	—	3	1	—	2	71	79	*82*	90
21	3	—	4	2	2	6	88	105	*101*	118
22	2	1	4	1	3	4	89	104	*101*	116
23	2	—	2	2	8	2	114	130	*128*	144
24	1	—	1	1	5	10	123	141	*142*	160
25	2	—	5	4	5	10	146	172	*160*	186
26	4	—	—	7	3	10	123	147	*148*	172
27	—	—	5	4	8	6	108	131	*121*	144
28	1	—	2	3	8	6	132	152	*155*	175
29	—	—	4	3	7	7	129	150	*148*	169
30	4	—	1	6	3	6	122	142	*139*	159
31	3	—	6	1	8	19	154	191	*167*	204
August 1	3	—	4	3	17	17	144	188	*161*	205
2	2	—	2	3	7	17	130	161	*148*	179
3	1	—	2	3	11	4	108	129	*117*	138
4	—	—	3	4	5	10	90	112	*102*	124
5	3	—	6	4	12	11	99	135	*109*	145
6	—	1	4	1	9	12	95	122	*104*	131
7	1	—	3	3	8	9	70	94	*79*	103
8	—	—	6	1	12	19	71	109	*82*	120
9	1	—	2	3	3	8	81	98	*88*	105
10	1	—	2	1	3	8	62	77	*63*	78
11	—	—	2	2	3	8	58	73	*64*	79
12	3	—	3	3	5	6	57	77	*65*	85
13	—	—	3	2	6	7	38	56	*43*	61
14	2	—	1	2	1	4	37	47	*38*	48
15	1	—	9	6	4	6	43	69	*49*	75
16	2	—	3	5	6	3	42	61	*42*	61
17	1	—	5	4	3	5	31	49	*36*	54
18	—	1	2	3	5	4	34	49	*38*	53

Deaths from **Cholera** occurring **on each Day** during the **13 Weeks** ending 29th Sept. 1866 in the **Water-Fields** of the several London Water Companies—*continued.*

Days.	Grand Junction, West Middlesex, and Chelsea.	Grand Junction, New River, West Middlesex, and Chelsea.	Southwark and Lambeth.	Southwark, Lambeth, and Kent.	New River.	New River and East London.	East London.	Total of London.	East London (*including West Ham*).	Total of London (*including West Ham*).
August 19	—	—	1	3	3	—	25	32	*25*	**32**
20	—	—	1	3	5	5	26	40	*28*	**42**
21	2	—	—	3	4	3	20	32	*23*	**34**
22	1	—	3	6	1	6	19	36	*22*	**39**
23	—	—	—	—	1	6	26	33	*26*	**33**
24	—	—	2	3	3	1	18	27	*19*	**28**
25	—	—	4	7	—	2	11	24	*11*	**24**
26	2	—	2	3	5	2	21	35	*21*	**35**
27	—	—	2	5	3	2	21	33	*21*	**33**
28	3	—	1	1	1	—	17	23	*17*	**23**
29	2	—	4	3	2	1	20	32	*23*	**35**
30	3	—	1	6	3	2	9	24	*9*	**24**
31	2	—	3	7	3	1	7	23	*7*	**23**
Sept. 1	3	—	4	3	4	1	10	25	*10*	**25**
2	5	—	2	5	4	1	5	22	*5*	**22**
3	5	1	2	6	2	1	10	27	*10*	**27**
4	2	1	—	2	6	1	11	23	*13*	**25**
5	—	—	4	2	4	2	13	25	*14*	**26**
6	2	—	5	4	2	3	10	26	*12*	**28**
7	2	—	4	3	3	1	8	21	*8*	**21**
8	1	1	2	7	3	2	11	27	*12*	**28**
9	3	1	3	1	5	—	9	22	*11*	**24**
10	1	2	—	7	5	2	13	30	*13*	**30**
11	2	—	1	1	4	3	14	25	*15*	**26**
12	2	1	5	5	5	4	9	31	*9*	**31**
13	1	2	—	5	3	—	11	22	*11*	**22**
14	1	—	3	3	4	—	6	17	*6*	**17**
15	1	2	3	4	4	1	7	22	*8*	**23**
16	1	—	3	2	3	3	6	18	*6*	**18**
17	3	—	2	4	6	1	8	24	*8*	**24**
18	3	—	3	3	7	—	8	24	*11*	**27**
19	5	1	4	2	4	—	8	24	*9*	**25**
20	5	—	2	2	9	1	9	28	*10*	**29**
21	2	1	4	4	7	1	4	23	*4*	**23**
22	3	4	2	—	6	1	6	22	*7*	**23**
23	2	1	6	1	6	1	7	24	*7*	**24**
24	2	3	2	4	11	1	3	26	*3*	**26**
25	1	1	3	3	12	1	5	26	*5*	**26**
26	2	2	8	2	9	2	4	29	*4*	**29**
27	1	—	2	3	3	—	5	14	*5*	**14**
28	4	1	2	1	5	—	6	19	*7*	**20**
29	3	2	2	3	5	—	6	21	*6*	**21**
Total -	143	30	229	232	382	325	3410	4751	*3796*	**5137**

TABLE **24.**—**Deaths** from **Cholera** occurring **on each Day** during the **13 Weeks** ending 29th Sept.

SUB-DISTRICTS.	Elevation in Feet above Trin. High-water Mark.	JULY											
		1	2	3	4	5	6	7	8	9	10	11	12
Grand Junction, West Middlesex, and Chelsea.													
St. John Westminster	2	-	-	-	-	-	-	-	1	-	-	-	-
St. Peter Hammersmith	4	-	-	-	-	-	-	-	-	-	-	-	-
St. Margaret Westminster *WH*	4	-	-	-	-	-	-	-	-	-	-	-	-
Fulham *W*	6	-	-	-	-	-	-	-	-	-	-	-	-
St. Paul Hammersmith	8	-	-	-	-	-	-	-	-	2	-	-	-
Chelsea South *H*	10	-	-	-	-	-	-	-	-	-	-	-	-
Chelsea North-west *HWw*	12	1	-	-	-	-	-	-	-	-	-	-	-
Brompton *H*	12	-	-	-	-	-	-	-	-	-	-	-	-
Belgrave *H*	12	-	-	-	-	-	-	-	-	1	-	-	-
Chelsea North-east	18	-	-	-	-	-	-	-	-	-	-	-	-
Kensington Town *W*	28	-	-	-	-	-	-	-	-	-	-	-	-
St. James's-square	40	-	-	-	-	-	-	-	-	-	-	-	-
May Fair *W*	56	-	-	-	-	-	-	-	-	-	-	-	-
Hanover-square	64	-	-	-	-	-	-	-	-	-	-	-	-
Golden-square *W*	68	-	-	-	-	-	-	-	-	-	-	-	-
Rectory, Marylebone *W*	68	-	-	-	-	-	-	-	-	-	-	-	-
Cavendish-square	73	-	-	-	-	-	-	-	-	-	-	-	-
All Souls Marylebone *H*	76	-	-	-	-	-	-	-	-	-	-	-	-
St. John Paddington *H*	76	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Marylebone	79	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Paddington *WH*	82	-	-	-	-	-	-	-	-	-	-	-	-
Regent's Park Pancras	87	-	-	-	-	-	-	-	-	-	-	1	-
Christchurch Marylebone	92	-	-	-	-	-	-	-	-	-	-	-	-
St. John Marylebone	124	-	-	-	-	-	-	-	-	-	-	-	-
		1	-	-	-	-	-	-	1	3	-	1	-
Grand Junction, New River, West Middlesex, and Chelsea.													
Charing Cross *WH*	17	-	-	-	-	-	-	-	-	-	-	-	-
Tottenham-court *wH*	73	-	-	-	-	-	-	-	-	-	-	-	-
Hampstead *W*	350	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-
Southwark and Lambeth.													
St. George Camberwell	−3	-	-	-	-	-	-	-	-	-	-	-	-
St. Peter Walworth *W*	−2	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Newington *H*	−1	-	-	-	-	-	-	-	-	-	-	-	-
Trinity Newington	−1	-	-	-	-	-	-	-	-	-	-	-	-
Kent Road	−1	-	-	-	-	-	-	-	-	-	-	-	-
St. James Bermondsey	−1	-	-	-	-	-	-	-	1	-	-	-	-
St. Mary Magdalen Bermondsey *W*	0	-	-	-	-	-	-	-	-	-	-	-	-
Leather Market	0	-	-	-	-	-	-	-	-	-	-	-	-
London Road *L*	0	-	-	-	-	1	-	-	-	-	-	-	1
Lambeth Church 2d Part *W*	1	-	-	-	-	-	-	-	1	-	-	-	-
Lambeth Church 1st Part	2	-	-	-	-	-	1	-	-	-	-	-	-
Waterloo Road 2d Part	2	-	-	-	-	-	-	-	-	-	-	-	-
Christchurch Southwark *W*	2	-	-	-	-	-	-	-	-	-	-	-	-
Borough Road *W*	2	1	-	-	-	-	-	-	-	-	-	-	-
St. John Horsleydown *W*	2	-	-	-	-	-	-	-	-	-	-	-	-
Waterloo Road 1st Part	3	-	-	-	-	-	-	-	-	-	-	-	-
Battersea *Ww*	3	-	-	-	-	-	-	-	-	-	-	-	-
St. Saviour Southwark *H*	4	-	-	-	-	-	-	-	-	-	-	-	-
Kennington 1st Part	4	-	-	-	-	-	-	-	-	-	-	-	-
Camberwell *WLL*	5	-	-	-	-	-	-	-	-	-	-	-	-
St. Olave Southwark *H*	6	-	-	-	-	-	-	-	-	-	-	-	-
Kennington 2d Part	8	-	-	-	-	-	-	-	-	-	-	-	-
Wandsworth *L*	12	-	-	-	-	-	-	-	-	-	-	-	-
Putney	12	-	-	-	-	-	-	-	-	-	-	-	-
Clapham	21	-	-	-	-	-	-	-	-	-	-	-	-
Brixton	56	-	-	-	-	-	-	-	-	-	-	-	-
Dulwich	68	-	-	-	-	-	-	-	-	-	-	-	-
Streatham	72	-	-	-	-	-	-	-	-	-	-	-	-
Norwood *W*	128?	-	-	-	-	-	-	-	-	-	-	-	-
Sydenham	188?	-	-	-	-	-	-	-	-	-	-	-	-
		1	-	-	-	1	1	-	2	-	-	-	1

866 in the several SUB-DISTRICTS of **London,** grouped according to their **Water Supply.**

.	.	.	.	.	.	.	.	.	JULY.									
13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	1
-	-	-	-	-	1	1	-	-	-	-	-	1	1	-	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-
2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	1	-
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-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
-	3	-	-	-	1	-	-	1	1	-	-	-	-	1	-	-	-	-
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1	1	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	1
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-	-	-	-	1	-	-	-	-	1	-	-	2	-	2	-	-	-	-
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	2	-	1
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-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	1	-	-	-
2	-	-	-	-	-	1	1	-	-	-	-	1	-	-	1	-	1	-
-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
3	5	1	-	2	3	3	3	4	4	2	1	5	-	5	2	4	1	6

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septembe

SUB-DISTRICTS.	AUGUST											
	1	2	3	4	5	6	7	8	9	10	11	12
Grand Junction, West Middlesex, and Chelsea.												
St. John Westminster	–	–	–	–	–	–	–	–	–	1	–	–
St. Peter Hammersmith	–	1	–	–	–	–	–	–	–	–	–	–
St. Margaret Westminster *WH*	1	–	–	–	–	–	–	–	–	–	–	–
Fulham *W*	–	–	–	–	–	–	–	–	–	–	–	–
St. Paul Hammersmith	1	–	–	–	–	–	–	–	–	–	–	–
Chelsea South *H*	–	–	–	–	–	–	–	–	–	–	–	–
Chelsea North-west *HWw*	–	–	–	–	–	–	–	–	–	–	–	–
Brompton *H*	–	–	–	–	–	–	–	–	–	–	–	–
Belgrave *H*	–	–	–	–	1	–	–	–	–	–	–	1
Chelsea North-east	–	–	–	–	–	–	–	–	–	–	–	–
Kensington Town *W*	1	–	–	–	1	–	–	–	–	–	–	1
St. James's-square	–	–	–	–	–	–	–	–	–	–	–	–
May Fair *W*	–	–	–	–	–	–	–	–	–	–	–	–
Hanover-square	–	–	–	–	–	–	–	–	–	–	–	–
Golden-square *W*	–	–	1	–	–	–	–	–	–	–	–	–
Rectory, Marylebone *W*	–	–	–	–	–	–	1	–	–	–	–	–
Cavendish-square	–	–	–	–	–	–	–	–	–	–	–	–
All Souls Marylebone *H*	–	–	–	–	–	–	–	–	–	–	–	1
St. John Paddington *H*	–	1	–	–	–	–	–	–	1	–	–	–
St. Mary Marylebone	–	–	–	–	–	–	–	–	–	–	–	–
St. Mary Paddington *WH*	–	–	–	–	–	–	–	–	–	–	–	–
Regent's Park Pancras	–	–	–	–	–	–	–	–	–	–	–	–
Christchurch Marylebone	–	–	–	–	1	–	–	–	–	–	–	–
St. John Marylebone	–	–	–	–	–	–	–	–	–	–	–	–
	3	2	1	–	3	–	1	–	1	1	–	3
Grand Junction, New River, West Middlesex, and Chelsea.												
Charing Cross *WH*	–	–	–	–	–	–	–	–	–	–	–	–
Tottenham-court *wH*	–	–	–	–	–	–	–	–	–	–	–	–
Hampstead *W*	–	–	–	–	–	1	–	–	–	–	–	–
	–	–	–	–	–	1	–	–	–	–	–	–
Southwark and Lambeth.												
St. George Camberwell	–	–	1	–	–	–	–	1	–	–	–	–
St. Peter Walworth *W*	–	1	–	–	–	–	–	–	–	–	–	–
St. Mary Newington *H*	–	–	–	–	–	–	–	–	–	–	–	–
Trinity Newington	–	–	–	–	–	–	–	–	–	–	–	–
Kent Road	–	–	–	–	–	–	–	–	–	–	–	–
St. James Bermondsey	–	–	–	1	1	–	–	1	–	–	–	–
St. Mary Magdalen Bermondsey *W*	1	–	–	–	–	–	–	–	–	–	–	–
Leather Market	–	–	–	–	–	–	–	–	–	1	–	–
London Road *L*	–	–	–	–	–	–	2	–	–	–	–	1
Lambeth Church 2d Part *W*	–	–	–	–	–	–	–	2	–	–	–	–
Lambeth Church 1st Part	–	–	–	–	–	–	–	–	1	–	–	–
Waterloo Road 2d Part	–	–	–	–	–	–	–	–	–	–	–	–
Christchurch Southwark *W*	–	1	–	–	–	1	–	1	–	–	–	–
Borough Road *W*	–	–	–	–	–	–	–	–	–	–	–	–
St. John Horsleydown *W*	–	–	–	–	–	–	–	–	–	–	–	–
Waterloo Road 1st Part	–	–	–	–	–	–	–	–	–	–	–	–
Battersea *Ww*	–	–	–	1	3	–	1	1	–	1	–	–
St. Saviour Southwark *H*	3	–	–	1	1	2	–	–	1	–	2	1
Kennington 1st Part	–	–	–	–	–	–	–	–	–	–	–	–
Camberwell *WLL*	–	–	1	–	–	–	–	–	–	–	–	–
St. Olave Southwark *H*	–	–	–	–	1	–	–	–	–	–	–	–
Kennington 2d Part	–	–	–	–	–	–	–	–	–	–	–	1
Wandsworth *L*	–	–	–	–	–	–	–	–	–	–	–	–
Putney	–	–	–	–	–	–	–	–	–	–	–	–
Clapham	–	–	–	–	–	1	–	–	–	–	–	–
Brixton	–	–	–	–	–	–	–	–	–	–	–	–
Dulwich	–	–	–	–	–	–	–	–	–	–	–	–
Streatham	–	–	–	–	–	–	–	–	–	–	–	–
Norwood *W*	–	–	–	–	–	–	–	–	–	–	–	–
Sydenham	–	–	–	–	–	–	–	–	–	–	–	–
	4	2	2	3	6	4	3	6	2	2	2	3

in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

AUGUST.																	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-
2	1	2	1	-	-	-	2	1	-	-	-	2	-	3	2	3	2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	1	-	1	-	-	-	-	1	-	1	2	1	-	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	1	-	1	-	-	1	-	-	-	1	-	-
-	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1
-	5	-	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-
1	9	3	5	2	1	1	-	3	-	2	4	2	2	1	4	1	3

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septe

SUB-DISTRICTS.	SEPTEMBER											
	1	2	3	4	5	6	7	8	9	10	11	12
Grand Junction, West Middlesex, and Chelsea.												
St. John Westminster	–	–	–	–	–	1	–	–	–	–	–	–
St. Peter Hammersmith	–	–	–	–	–	–	–	–	–	–	–	–
St. Margaret Westminster *WH*	1	1	–	–	–	–	–	–	–	–	–	–
Fulham *W*	–	–	–	–	–	–	–	–	–	–	–	–
St. Paul Hammersmith	–	–	–	–	–	–	–	–	–	–	–	–
Chelsea South *H*	–	2	1	1	–	–	1	–	–	–	–	–
Chelsea North-west *HWw*	–	–	–	–	–	–	–	–	–	–	–	–
Brompton *H*	–	–	–	–	–	–	–	1	1	–	–	–
Belgrave *H*	1	1	–	–	–	–	–	–	–	1	–	1
Chelsea North-east	–	–	1	–	–	1	–	–	–	–	–	–
Kensington Town *W*	–	–	–	–	–	–	–	–	–	–	1	–
St. James's-square	–	–	–	–	–	–	–	–	–	–	1	–
May Fair *W*	–	–	–	–	–	–	–	–	–	–	–	–
Hanover-square	–	–	–	–	–	–	–	–	–	–	–	–
Golden-square *W*	–	–	–	–	–	–	–	–	–	–	–	–
Rectory, Marylebone *W*	–	–	–	–	–	–	–	–	2	–	–	–
Cavendish-square	–	–	–	–	–	–	–	–	–	–	–	–
All Souls Marylebone *H*	–	–	–	1	–	–	–	–	–	–	–	–
St. John Paddington *H*	–	–	1	–	–	–	–	–	–	–	–	–
St. Mary Marylebone	–	–	–	–	–	–	–	–	–	–	–	1
St. Mary Paddington *WH*	–	–	–	–	–	–	–	–	–	–	–	–
Regent's Park Pancras	–	–	–	–	–	–	–	–	–	–	–	–
Christchurch Marylebone	–	–	2	–	–	–	1	–	–	–	–	–
St. John Marylebone	1	1	–	–	–	–	–	–	–	–	–	–
	3	3	5	2	–	2	2	1	3	1	2	2
Grand Junction, New River, West Middlesex, and Chelsea.												
Charing Cross *WH*	–	–	–	–	–	–	–	–	–	–	–	–
Tottenham-court *wH*	–	–	–	1	–	–	–	1	1	2	–	1
Hampstead *W*	–	–	1	–	–	–	–	–	–	–	–	–
	–	–	1	1	–	–	–	1	1	2	–	1
Southwark and Lambeth.												
St. George Camberwell	–	–	–	–	–	–	–	–	–	–	–	–
St. Peter Walworth *W*	–	–	–	–	1	–	1	–	–	–	–	–
St. Mary Newington *H*	–	–	–	–	–	–	–	–	–	–	–	–
Trinity Newington	–	–	–	–	–	–	–	–	–	–	–	–
Kent Road	–	–	–	–	–	–	–	–	–	–	–	–
St. James Bermondsey	–	–	–	–	1	–	–	1	–	–	–	–
St. Mary Magdalen Bermondsey *W*	1	–	–	–	–	–	–	–	–	–	–	–
Leather Market	–	–	–	–	–	–	–	–	–	–	–	–
London Road *L*	–	–	1	–	–	–	–	–	1	–	–	–
Lambeth Church 2d Part *W*	–	1	–	–	–	–	–	–	–	–	–	2
Lambeth Church 1st Part	–	–	–	–	–	–	1	–	–	–	–	–
Waterloo Road 2d Part	–	–	–	–	–	–	–	–	–	–	–	–
Christchurch Southwark *W*	–	–	–	–	–	–	–	–	–	–	–	–
Borough Road *W*	–	–	–	–	–	–	–	–	–	–	–	–
St. John Horsleydown *W*	–	–	–	–	–	–	–	–	1	–	–	–
Waterloo Road 1st Part	–	–	–	–	–	–	–	–	–	–	–	–
Battersea *Ww*	–	–	–	–	1	–	–	–	–	–	–	–
St. Saviour Southwark *H*	1	–	–	–	–	2	–	1	–	–	–	–
Kennington 1st Part	–	–	–	–	–	–	–	–	–	–	–	–
Camberwell *WLL*	–	–	–	–	–	–	–	–	–	–	–	1
St. Olave Southwark *H*	1	–	–	–	–	–	–	–	–	–	–	–
Kennington 2d Part	1	–	–	–	–	–	–	–	–	–	–	–
Wandsworth *L*	–	–	–	–	1	2	1	–	1	–	1	–
Putney	–	–	–	–	–	–	–	–	–	–	–	1
Clapham	–	–	–	–	–	1	–	–	–	–	–	–
Brixton	–	–	1	–	–	–	–	–	–	–	–	1
Dulwich	–	–	–	–	–	–	–	–	–	–	–	–
Streatham	–	–	–	–	–	–	–	–	–	–	–	–
Norwood *W*	–	1	–	–	–	–	–	–	–	–	–	–
Sydenham	–	–	–	–	–	–	1	–	–	–	–	–
	4	2	2	–	4	5	4	2	3	–	1	5

6 in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

SEPTEMBER.															Deaths in 91 days.	Population, 1861.
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
-	-	-	-	1	-	-	-	1	-	-	-	-	1	-	11	37,483
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	5,415
-	-	-	1	1	-	1	-	-	-	-	-	1	2	1	10	30,730
-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	6	15,539
-	-	-	1	-	-	-	-	-	-	-	1	-	-	1	10	19,104
-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	10	21,654
-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	4	19,899
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	4	18,198
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	55,113
-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	4	21,886
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	9	51,910
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	10,753
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	12,885
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	19,773
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	13,966
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	8	26,692
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	15,090
-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	7	29,952
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	36,769
-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	22,493
1	-	2	-	1	-	1	-	-	-	-	-	-	-	-	8	39,015
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	4	34,927
-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	7	34,913
-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	9	32,540
1	1	3	3	5	5	2	3	2	2	1	2	1	4	3	143	626,699
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	11,071
2	-	-	-	1	-	1	4	1	3	1	2	-	1	2	27	29,371
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	19,106
2	-	-	-	1	-	1	4	1	3	1	2	-	1	2	30	59,548
-	-	-	-	-	-	1	-	1	-	-	-	-	-	1	12	20,333
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	44,463
-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	15,082
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	22,675
-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	19,652
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	25,154
-	-	-	1	-	-	-	-	-	-	-	2	-	-	-	5	16,505
-	-	-	1	-	-	-	1	1	-	1	-	-	-	-	6	16,696
-	-	-	-	-	-	2	1	-	-	1	2	-	-	-	16	19,190
-	-	1	-	1	1	-	-	1	-	1	2	1	-	-	23	29,542
1	-	-	-	1	-	-	-	-	1	-	1	1	1	1	14	19,839
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	18,640
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	6	17,069
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7	16,668
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	11,393
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	15,269
-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	20	19,600
-	1	1	-	1	-	1	-	-	-	-	-	-	-	-	23	19,101
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	30,785
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	21,297
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	7	7,663
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	20,440
1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	8	13,346
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6,481
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	20,894
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	6	20,067
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	—	1,723
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	10,082
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	7,462
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10,595
3	3	2	3	4	2	4	2	6	2	3	8	2	2	2	229	537,706

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septem

SUB-DISTRICTS.	Elevation in Feet above Trin. High-water Mark.	JULY										
		1	2	3	4	5	6	7	8	9	10	11
Southwark, Lambeth, and Kent.												
Rotherhithe *W*	0	–	–	–	–	–	–	–	–	–	–	–
Peckham	4	–	–	–	–	–	–	–	–	–	–	–
St. Nicholas Deptford	4	–	–	–	–	–	–	–	–	–	–	–
Greenwich East *WH*	7	–	–	–	–	–	–	–	–	–	–	–
St. Paul Deptford	10	–	–	–	–	–	–	–	–	–	–	–
Greenwich West *H*	12	–	–	–	–	–	–	–	–	–	–	–
Lewisham Village *W*	16	–	–	–	–	–	–	–	–	–	–	–
Lee	44	–	–	–	–	–	–	–	–	–	–	–
Eltham	?	–	–	–	–	–	–	–	–	–	–	–
Plumstead and Charlton	?	–	–	–	–	–	–	–	–	–	–	–
Woolwich Dockyard *H*	?	–	–	–	–	–	–	–	–	–	–	–
Woolwich Arsenal *H*	?	–	–	–	–	–	–	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–
New River.												
London City, South-west	21	–	–	–	–	–	–	–	–	–	–	–
London City, South	21	–	–	–	–	–	–	–	–	–	–	–
London City, South-east	21	–	–	–	–	–	–	–	–	–	–	–
West London, South	24	–	–	–	–	–	–	–	–	–	–	–
West London, North *WH*	36	–	–	–	–	–	–	–	–	–	–	–
St. Clement Danes, Strand *H*	36	–	–	–	–	–	–	–	–	–	–	–
Saffron-hill	40	–	–	–	–	–	–	–	–	–	–	–
St. Leonard Shoreditch *L*	41	–	–	–	–	–	–	–	–	–	–	–
Finsbury	43	–	–	–	–	–	–	–	–	–	–	–
Cripplegate	44	–	–	–	–	–	–	–	–	–	–	–
London City, North-west	44	–	–	–	–	–	–	–	–	–	–	–
London City, North-east	44	–	–	–	–	–	–	–	–	–	–	–
St. James Clerkenwell *W*	44	–	–	–	–	1	–	–	–	–	–	–
St. Mary-le-Strand	48	–	–	–	–	–	–	–	–	–	–	–
St. Andrew East Holborn *W*	50	–	–	–	–	–	–	–	–	–	–	–
Gray's Inn-lane *H*	52	–	–	–	–	–	–	–	–	–	–	–
Camden-town *W*	52	–	–	–	–	–	–	–	–	–	–	–
City-road *HL*	52	1	–	–	–	–	–	–	–	–	–	–
Whitecross-street	52	–	–	–	–	–	–	–	–	–	–	–
Hoxton New Town *w*	52	–	–	–	–	–	–	–	–	1	–	–
Hoxton Old Town	52	–	–	–	–	–	–	–	–	–	–	–
Haggerstone West *W*	52	–	2	–	–	–	–	–	–	–	–	–
West Hackney	55	–	–	–	–	–	–	–	–	–	–	–
Long-acre	60	–	–	–	–	–	–	–	–	–	–	–
Somers-town	60	–	–	–	–	1	–	–	–	–	–	–
Old Street, St. Luke's	60	–	–	–	–	–	–	–	–	–	–	–
St. Anne Soho	64	–	–	–	–	–	–	–	–	–	–	–
St. Giles South *W*	64	–	–	–	–	–	–	–	–	–	–	–
Berwick-street	65	–	–	–	–	–	–	–	–	–	–	–
St. George-the-Martyr Holborn *H*	66	–	–	–	–	–	–	–	–	–	–	–
Amwell, Clerkenwell	68	–	–	–	–	–	–	–	–	–	–	–
St. Giles North	68	–	–	–	–	–	–	–	–	–	–	–
St. George Bloomsbury	71	–	–	–	–	–	–	–	–	–	–	–
Stoke Newington	72	–	–	–	–	–	–	–	–	–	–	–
Goswell-street	78	–	–	–	–	–	–	–	–	–	–	–
Pentonville	84	–	–	–	–	–	–	–	–	–	–	–
Islington East *Ww*	88	–	–	–	–	–	–	–	–	–	–	–
Islington West *WHH*	100	–	–	–	–	–	–	1	–	–	–	–
Kentish-town	110	–	–	–	–	–	–	–	–	–	–	–
		1	2	–	–	2	–	1	–	1	–	–
New River and East London.												
Shadwell *W*	7	–	–	–	–	–	–	–	–	–	–	–
Aldgate	19	–	–	–	–	–	–	–	–	–	–	–
Whitechapel North	36	–	–	–	–	–	–	–	–	–	–	–
Artillery, Whitechapel	36	–	–	–	–	–	–	–	–	–	–	–
St. Botolph, East London	36	–	–	–	–	–	–	–	–	–	–	–
Holywell Shoreditch	36	–	–	–	–	–	–	–	–	–	–	–
Hackney *WHw*	44	–	–	–	–	–	–	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–

in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

JULY.																	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
–	–	–	–	–	–	–	–	1	–	–	–	3	–	1	–	–	–
–	–	–	–	–	–	–	–	–	1	–	1	1	1	–	–	–	–
–	–	–	–	–	–	–	2	–	–	–	–	–	1	–	1	1	–
–	–	–	–	–	–	–	–	–	1	–	1	2	–	1	–	1	–
–	–	–	1	–	–	1	–	–	–	–	2	1	–	–	1	1	–
–	–	–	–	1	–	–	–	–	–	1	–	–	2	–	1	2	1
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
–	–	–	1	1	–	1	2	1	2	1	4	7	4	3	3	6	1
–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	1
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	1	–	–	–	1	–	–	1	1	–	–
–	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–
–	–	–	–	–	–	–	–	1	1	1	–	–	1	–	–	–	1
–	1	–	–	–	1	–	–	–	2	–	1	–	2	1	–	–	–
–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	–	1	1
–	–	–	–	1	–	–	–	–	1	–	1	–	–	–	–	–	–
–	–	–	–	–	–	–	–	1	–	–	–	–	1	–	–	–	1
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	–	–
–	–	–	–	–	–	–	–	1	–	2	–	–	1	5	2	–	1
–	–	–	–	–	–	–	–	–	1	–	1	1	–	–	1	–	1
–	1	1	1	1	1	–	2	3	3	5	5	3	8	8	7	3	8
–	–	2	–	1	3	2	3	2	1	7	4	6	2	3	5	6	6
–	–	–	–	1	–	–	1	1	–	–	1	2	1	1	–	–	1
–	–	–	–	1	–	–	1	–	1	2	3	2	2	–	–	–	4
–	–	1	1	–	–	–	–	–	–	1	–	–	–	–	1	–	2
–	–	–	–	–	–	–	–	1	–	–	1	–	1	2	–	–	3
–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–
–	–	1	1	–	–	–	1	–	–	–	–	–	–	–	1	–	3
–	–	4	2	3	4	2	6	4	2	10	10	10	6	6	7	6	19

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septemb

SUB-DISTRICTS.	AUGUST										
	1	2	3	4	5	6	7	8	9	10	11
Southwark, Lambeth, and Kent.											
Rotherhithe *W*	-	1	-	-	1	-	-	-	1	1	-
Peckham	-	-	-	-	-	-	-	-	-	-	-
St. Nicholas Deptford	-	-	1	1	-	-	-	-	1	-	-
Greenwich East *WH*	1	-	-	1	-	1	-	1	-	-	-
St. Paul Deptford	1	1	2	-	-	-	1	-	1	-	-
Greenwich West *H*	1	1	-	2	3	-	2	-	-	-	2
Lewisham Village *W*	-	-	-	-	-	-	-	-	-	-	-
Lee	-	-	-	-	-	-	-	-	-	-	-
Eltham	-	-	-	-	-	-	-	-	-	-	-
Plumstead and Charlton	-	-	-	-	-	-	-	-	-	-	-
Woolwich Dockyard *H*	-	-	-	-	-	-	-	-	-	-	-
Woolwich Arsenal *H*	-	-	-	-	-	-	-	-	-	-	-
	3	3	3	4	4	1	3	1	3	1	2
New River.											
London City, South-west	-	-	-	-	-	-	-	-	-	-	-
London City, South	-	-	-	-	-	-	-	-	-	-	-
London City, South-east	1	-	-	-	-	-	1	-	-	-	-
West London, South	-	-	2	-	2	1	-	-	-	-	-
West London, North *WH*	4	-	-	-	-	-	-	2	-	-	1
St. Clement Danes, Strand *H*	3	-	-	-	-	1	-	-	-	1	-
Saffron-hill	-	-	-	-	-	-	-	-	-	1	-
St. Leonard Shoreditch *L*	2	1	2	-	1	-	-	1	-	-	-
Finsbury	-	-	-	1	-	-	-	-	-	-	-
Cripplegate	-	-	-	-	-	-	1	1	-	-	-
London City, North-west	-	-	-	-	-	-	-	-	-	-	-
London City, North-east	-	-	-	-	-	-	-	1	-	-	-
St. James Clerkenwell *W*	-	1	-	-	-	-	-	-	-	-	-
St. Mary-le-Strand	-	-	-	-	-	-	-	-	-	-	-
St. Andrew East Holborn *W*	-	-	-	-	-	-	-	-	-	-	-
Gray's Inn-lane *H*	-	-	-	-	-	-	-	1	-	-	-
Camden-town *W*	-	-	-	-	-	-	-	-	-	-	-
City-road *HL*	-	-	-	-	-	1	-	-	-	-	-
Whitecross-street	-	1	-	-	-	-	-	-	-	-	-
Hoxton New Town *w*	-	-	-	-	1	1	-	-	-	-	-
Hoxton Old Town	1	-	-	-	1	-	-	-	-	-	-
Haggerstone West *W*	-	1	-	-	3	-	2	1	1	-	-
West Hackney	1	1	1	-	-	1	1	-	1	-	1
Long-acre	-	-	-	-	-	-	-	-	-	-	-
Somers-town	-	-	-	-	1	1	-	1	-	-	1
Old Street, St. Luke's	-	-	-	-	-	-	-	-	-	-	-
St. Anne Soho	-	-	-	-	-	-	-	-	-	-	-
St. Giles South *W*	-	-	-	1	1	-	-	-	-	-	-
Berwick-street	1	-	1	1	-	-	-	-	1	-	-
St. George-the-Martyr Holborn *H*	-	-	-	-	-	-	-	-	-	-	-
Amwell, Clerkenwell	-	1	-	-	-	-	-	-	-	-	-
St. Giles North	-	-	-	-	-	-	-	-	-	-	-
St. George Bloomsbury	-	-	-	-	1	-	-	-	-	-	-
Stoke Newington	-	-	-	-	-	-	-	-	-	-	-
Goswell-street	-	-	-	-	-	-	-	-	-	-	-
Pentonville	-	-	-	-	-	-	-	-	-	-	-
Islington East *Ww*	1	-	1	-	1	2	2	1	-	1	-
Islington West *WHH*	2	1	4	1	-	1	-	3	-	-	-
Kentish-town	1	-	-	1	-	-	1	-	-	-	-
	17	7	11	5	12	9	8	12	3	3	3
New River and East London.											
Shadwell *W*	6	7	-	7	8	6	1	7	3	5	4
Aldgate	1	-	1	-	1	2	1	3	-	-	-
Whitechapel North	1	-	1	2	2	2	3	1	1	-	2
Artillery, Whitechapel	2	3	-	-	-	-	-	2	1	2	-
St. Botolph, East London	5	3	-	1	-	2	1	2	1	-	-
Holywell Shoreditch	-	3	-	-	-	-	1	1	-	-	1
Hackney *WHw*	2	1	2	-	-	-	2	3	2	1	1
	17	17	4	10	11	12	9	19	8	8	8

in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

AUGUST.																	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	-	-	1	-	-	-	-	1	-	-	-	1	-	-	-	-	-
-	-	1	-	-	-	-	-	-	-	1	-	1	1	-	1	1	1
-	2	1	1	-	1	1	2	2	-	1	2	1	2	1	2	1	-
-	2	2	-	2	-	-	-	1	-	-	-	-	1	-	-	-	2
1	-	-	-	1	1	-	1	-	-	-	1	-	-	-	-	1	2
-	2	1	-	-	1	2	-	1	-	-	1	-	-	-	-	1	-
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	-
-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	1	2
-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
2	6	5	4	3	3	3	3	6	-	3	7	3	5	1	3	6	7
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-
-	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1	-	1	-	1	-	-	-	-	-	1	-	-	1	1	-
-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	1	-	1	1	-	1	-	-	-	-	1	-	1	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	1	1	1	1	-	1	1	1	2	-	1	-	-	-	1	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	2	-	1	1	-	-	-	-	-	-	-	1	1	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	4	6	3	5	3	5	4	1	1	3	-	5	3	1	2	3	3
1	3	2	2	2	-	2	2	-	-	1	-	2	1	-	-	1	-
-	2	1	1	-	-	1	1	4	3	-	-	-	-	-	-	1	-
-	1	-	1	-	-	1	-	-	2	-	-	-	1	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	1	-	-	-	2	-	-	1	-	-	-	-	-	-
-	-	-	-	1	-	1	-	-	-	-	1	-	-	-	1	-	-
-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1
4	6	3	5	4	-	5	3	6	6	1	2	2	2	-	1	2	1

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septemb

SUB-DISTRICTS.	SEPTEMBER											
	1	2	3	4	5	6	7	8	9	10	11	12
Southwark, Lambeth, and Kent.												
Rotherhithe *W*	1	–	1	–	–	–	–	–	–	–	–	–
Peckham	–	–	1	–	1	1	–	3	–	–	–	–
St. Nicholas Deptford	–	–	3	–	1	1	1	2	–	3	–	2
Greenwich East *WH*	–	–	–	–	–	–	–	–	–	–	–	–
St. Paul Deptford	–	–	–	–	–	–	–	–	–	–	1	–
Greenwich West *H*	1	–	1	–	–	1	–	–	–	–	–	–
Lewisham Village *W*	–	1	–	–	–	–	–	–	–	–	–	–
Lee	–	–	–	–	–	–	–	–	–	–	–	–
Eltham	–	–	–	–	–	–	–	–	–	–	–	–
Plumstead and Charlton	–	2	–	–	–	–	–	–	1	–	–	–
Woolwich Dockyard *H*	1	1	–	2	–	–	–	1	–	1	–	1
Woolwich Arsenal *H*	–	1	–	–	–	1	2	1	–	3	–	2
	3	5	6	2	2	4	3	7	1	7	1	5
New River.												
London City, South-west	–	–	–	–	–	–	–	–	–	–	–	–
London City, South	–	–	–	–	–	–	–	–	–	–	–	–
London City, South-east	–	–	1	–	–	–	–	–	–	–	–	–
West London, South	–	–	–	–	–	–	–	–	–	–	–	–
West London, North *WH*	–	–	–	1	–	–	–	–	–	–	–	1
St. Clement Danes, Strand *H*	–	–	–	–	–	–	–	–	–	–	1	–
Saffron-hill	–	–	–	–	–	–	–	–	–	–	–	–
St. Leonard Shoreditch *L*	–	1	–	–	–	–	–	–	–	–	–	1
Finsbury	–	1	–	–	–	–	–	–	–	–	–	–
Cripplegate	–	–	–	–	–	–	1	–	–	–	–	–
London City, North-west	–	–	–	–	–	–	–	–	–	–	–	–
London City, North-east	–	–	–	–	–	–	–	–	–	–	–	–
St. James Clerkenwell *W*	1	–	–	1	–	1	–	–	1	1	–	1
St. Mary-le-Strand	–	–	–	–	–	–	–	–	–	–	–	–
St. Andrew East Holborn *W*	–	–	–	–	–	–	–	–	–	–	–	–
Gray's Inn-lane *H*	–	–	–	–	–	–	–	–	–	–	–	–
Camden-town *W*	–	–	–	–	–	–	–	–	–	–	–	–
City-road *HL*	–	–	–	–	–	–	–	–	–	–	–	–
Whitecross-street	–	–	–	–	–	–	–	–	1	–	–	–
Hoxton New Town *w*	–	–	1	1	–	–	–	–	–	–	–	2
Hoxton Old Town	1	–	–	–	–	–	1	–	–	–	–	–
Haggerstone West *W*	1	–	–	–	1	–	–	–	–	–	–	–
West Hackney	–	–	–	–	–	–	–	–	–	–	–	–
Long-acre	–	–	–	–	–	–	–	–	–	1	–	–
Somers-town	–	–	–	–	1	–	–	–	–	–	–	–
Old Street, St. Luke's	–	–	–	–	–	–	–	–	–	–	–	–
St. Anne Soho	–	1	–	–	–	–	–	–	–	–	–	–
St. Giles South *W*	1	–	–	–	–	–	–	1	–	–	–	–
Berwick-street	–	–	–	–	–	–	–	–	–	–	–	–
St. George-the-Martyr Holborn *H*	–	–	–	–	–	–	–	–	–	–	–	–
Amwell, Clerkenwell	–	–	–	–	–	–	–	–	–	–	–	–
St. Giles North	–	–	–	1	1	1	–	–	–	2	–	–
St. George Bloomsbury	–	–	–	–	–	–	–	–	–	–	–	–
Stoke Newington	–	–	–	–	–	–	–	–	–	–	–	–
Goswell-street	–	–	–	–	–	–	–	–	–	–	–	–
Pentonville	–	–	–	–	–	–	–	1	–	–	–	–
Islington East *Ww*	–	–	–	2	–	–	–	1	1	–	1	–
Islington West *WHH*	–	1	–	–	1	–	1	–	2	1	2	–
Kentish-town	–	–	–	–	–	–	–	–	–	–	–	–
	4	4	2	6	4	2	3	3	5	5	4	5
New River and East London.												
Shadwell *W*	–	–	–	–	1	1	–	–	–	–	–	–
Aldgate	–	–	–	1	–	–	–	–	–	–	–	–
Whitechapel North	–	–	–	–	–	–	–	–	–	–	–	–
Artillery, Whitechapel	1	–	–	–	–	–	–	–	–	–	1	–
St. Botolph, East London	–	–	1	–	–	–	–	2	–	–	1	3
Holywell Shoreditch	–	–	–	–	–	–	–	–	–	1	–	–
Hackney *WHw*	–	1	–	–	1	2	1	–	–	1	1	1
	1	1	1	1	2	3	1	2	–	2	3	4

in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

SEPTEMBER.															Deaths in 91 days.	Population, 1861.
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	19	24,502
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	28,135
2	1	1	1	-	-	1	-	1	-	1	-	1	-	1	55	8,139
-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	23	18,306
-	1	1	-	1	-	1	-	-	1	1	-	1	-	1	32	37,834
1	-	-	-	-	-	-	-	-	1	1	-	-	1	-	37	21,696
-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	4	7,372
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	—	11,807
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	—	3,009
-	-	-	1	-	1	-	-	-	-	-	-	-	-	1	10	32,974
-	-	1	-	-	-	1	-	-	-	-	1	-	-	-	17	22,919
-	-	-	1	-	1	1	-	-	-	-	1	-	-	-	17	18,776
4	2	4	3	2	2	4	-	1	4	3	2	3	1	3	232	235,469
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7,762
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	8,570
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	8,659
-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	11	15,395
1	-	-	1	-	1	-	1	-	1	-	-	1	1	-	23	11,750
-	-	1	-	1	1	-	-	-	-	-	1	-	-	-	12	15,207
-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	12,012
-	-	-	-	-	1	-	-	-	-	1	-	-	-	1	15	19,188
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	8	12,931
-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	10	19,697
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	9,020
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	11,544
-	-	-	-	2	-	1	-	-	-	1	-	-	-	-	13	19,152
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	10,346
-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	3	12,947
-	-	1	2	1	-	-	-	-	1	1	1	-	-	1	13	27,808
-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	7	23,266
-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3	17,860
-	1	-	-	-	-	1	1	1	-	1	1	-	-	-	9	14,778
1	-	2	-	-	-	1	-	-	-	-	1	-	-	-	24	26,516
-	-	-	1	-	-	-	1	1	-	2	1	-	-	-	15	25,777
-	-	-	-	-	1	1	-	1	-	-	-	1	-	-	27	23,260
-	-	-	-	-	1	1	-	-	-	1	1	-	-	-	19	24,265
-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	11,618
-	-	-	1	-	-	-	-	-	-	-	1	-	-	2	14	39,099
-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	11,504
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	17,426
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	19,483
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10,607
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	19,903
-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3	17,250
1	1	-	-	-	1	-	-	1	2	1	1	-	1	1	91	17,201
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	17,392
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	6,608
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	4	16,200
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	13,079
-	-	-	1	-	1	-	-	-	1	1	-	-	1	-	35	79,899
1	1	-	-	-	1	-	1	1	3	2	-	1	1	-	44	75,442
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	44,317
4	3	6	7	4	9	7	6	6	11	12	9	3	5	5	382	794,738
-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	138	12,537
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	9,971
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	12,122
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	6,557
-	1	-	-	-	-	-	-	-	1	1	2	-	-	-	42	20,990
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	17,313
1	1	1	-	-	-	1	1	1	-	-	-	-	-	-	39	31,481
1	3	1	-	-	1	1	1	1	1	1	2	-	-	-	325	110,971

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septem

SUB-DISTRICTS.	Elevation in Feet above Trin. High-water Mark.	JULY										
		1	2	3	4	5	6	7	8	9	10	11
East London.												
St. John St. George-in-the-East *W*	2	–	–	–	–	–	–	–	–	–	–	–
Poplar *W*	3	–	–	–	–	–	–	–	–	–	–	–
Limehouse *W*	10	–	–	–	–	–	–	–	–	1	–	1
Bow *wwL*	12	–	–	–	–	–	–	–	–	–	–	1
Ratcliffe *W*	18	–	–	–	–	–	–	–	–	–	–	–
St. Mary St. George-in-the-East	26	–	–	–	–	–	–	–	–	–	–	–
St. Paul St. George-in-the-East	27	–	–	–	–	–	–	–	–	–	–	–
Mile End Old Town East *Ww*	28	–	–	–	–	–	–	1	–	–	–	–
Goodman's Fields	28	–	–	–	–	–	–	–	–	–	–	–
Whitechapel Church *H*	32	–	–	–	–	–	–	–	–	–	–	1
Mile End Old Town West	32	–	–	–	–	–	–	–	–	–	–	–
Mile End New Town *W*	36	–	–	–	–	–	–	–	–	–	–	–
Spitalfields	36	–	–	–	–	–	–	–	–	–	–	–
Town, Bethnal Green	36	–	–	–	–	–	–	–	–	–	–	–
Church, Bethnal Green	36	–	–	–	–	–	–	–	–	–	–	1
Green, Bethnal Green *WHL*	36	–	–	–	–	–	–	–	–	–	–	–
South Hackney *L*	44	–	–	–	–	–	–	–	–	–	–	–
Hackney-road	44	–	–	–	–	–	–	–	–	–	–	–
Haggerstone East	52	–	–	–	–	–	–	–	–	–	–	–
Stamford-hill	76	–	–	–	–	–	–	–	–	–	–	–
		–	–	–	–	–	–	1	–	1	–	4
Stratford	—	–	–	–	–	–	–	–	–	–	–	–
West Ham *ww*	—	–	–	–	–	–	–	–	–	–	–	–
Leyton *W*	—	–	–	–	–	–	–	–	–	–	–	–
Walthamstow	—	–	–	–	–	–	–	–	–	–	–	–
		–	–	–	–	–	–	1	–	1	–	4

SUB-DISTRICTS.	AUGUST										
	1	2	3	4	5	6	7	8	9	10	11
East London.											
St. John St. George-in-the-East *W*	6	4	3	4	4	9	10	2	8	3	5
Poplar *W*	9	13	12	9	13	7	9	9	12	7	6
Limehouse *W*	10	11	4	4	4	4	5	3	2	2	2
Bow *wwL*	16	18	11	15	7	7	4	4	10	4	7
Ratcliffe *W*	9	7	4	7	10	3	2	1	3	6	1
St. Mary St. George-in-the-East	7	2	5	8	4	2	1	2	1	2	4
St. Paul St. George-in-the-East	4	3	2	1	1	5	3	4	5	2	1
Mile End Old Town East *Ww*	16	12	9	5	8	11	3	3	7	7	2
Goodman's Fields	3	–	2	1	3	2	1	4	1	–	1
Whitechapel Church *H*	18	22	6	8	11	14	6	6	8	10	9
Mile End Old Town West	9	10	9	1	5	5	4	4	4	1	1
Mile End New Town *W*	2	5	3	6	4	3	4	10	5	2	3
Spitalfields	1	4	8	5	3	6	5	4	3	3	2
Town, Bethnal Green	9	6	12	6	6	8	1	4	5	4	9
Church, Bethnal Green	5	2	6	1	3	2	2	1	1	2	1
Green, Bethnal Green *WHL*	10	7	8	6	10	6	6	5	5	5	4
South Hackney *L*	2	1	–	–	–	–	–	–	–	–	–
Hackney-road	8	2	4	1	3	1	3	4	1	2	–
Haggerstone East	–	1	–	2	–	–	1	1	–	–	–
Stamford-hill	–	–	–	–	–	–	–	–	–	–	–
	144	130	108	90	99	95	70	71	81	62	58
Stratford	10	7	4	2	5	5	3	5	3	1	3
West Ham *ww*	7	11	4	8	4	4	5	5	4	–	3
Leyton *W*	–	–	1	2	1	–	1	1	–	–	–
Walthamstow	–	–	–	–	–	–	–	–	–	–	–
	161	148	117	102	109	104	79	82	88	63	64

; in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

- - - - - - - JULY.																	
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	-	-	-	-	3	2	-	2	2	3	2	4	8	6	7	7	6	9
	3	2	4	7	7	20	8	11	6	19	17	26	17	19	18	15	14	19
	-	4	5	5	9	9	12	12	8	8	12	11	16	7	10	7	7	10
	3	1	2	8	4	7	12	14	16	13	27	25	24	16	22	19	14	18
	1	-	1	2	2	5	5	1	5	4	5	10	5	5	8	2	6	8
	-	-	-	3	5	1	2	2	7	1	4	5	5	4	4	4	8	5
	-	1	-	1	1	3	2	-	2	6	6	3	4	2	4	-	-	9
	1	2	4	6	3	7	8	18	12	12	12	12	7	11	7	9	9	13
	-	-	1	2	1	1	1	-	2	3	-	3	-	4	2	4	2	3
	-	-	-	-	6	2	5	11	5	16	8	15	10	9	10	19	14	15
	1	-	-	3	3	6	4	5	6	13	5	6	6	6	10	12	9	10
	-	-	-	2	-	3	3	-	1	2	2	5	6	8	4	7	5	5
	-	-	-	-	-	-	1	1	-	-	3	1	3	1	4	2	2	2
	-	-	-	1	1	-	2	1	3	2	3	3	1	2	5	4	3	6
	-	1	2	2	1	-	1	3	5	2	4	3	4	2	4	9	8	4
	-	-	3	6	8	10	4	6	7	7	10	12	5	5	10	7	8	9
	-	-	-	1	-	-	-	1	1	-	1	-	1	-	-	1	2	5
	1	-	1	1	-	-	1	-	1	3	1	2	1	1	3	1	4	4
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	10	11	23	50	54	76	71	88	89	114	123	146	123	108	132	129	122	154
	1	1	3	1	2	4	5	6	2	5	9	4	10	3	12	8	9	8
	-	-	2	2	3	5	6	6	10	9	10	10	15	10	11	11	8	5
	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11	12	28	53	59	85	82	101	101	128	142	160	148	121	155	148	139	167

- - - - - - - AUGUST.																		
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	2	2	5	2	3	-	3	-	-	-	1	-	1	1	-	1	1	-
	4	3	6	2	5	3	3	1	3	6	2	1	3	4	2	3	2	1
	1	3	1	5	1	1	1	1	1	1	-	-	-	-	2	-	-	-
	3	3	3	1	3	2	6	3	-	2	1	1	1	1	-	-	1	1
	4	3	3	2	2	2	1	-	2	-	-	-	-	1	2	1	-	-
	2	2	1	1	1	1	2	-	-	2	-	-	1	2	1	-	-	-
	1	1	1	3	-	1	-	-	1	1	-	-	-	-	-	-	-	-
	5	5	6	2	-	3	-	3	4	3	1	1	-	2	1	-	-	1
	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
	3	6	3	3	4	2	2	1	2	-	3	2	-	2	2	4	-	1
	1	-	2	-	3	2	1	-	1	1	-	1	-	-	-	1	-	-
	2	3	2	2	5	3	2	-	-	-	2	-	2	2	-	2	2	-
	1	-	-	3	1	2	1	4	3	4	2	2	3	4	2	2	1	2
	3	6	1	-	1	1	1	1	1	1	3	-	2	-	-	2	2	-
	-	1	2	2	-	-	1	-	-	-	-	-	2	-	-	1	-	-
	4	2	5	3	2	1	1	3	1	1	1	2	4	1	2	-	-	1
	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	1	-	-
	1	2	1	-	2	1	1	1	-	3	2	1	2	-	2	1	-	-
	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37	43	42	31	34	25	26	20	19	26	18	11	21	21	17	20	9	7
	-	-	-	2	1	-	1	1	2	-	-	-	-	-	-	-	-	-
	1	6	-	3	3	-	1	1	-	-	1	-	-	-	-	3	-	-
	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	38	49	42	36	38	25	28	22	22	26	19	11	21	21	17	23	9	7

DEATHS from CHOLERA occurring ON EACH DAY during the 13 Weeks ending 29th Septem r

SUB-DISTRICTS.	SEPTEMBER - - -											
	1	2	3	4	5	6	7	8	9	10	11	12
East London.												
St. John St. George-in-the-East *W*	-	-	-	2	-	1	-	1	-	-	-	1
Poplar *W* - - - - - -	-	1	-	1	2	-	-	1	1	4	-	1
Limehouse *W* - - - - -	-	2	1	-	-	-	1	-	-	-	-	-
Bow *wwL* - - - - - -	-	-	2	-	-	1	-	3	-	-	2	-
Ratcliffe *W* - - - - - -	-	-	-	-	2	1	-	-	-	-	-	-
St. Mary St. George-in-the-East -	-	-	1	-	-	-	1	1	-	-	-	-
St. Paul St. George-in-the-East -	1	-	-	-	-	-	-	-	-	1	-	-
Mile End Old Town East *Ww* -	-	-	-	-	-	-	1	-	2	-	1	-
Goodman's Fields - - - - -	-	-	-	-	2	-	-	1	-	-	-	-
Whitechapel Church *H* - -	-	1	1	3	-	1	-	1	1	-	-	-
Mile End Old Town West - -	-	-	1	-	-	-	1	-	-	1	1	1
Mile End New Town *W* - -	-	-	-	1	-	2	1	2	-	2	-	1
Spitalfields - - - - - -	7	1	4	2	4	2	1	1	3	1	7	5
Town, Bethnal Green - - -	-	-	-	-	3	1	-	-	-	3	1	-
Church, Bethnal Green - - -	-	-	-	-	-	-	1	-	1	-	-	-
Green, Bethnal Green *WHL* -	1	-	-	-	-	-	1	-	1	-	-	-
South Hackney *L* - - - - -	1	-	-	1	-	-	-	-	-	1	1	-
Hackney-road - - - - - -	-	-	-	1	-	1	-	-	-	-	1	-
Haggerstone East - - - - -	-	-	-	-	-	-	-	-	-	-	-	-
Stamford-hill - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-
	10	5	10	11	13	10	8	11	9	13	14	9
Stratford - - - - - - -	-	-	-	1	1	1	-	1	-	-	-	-
West Ham *ww* - - - - -	-	-	-	1	-	1	-	-	2	-	1	-
Leyton *W* - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-
Walthamstow - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-
	10	5	10	13	14	12	8	12	11	13	15	9

Note. — The letters placed against the names of the sub-districts denote public institutions situ d therein, namely,

W—Workhouse;
H—Hospital;
L—Lunatic Asylum;
w—Workhouse not belonging to the district in which it is situated.

Included with the deaths in the above Table are the following fatal Cholera cases registered in pu c institutions:

IN HOSPITALS:			Deaths from Cholera in 91 D.
St. George's Hospital, situate in the sub-district of		Belgrave (St. Geo. Han. Sq.) - -	5
Middlesex Hospital	„	„ All Souls (Marylebone) - - -	7
Royal Free Hospital	„	„ Grays Inn Lane - - - -	9
Fever Hospital	„	„ Islington West - - - - -	28
King's College Hospital	„	„ St. Clement Danes - - - -	9
St. Bartholomew's Hospital	„	„ West London North - - - -	22
London Hospital	„	„ Whitechapel Church - - - -	305
Cholera Hospital	„	„ Spitalfields - - - - - -	83
Guy's Hospital	„	„ St. Olave and St. Saviour (Southwark)	16

6 in the several Sub-districts of LONDON, grouped according to their Water Supply—*continued.*

- - - - - SEPTEMBER.															Deaths in 91 days.	Population, 1861.
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**154**	**9,695**
-	-	1	-	1	-	-	-	-	-	1	-	-	1	-	**419**	**43,529**
1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	**239**	**27,161**
-	1	-	-	2	-	-	-	-	-	-	-	-	-	1	**405**	**35,667**
1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	**169**	**16,874**
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	**122**	**18,181**
-	-	1	-	-	-	1	1	-	-	-	-	-	-	-	**96**	**21,015**
-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	**290**	**39,317**
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**56**	**11,166**
1	1	-	2	1	3	-	-	-	-	-	-	1	-	2	**332**	**8,062**
-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	**180**	**33,747**
1	1	-	1	-	1	-	1	1	-	-	-	-	-	-	**148**	**15,392**
1	1	2	3	3	2	1	3	2	2	-	4	1	3	2	**186**	**15,700**
1	-	1	-	-	1	1	-	-	-	-	-	1	-	-	**150**	**21,486**
-	-	1	-	-	-	-	-	2	-	-	-	-	1	-	**102**	**25,528**
-	-	1	-	-	-	-	-	1	1	-	-	1	1	1	**240**	**31,789**
-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	**27**	**15,458**
1	-	-	-	-	-	-	-	1	-	2	-	1	-	-	**83**	**26,298**
-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	**10**	**17,310**
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**5,483**
7	6	8	8	8	9	4	6	7	3	5	4	5	6	6	**3410**	**438,858**
-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	**159**	**15,994**
1	-	-	2	1	1	-	1	-	-	-	-	-	-	-	**216**	**25,195**
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10**	**7,536**
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	**1**	**10,594**
8	6	8	11	9	10	4	7	7	3	5	4	5	7	6	**3796**	**498,177**

In Outlying Workhouses :			Deaths from Cholera in 91 days.
St. George Hanover Square Workhouse, situate in the sub-district of		Chelsea, North-west	—
Strand Workhouse	,,	,, Tottenham Court	1
St. Luke's Workhouse	,,	,, Hoxton New Town	2
East London Workhouse	,,	,, Hackney	—
West London Workhouse	,,	,, Islington East	5
London City Workhouse	,,	,, Mile End Old Town East, and Bow	27
Stepney Workhouse	,,	,, Bow	8

TABLE **25.**—LONDON DISTRICTS. **Water Companies** supplying EACH DISTRICT; **Area** in A[cres]; Number of **Inhabited Houses** in 1861; **Annual Value** of **Property** assessed in 1866; **Estim[ated] Population,** 1866; and **Deaths** REGISTERED from **Cholera** and **Diarrhœa,** in **1849,** in **185[4]** and in **1866.**

Initial of Water Company furnishing the chief Supply.	DISTRICTS.	Area in Statute Acres.	Number of Inhabited Houses enumerated in 1861.	Annual Value of Property assessed in 1866.	Estimated Population, 1866.†	Deaths registered from CHOLERA.				Deaths registered DIARRH[OEA]		
						1849.	From 1st July 1853 to 31st December 1854.	1866. Uncorrected for Deaths in Hospitals and Workhouses.	1866. Corrected for Deaths in Hospitals and Workhouses.	1849.	From 1st July 1853 to 31st December 1854.	
	LONDON - - -	77,997	359,421	£ 15,261,999	3,037,991	14,137	11,661	5,596	5,596	3,899	6,258	
	WEST DISTRICTS.											
GJ., WM., C.	Kensington - - -	7,342	25,813	1,431,352	227,193	260	543	85	87	146	287	
C.	Chelsea - - - -	865	8,314	299,868	65,957	247	309	22	23	92	158	
G.J., C.	St. George Hanover-square	1,161	10,437	1,076,272	94,315	131	303	18	14	69	130	
C.	Westminster - - -	917	6,798	341,116	68,268	437	443	43	42	112	207	
N.R., C.	St. Martin-in-the-Fields -	305	2,240	265,336	21,370	91	59	10	10	27	43	
G.J., N.R.	St. James Westminster -	164	3,333	462,062	34,155	57	497	13	18	40	43	
	NORTH DISTRICTS.											
W.M., G.J.	Marylebone - - -	1,509	16,357	1,053,748	159,871	261	397	54	46	229	349	
N.R., W.M.	Hampstead - - -	2,252	2,653	147,624	23,557	9	15	2	2	11	14	
N.R., W.M.	Pancras - - - -	2,716	21,852	925,872	211,825	360	256	138	120	232	337	
N.R.	Islington - - - -	3,127	20,704	777,632	193,648	187	116	120	82	110	249	
N.R., E.*	Hackney - - - -	3,929	13,392	370,616	97,120	139	91	103	111	93	127	
	CENTRAL DISTRICTS.											
N.R.	St. Giles - - - -	245	4,690	277,412	52,226	285	115	49	52	77	141	
N.R.	Strand - - - -	172	3,775	299 808	40,883	156	112	29	26	62	93	
N.R.	Holborn - - - -	196	4,109	231,875	42,556	161	28	22	29	55	94	
N.R.	Clerkenwell - - -	380	7,088	242,524	63,957	121	67	45	78	92	127	
N.R.	St. Luke - - - -	220	6,356	186,452	56,710	183	55	46	86	97	161	
N.R., E.	East London - - -	153	4,489	} 2,137,791	{ 37,661	182	90	59	52	57	121	
N.R.	West London - - -	138	2,580		{ 25,470	429	133	60	21	63	51	
N.R.	London City - - -	434	6,362	}	{ 39,756	207	76	20	26	47	60	
	EAST DISTRICTS.											
N.R., E.	Shoreditch - - -	646	17,072	386,044	136,836	789	266	139	154	189	298	
E.*	Bethnal Green - - -	760	14,731	192,116	110,289	789	213	611	698	207	217	
E.,* N.R.	Whitechapel - - -	406	8,664	277,748	76,386	506	427	909	580	155	227	
E.*	St. George-in-the-East -	243	6,169	196,745	47,779	199	175	385	461	70	156	
E.,* N.R.	Stepney - - - -	576	7,441	234,804	56,198	335	266	559	652	102	156	
E.*	Mile-End-Old-Town - -	681	10,758	191,056	80,695	166	170	501	513	82	167	
E.*	Poplar - - - -	2,918	11,123	344,320	99,762	313	218	837	892	77	137	
	SOUTH DISTRICTS.											
S., L.	St. Saviour Southwark -	250	4,471	164,000	36,422	539	551	32	26	111	195	
S.	St. Olave Southwark -	169	2,209	110,700	18,914	349	341	21	12	49	35	
S.	Bermondsey - - -	688	8,220	150,000	64,310	734	923	35	38	149	209	
S., L.	St. George Southwark -	282	7,238	146,000	57,498	836	625	38	43	125	185	
S., L.	Newington - - -	624	12,740	240,000	92,680	907	741	26	29	135	196	
L., S.	Lambeth - - - -	4,015	22,910	637,000	174,904	1,618	1,003	114	115	276	461	
L., S.	Wandsworth - - -	11,695	11,186	361,400	82,979	484	450	40	41	75	153	
S., L., K.	Camberwell - - -	4,342	12,098	250,000	81,818	504	581	46	49	86	180	
S., L.	Rotherhithe - - -	886	3,521	83,500	28,767	352	308	25	27	44	105	
K.	Greenwich - - - -	5,367	17,821	357,976	144,836	718	613	284	285	202	308	
K., L.	Lewisham - - - -	17,224	9,707	411,260	90,420	96	85	56	56	54	81	

* The East London Company supplied water in 1866 from two distinct sources; the one at Lea Bridge where the wa[ter is] filtered, and the other lower down at Old Ford, from reservoirs in close proximity to the River Lea. The pipes of th[e two] systems are in communication, but Hackney is chiefly supplied from Lea Bridge; the other districts from Old Ford.

† The estimated population of 1866 is deduced from the ratio between 1841 and 1861. It must be considered [only] approximative.

BLE **26.**— LONDON DISTRICTS. **Water Companies** supplying each DISTRICT; **Elevation**; **Persons** to an **Acre**; **Persons** to a **House**; **Annual Value** of **Property** per **Head** of **Population**; AVERAGE ANNUAL **Value** of **Houses**; **Poor Relief**; and **Number** of **Deaths** to 10,000 PERSONS LIVING from **Cholera** and **Diarrhœa** in **1849**, in **1853-54**, and in **1866.**

Initial Water Company Furnishing the Chief Supply.	DISTRICTS.	Elevation in Feet above Trinity High-water Mark.	Persons to an Acre in 1866.	Persons to a House in 1861.	Annual Value of Property per Head of Population.	Average annual Value of Houses in 1866.	Relief to Poor in the £ on annual Value as assessed for Poor Rate in 1866.*	Deaths from CHOLERA to every 10,000 Inhabitants.			Deaths from DIARRHŒA to every 10,000 Inhabitants.		
								1849.	From 1st July 1853 to 31st December 1854.	1866. Corrected for Deaths in Hospitals and Workhouses.	1849.	From 1st July 1853 to 31st December 1854.	1866.
					£	£	*s.* *d.*						
	LONDON - -	39	39·0	7·8	5·006	39·19	1 3¾	62	46	18	17	25	10
	WEST DISTRICTS.												
WM., C.	Kensington - - -	40	30·9	7·2	6·300	45·38	0 8	24	38	4	13	20	11
C.	Chelsea - - - -	12	76·3	7·6	4·546	34·69	1 9½	46	51	4	17	25	7
J., C.	St. George Hanover Square	34	81·2	8·4	11·411	95·97	0 6¾	18	33	2	10	17	5
C.	Westminster - - -	3	74·4	10·0	4·997	50·14	1 0¾	68	57	6	17	30	10
R., C.	St. Martin-in-the-Fields -	38	70·1	10·1	12·416	125·76	1 0¾	37	20	5	11	17	11
., N.R.	St. James Westminster -	58	208·3	10·6	13·527	143·38	1 0	16	142	5	11	12	4
	NORTH DISTRICTS.												
M., G.J.	Marylebone - - -	87	105·9	9·9	6·591	65·15	1 1½	17	17	3	15	21	11
., W.M.	Hampstead - - -	350	10·5	7·2	6·267	45·13	0 7	8	12	1	10	11	6
., W.M.	Pancras - - - -	73	78·0	9·1	4·371	39·76	1 2½	22	10	6	14	19	10
N.R.	Islington - - - -	94	61·9	7·5	4·016	30·13	0 9	22	11	4	13	22	8
R., E.	Hackney - - - -	53	24·7	6·2	3·816	23·73	0 11½	25	15	11	17	20	8
	CENTRAL DISTRICTS.												
N.R.	St. Giles - - - -	68	213·2	11·5	5·312	61·25	1 5¾	53	22	10	14	26	16
N.R.	Strand - - - -	50	237·7	11·4	7·333	83·49	2 0	35	22	6	14	21	7
N.R.	Holborn - - - -	53	217·1	10·9	5·449	59·49	1 6¾	35	6	7	12	20	17
N.R.	Clerkenwell - - -	65	168·3	9·3	3·792	35·14	1 8¾	19	10	12	14	19	14
N.R.	St. Luke - - - -	51	257·8	9·0	3·288	29·52	2 6	34	10	15	18	29	13
R., E.	East London - - -	40	246·2	} 8·4	20·778	175·41	2 11½	45	†23	14	13	26	7
N.R.	West London - - -	29	184·6				2 7¾	96	†10	8	22	18	11
N.R.	London City - - -	31	91·6				0 7¾	38	†14	7	8	11	4
	EAST DISTRICTS.												
R., E.	Shoreditch - - -	48	211·8	7·6	2·821	21·38	2 7½	76	23	11	18	25	10
E.	Bethnal Green - - -	38	145·1	7·1	1·742	12·43	2 9	90	23	63	24	23	16
., N.R.	Whitechapel - - -	32	188·1	9·1	3·636	33·14	2 3¾	64	45	76	20	27	16
E.	St. George-in-the-East -	21	196·6	7·9	4·118	32·63	3 2	42	36	97	15	31	18
., N.R.	Stepney - - - -	11	97·6	7·6	4·178	31·77	2 11¾	62	48	116	19	28	20
E.	Mile End Old Town - -	30	118·5	6·8	2·368	16·08	1 9¾	31	28	64	15	27	12
E.	Poplar - - - -	8	34·2	7·1	3·451	24·57	1 6¾	71	42	89	17	25	19
	SOUTH DISTRICTS.												
S., L.	St. Saviour Southwark -	3	145·7	8·1	4·503	36·43	2 7	153	142	7	32	53	11
S.	St. Olave Southwark -	4	111·9	8·6	5·853	50·49	1 6¾	181	140	6	25	19	9
S.	Bermondsey - - -	0	93·5	7·1	2·332	16·56	1 7	161	179	6	33	39	12
S., L.	St. George Southwark -	0	203·9	7·7	2·539	19·47	3 0½	164	121	1	25	34	8
S., L.	Newington - - -	−1	148·5	6·5	2·590	16·71	2 2	144	112	3	21	29	6
L., S.	Lambeth - - - -	3	43·6	7·1	3·642	25·76	1 5¾	120	70	7	20	31	10
L., S.	Wandsworth - - -	24	7·1	6·3	4·355	27·41	1 0	‡100	85	5	15	28	8
, L., K.	Camberwell - - -	4	18·8	5·9	3·056	18·06	1 3½	97	99	6	17	30	8
S., L.	Rotherhithe - - -	0	32·5	7·0	2·903	20·20	2 0¾	205	165	9	26	54	6
K.	Greenwich - - -	27	27·0	7·2	2·472	17·71	2 2¾	75	49	20	21	29	20
K., L.	Lewisham - - - -	87	5·2	6·8	4·548	30·81	0 8½	30	22	6	17	20	6

* The amounts in this Column are taken from a Parliamentary Return relating to Poor Relief in the Metropolis, dated th April 1867.

† The three districts of the City of London, the East London, and the West London, including St. Bartholomew's ospital, comprise the City of London, within and without the walls. Mr. Simon, the health officer of the City, has certained that the deaths from cholera properly belonging to these districts were 213, 197, 278 in 1849, and 79, 104, and in 1854; his numbers have been adopted in the calculations. A similar correction is required of the mortality of . Olave's district, where many persons from other districts died of cholera in St. Thomas's Hospital.

‡ Excluding the deaths which occurred in Drouet's Asylum for Infant Paupers, the mortality of the Wandsworth District as at the rate of 72 deaths to 10,000 persons living.

TABLE 27.—LONDON SUB-DISTRICTS. **Water Supply; Elevation; Area; P… Cholera** in the THREE EPIDE…

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	Area in Statute Acres.	POPULATION ENUMER… 1851.	18…
Col. 1.	2.	3.	4.	5.	6.	7
		LONDON - - -	39	77,997	2,362,236	2,803…
		WEST DISTRICTS - - -	28	10,754	376,427	463,…
		NORTH DISTRICTS - - -	135	13,533	490,396	618,…
		CENTRAL DISTRICTS - - -	49	1,938	393,256	378,…
		EAST DISTRICTS - - -	26	6,230	485,522	571,…
		SOUTH DISTRICTS - - -	6	45,542	616,635	773,…
		WEST DISTRICTS.				
		1.—KENSINGTON.				
G.J.&W.M.	1	St. Mary Paddington *WH* -	82	795	17,252	39,…
G. J.	2	St. John Paddington *H* - -	76	450	29,053	36,…
W. M.	3	Kensington Town *W* - -	28	1244	29,183	51,…
W. M. & C.	4	Brompton *H* - - - -	12	698	14,870	18,…
W.M.&Wells	5	St. Peter Hammersmith - -	4	203	4,467	5,…
W.M., G.J., & Wells.	6	St. Paul Hammersmith - -	8	2118	13,293	19,…
W.M., C., & Wells.	7	Fulham *W* - - - - -	6	1834	11,886	15,…
		2.—CHELSEA.				
C.	1	Chelsea South *H* - - -	10	368	19,050	21,…
C.	2	Chelsea North-West *HWw* -	12	213	17,669	19,…
C.	3	Chelsea North-East - - -	13	284	19,819	21,…
		3.—ST. GEORGE HANOVER SQUARE.				
G. J.	1	Hanover Square - - -	64	445	20,216	19,…
G. J.	2	May Fair *W* - - - -	56	136	12,980	12,…
C.	3	Belgrave *H* § - - - -	12	580	40,034	55,…

NOTE.—The letters placed against the names of the sub-districts denote public institutions situ… therein, namely,

W—Workhouse;
H—Hospital;
L—Lunatic Asylum;
w—Workhouse not belonging to the district in which it is situated.
C H—Temporary Cholera Hospital.

* Where many deaths from cholera occurred in Workhouses in 1849, a proportion has been distribut… in the calculation over the other sub-districts of the Union in which the Workhouse is situated.

† Column 13, showing the mortality from Cholera in 1853–54, to 10,000 persons living, appeared i… he Report of the General Board of Health (see Report of the Committee for Scientific Inquiries in relati… to the Cholera epidemic of 1854, pp. 111–113), and is corrected for deaths from Cholera in Hospitals nd Workhouses.

‡ Column 10 represents the number of deaths from Cholera in 1866 *registered* in each Sub-district.

The numbers in Column 11, on which the calculations in Column 14 are based, are corrected for pe… ns who died of cholera in hospitals and workhouses not situated in the districts in which they were atta… ed. *Example*: Of 62 deaths from cholera in the Whitechapel Union Workhouse, 47 were deaths of persons ho…

enumerated in **1851** and **1861**; **Deaths** and **Annual Rate** of **Mortality** from **49, 1853–4,** and **1866.**

Deaths from Cholera.				Deaths from Cholera to every 10,000 Inhabitants.			SUB-DISTRICTS.
	From 1st July 1853 to 31st December 1854.	1866. Uncorrected	1866. Corrected	In the Year 1849.*	From 1st July 1853 to 31st December 1854.†	In the Year 1866.	
		For Deaths in Hospitals and Workhouses.					
	9.	10.‡	11.	12.	13.	14.	15.
37	11,661	5,596	5596	62	46	18	**LONDON.**
23	2,154	191	194	34	53	4	West Districts.
56	875	417	361	20	16	5	North Districts.
24	676	330	370	44	17	10	Central Districts.
97	1,735	3,941	3950	66	34	65	East Districts.
37	6,221	717	721	120	94	8	South Districts.
							WEST DISTRICTS.
							1.—Kensington.
2	33	13	13	7	2	2	St. Mary Paddington.
3	71	12	12	8	26	3	St. John Paddington.
7	157	15	15	33	49	2	Kensington Town.
7	48	4	6	18	34	3	Brompton.
8	33	7	7	18	83	12	St. Peter Hammersmith.
3	96	25	25	25	80	11	St. Paul Hammersmith.
0	105	9	9	51	59	5	Fulham.
							2.—Chelsea.
2	128	13	13	59	76	6	Chelsea South.
7	101	4	5	46	38	2	Chelsea North-West.
8	80	5	5	27	43	2	Chelsea North-East.
							3.—St. George Hanover Sq.
7	21	2	3	6	12	2	Hanover Square.
9	32	2	2	7	12	2	May Fair.
5	250	14	9	28	49	1	Belgrave.

belong to Mile End New Town, where the workhouse is situated. The 47 deaths are referred to the sub-districts from which the patients were brought, viz., 20 to Spitalfields, 2 to Artillery, 1 to White-Church, 11 to Whitechapel North, 3 to Goodman's Fields, and 10 to Aldgate. Of the 15 deaths ing to Mile End New Town 12 were deaths of persons who were inmates of the workhouse at the time ere attacked.

f 7 deaths from cholera in St. George's Hospital 5, which were deaths of persons who did not belong to ve, have been referred to the several sub-districts from which the patients were brought.

ie following are Outlying Workhouses:

St. George Hanover Square Workhouse is in Chelsea North-west sub-district. 2 : 2.
The Strand - - „ „ Tottenham-court sub-district. 9 : 2.
West London - - „ „ Islington East sub-district. 10 : 2.
East London - - „ „ Hackney sub-district. 11 : 4.
St. Luke Middlesex - „ „ Hoxton New Town sub-district. 20 : 3.
London City - - „ „ Mile End Old Town East, sub-district. 24*b* : 2; and Bow sub-district. 25 : 1.
Stepney - - - „ „ Bow sub-district. 25 : 1.

LONDON SUB-DISTRICTS.—WATER SUPPLY; ELEVATION; AREA; POPULA
in the THREE EPIDEMICS of 18

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	Area in Statute Acres.	POPULATION ENUMER 1851.	POPULATION ENUMER 18
Col. 1.	2.	3.	4.	5.	6.	7
		WEST DISTRICTS—*cont.*				
		4.—WESTMINSTER.				
C.	1	St. John - - - - -	2	260	34,295	37,3
C.	2	St. Margaret *WH** - -	4	657	31,314	30,0
		5.—ST. MARTIN-IN-THE-FIELDS.				
N. R. & C.	1	Charing Cross *WH* - -	17	263	12,587	11,1
N. R.	2	Long Acre - - - -	60	42	12,053	11,8
		6.—ST. JAMES WESTMINSTER.				
N. R.	1	Berwick Street - - -	65	25	10,798	10,7
G. J.	2	St. James's Square - - -	40	85	11,469	10,3
G. J.	3	Golden Square *W* - - -	68	54	14,139	13,6
		NORTH DISTRICTS.				
		7.—MARYLEBONE.				
W. M.	1	All Souls *H*† - - - -	76	112	28,841	29,2
W. M.	2	Cavendish Square - - -	73	113	14,687	15,0
G.J.&W.M.	3	Rectory *W* - - - -	68	116	27,633	26,2
G.J.&W.M.	4	St. Mary - - - - -	79	108	22,814	22,3
W. M.	5	Christchurch - - - -	92	518	33,895	34,3
W. M.	6	St. John - - - -	124	542	29,826	32,0
		8.—HAMPSTEAD.				
N.R.&W.M.	1	Hampstead *W* - - -	350	2252	11,986	19,6
		9.—PANCRAS.				
W. M.	1	Regent's Park - - - -	87	427	31,918	34,7
N.R.&W.M.	2	Tottenham Court *wH*‡ - -	73	145	28,433	29,1
N. R.	3	Gray's Inn Lane *H*§ - -	52	155	26,523	27,8
N. R.	4	Somers Town - - - -	60	184	35,641	39,9
N. R.	5	Camden Town *W* - - -	62	171	21,115	23,6
N. R.	6	Kentish Town - - - -	110	1634	23,326	44,7

* Three deaths from cholera were returned in the Westminster Hospital, two of these which were deaths of persons who did not belong to St. Margaret, have been referred to the respective sub-districts from which the patients were brought. One death from cholera in the hospital in Broad Sanctuary has been referred to St. John, Westminster; and 11 deaths from cholera in the Pear Street House have been distributed proportionally over the two sub-districts of Westminster.

† Of 10 deaths from cholera in Middlesex Hospital 8, which were deaths of persons who did not belong to All Souls, have been referred to the several sub-districts from which the patients were brought.

nerated in 1851 and 1861; DEATHS and ANNUAL RATE OF MORTALITY from CHOLERA 3–4, and 1866—*continued.*

DEATHS FROM CHOLERA.				DEATHS FROM CHOLERA to every 10,000 Inhabitants.			SUB-DISTRICTS.
49.	From 1st July 1853 to 31st December 1854.	1866. Uncorrected	1866. Corrected	In the Year 1849.	From 1st July 1853 to 31st December 1854.	In the Year 1866.	
		For Deaths in Hospitals and Workhouses.					
8.	9.	10.	11.	12.	13.	14.	15.
							WEST DISTRICTS—*cont.*
							4.—WESTMINSTER.
12	192	17	26	62	63	7	St. John.
25	251	26	16	72	54	5	St. Margaret.
							5.—ST. MARTIN-IN-THE-FIELDS.
60	41	2	2	40	26	2	Charing Cross.
31	18	8	8	34	16	7	Long Acre.
							6.—ST. JAMES WESTMINSTER.
19	200	7	8	20	211	8	Berwick Street.
15	20	4	5	15	20	5	St. James's Square.
23	277	2	5	13	197	4	Golden Square.
							NORTH DISTRICTS.
							7.—MARYLEBONE.
71	158	14	6	31	13	2	All Souls.
16	12	1	1	14	10	1	Cavendish Square.
91	99	10	10	16	25	4	Rectory.
18	44	3	3	10	25	1	St. Mary.
34	49	12	12	13	18	4	Christchurch.
31	35	14	14	13	13	4	St. John.
							8.—HAMPSTEAD.
9	15	2	2	7	13	1	Hampstead.
							9.—PANCRAS.
64	25	9	23	20	10	6	Regent's Park.
60	90	46	17	21	17	6	Tottenham Court.
04	60	39	14	39	6	5	Gray's Inn Lane.
53	33	27	36	16	11	10	Somers Town.
54	27	8	14	21	7	7	Camden Town.
25	21	9	16	12	9	3	Kentish Town.

Of 36 deaths from cholera in the University College Hospital 31, which were deaths of persons who did belong to Tottenham Court, have been referred to the several sub-districts from which the patients were ght.

Of 32 deaths from cholera in the Royal Free Hospital 26, which were deaths of persons who did not ng to Gray's Inn Lane, have been referred to the several sub-districts from which the patients were brought.

LONDON SUB-DISTRICTS.—Water Supply; Elevation; Area; Popula[tion] in the Three Epidemics of 1[8]

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	Area in Statute Acres.	Population enumerated 1851.	Population enumerated 186[1]
Col. 1.	2.	3.	4.	5.	6.	7.
		NORTH DISTRICTS—*cont.*				
		10.—Islington.				
N. R.	1	Islington West *WHH* * - -	100	1228	47,881	75,4[1]
N. R.	2	Islington East *Ww* - -	88	1899	47,448	79,8[1]
		11.—Hackney.				
N. R.	1	Stoke Newington - - -	72	639	4,840	6,6[1]
E. L.	2	Stamford Hill - - - -	76	615	5,549	5,4[1]
N. R.	3	West Hackney - - - -	55	472	18,732	24,2[1]
E.L. & N.R.	4	Hackney *WwH* - - -	44	1731	20,850	31,4[1]
E. L.	5	South Hackney *L* - - -	44	472	8,458	15,4[1]
		CENTRAL DISTRICTS.				
		12.—St. Giles.				
N. R.	1	St. George Bloomsbury - -	71	122	16,807	17,3[1]
N. R.	2	St. Giles South *W* - - -	64	63	19,951	19,4[1]
N. R.	3	St. Giles North **CH** † - -	68	60	17,456	17,2[1]
		13.—Strand.				
N. R.	1	St. Anne Soho - - - -	64	53	17,335	17,4[1]
N. R.	2	St. Mary-le-Strand - - -	48	67	11,615	10,3[1]
N. R.	3	St. Clement Danes *H* ‡ - -	36	52	15,467	15,2[1]
		14.—Holborn.				
N. R.	1	St. George-the-Martyr *H* -	66	103	18,813	19,9[1]
N. R.	2	St. Andrew Eastern *W* - -	50	33	13,971	12,9[1]
N. R.	3	Saffron Hill - - - -	40	60	13,837	12,0[1]
		15.—Clerkenwell.				
N. R.	1	St. James *W* - - - -	44	74	21,529	19,1[1]
N. R.	2	Amwell - - - - -	68	82	15,720	17,9[1]
N. R.	3	Pentonville - - - -	84	134	11,904	13,0[1]
N. R.	4	Goswell Street - - - -	78	90	15,625	16,9[1]

* The Small-pox and Fever Hospitals are situated in the sub-district of Islington West. Of 59 deaths from cholera in the London Fever Hospital 49, which were deaths of persons who did not belong to Islington West, have been referred to the several sub-districts from which the patients were brought.

† Thirty-seven deaths from cholera which occurred in the Shelton Temporary Hospital situated in St. Giles North have been referred to the several sub-districts from which the patients were brought.

nerated in 1851 and 1861; DEATHS and ANNUAL RATE OF MORTALITY from CHOLERA 3–4, and 1866—*continued.*

DEATHS FROM CHOLERA.				DEATHS FROM CHOLERA to every 10,000 Inhabitants.			SUB-DISTRICTS.
49.	From 1st July 1853 to 31st December 1854.	1866. Uncorrected	1866. Corrected	In the Year 1849.	From 1st July 1853 to 31st December 1854.	In the Year 1866.	
		For Deaths in Hospitals and Workhouses.					
.	9.	10.	11.	12.	13.	14.	15.
							NORTH DISTRICTS—*cont.*
							10.—ISLINGTON.
64	72	81	33	13	13	4	Islington West.
23	44	39	49	26	9	5	Islington East.
							11.—HACKNEY.
8	5	1	1	17	11	1	Stoke Newington.
13	9	2	2	23	17	4	Stamford Hill.
23	26	23	25	12	13	9	West Hackney.
75	41	45	48	30	19	13	Hackney.
20	10	32	35	24	12	17	South Hackney.
							CENTRAL DISTRICTS.
							12.—ST. GILES.
19	13	3	7	11	12	4	St. George Bloomsbury.
94	63	4	22	72	22	12	St. Giles South.
72	39	42	23	70	34	14	St. Giles North.
							13.—STRAND.
47	65	3	8	27	40	5	St. Anne Soho.
19	13	3	6	16	12	6	St. Mary-le-Strand.
90	34	23	12	58	12	8	St. Clement Danes.
							14.—HOLBORN.
20	8	7	8	25	4	4	St. George-the-Martyr.
10	12	10	12	41	9	10	St. Andrew Eastern.
31	8	5	9	42	6	8	Saffron Hill.
							15.—CLERKENWELL.
53	25	22	39	25	12	22	St. James.
17	17	7	15	11	11	9	Amwell.
29	11	8	8	25	9	6	Pentonville.
22	14	8	16	14	9	10	Goswell Street.

Of 19 deaths from cholera in King's College Hospital 11, which were deaths of persons who did not g to St. Clement Danes, have been referred to the several sub-districts from which the patients were ght.

LONDON SUB-DISTRICTS.—Water Supply; Elevation; Area; Population in the Three Epidemics of 18

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	Area in Statute Acres.	Population enumerated 1851.	Population enumerated 186
Col. 1.	2.	3.	4.	5.	6.	7.
		CENTRAL DISTRICTS—*cont.*				
		16.—St. Luke.				
N. R.	1	Old Street - - - -	60	52	10,617	11,5
N. R.	2	City Road *HL* - - -	52	77	16,840	17,8
N. R.	3	Whitecross Street - - -	52	33	13,657	14,7
N. R.	4	Finsbury - - - - -	43	58	12,941	12,9
		17.—East London.				
N.R. & E.L.	1	St. Botolph **CH** * - - -	36	85	23,824	20,9
N. R.	2	Cripplegate - - - -	44	68	20,582	19,6
		18.—West London.				
N. R.	1	West London North *WH* † -	36	47	12,946	11,7
N. R.	2	West London South - - -	24	91	15,887	15,3
		19.—London City.				
N. R.	1	London City South-west - -	21	67	9,204	7,7
N. R.	2	London City North-west - -	44	72	11,847	9,0
N. R.	3	London City South - - -	21	100	11,461	8,5
N. R.	4	London City South-east - -	21	103	10,594	8,6
N. R.	5	London City North-east - -	44	92	12,826	11,5
		EAST DISTRICTS.				
		20.—Shoreditch.				
N.R. & E.L.	1	Holywell - - - - -	36	68	17,245	17,3
N. R.	2	St. Leonard *L* ‡ - - -	41	75	19,449	19,1
N. R.	3	Hoxton New Town *w* - -	52	130	23,505	26,5
N. R.	4	Hoxton Old Town - - -	52	116	17,431	25,7
N. R.	5	Haggerstone West *W* - -	52	132	20,276	23,2
E. L.	6	Haggerstone East - - -	52	125	11,351	17,3
		21.—Bethnal Green.				
E. L.	1	Hackney Road - - - -	44	141	23,910	26,2
E. L.	2	Green *W* § *HL* ‡ - - -	36	391	23,555	31,7
E. L.	3	Church - - - - -	36	132	21,787	25,5
E. L.	4	Town - - - - -	36	96	20,941	21,4

* Of 25 deaths from cholera in the Temporary Cholera Hospital, New Street, 10, which were deat of persons who did not belong to St. Botolph have been referred to the several sub-districts from which the pa nts were brought.

† Of 44 deaths from cholera in St. Bartholomew's Hospital 40, which were deaths of persons who di not belong to West London North, have been referred to the several sub-districts from which the patients were br ht.

nerated in 1851 and 1861; DEATHS and ANNUAL RATE OF MORTALITY from CHOLERA –4, and 1866—*continued.*

DEATHS FROM CHOLERA.				DEATHS FROM CHOLERA to every 10,000 Inhabitants.			SUB-DISTRICTS.
9.	From 1st July 1853 to 31st December 1854.	1866. Uncorrected	1866. Corrected	In the Year 1849.	From 1st July 1853 to 31st December 1854.	In the Year 1866.	
		For Deaths in Hospitals and Workhouses.					
	9.	10.	11.	12.	13.	14.	15.
							CENTRAL DIST.—*cont.*
							16.—ST. LUKE.
13	9	4	8	12	9	7	Old Street.
56	13	6	9	33	8	5	City Road.
56	21	21	44	48	16	30	Whitecross Street.
48	12	15	25	37	10	20	Finsbury.
							17.—EAST LONDON.
01	49	46	36	42	19	19	St. Botolph.
81	41	13	16	47	23	9	Cripplegate.
							18.—WEST LONDON.
51	116	48	8	70	5	7	West London North.
58	17	12	13	118	12	9	West London South.
							19.—LONDON CITY.
07	15	4	5	107	18	7	London City South-west.
18	8	1	2	19	7	3	London City North-west.
31	19	5	6	25	18	8	London City South.
26	24	4	7	25	24	9	London City South-east.
35	10	6	6	30	8	6	London City North-east.
							EAST DISTRICTS.
							20.—SHOREDITCH.
23	59	14	18	144	41	10	Holywell.
02	94	30	31	116	57	16	St. Leonard.
25	36	33	38	42	8	14	Hoxton New Town.
36	22	18	20	23	14	7	Hoxton Old Town.
74	38	32	34	52	12	14	Haggerstone West.
29	17	12	13	28	15	7	Haggerstone East.
							21.—BETHNAL GREEN.
33	57	92	116	110	27	44	Hackney Road.
33	81	246	266	67	27	75	Green.
02	32	110	129	51	16	48	Church.
31	43	163	187	124	24	87	Town.

Lunatic asylums where paupers are received.

Of 48 deaths from cholera in the Union Workhouse 15, which were deaths of persons who did not belong Green sub-district, have been referred to the several sub-districts from which the patients were brought.

LONDON SUB-DISTRICTS.—Water Supply; Elevation; Area; Popula in the Three Epidemics of 1

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	Area in Statute Acres.	Population enumer 1851.	Population enumer 18
Col. 1.	2.	3.	4.	5.	6.	7.
		EAST DISTRICTS—*cont.*				
		22.—Whitechapel.				
E.L. & N.R.	1	Artillery - - - - -	36	25	6,769	6,8
E. L.	2	Spitalfields **CH** * - - -	36	53	15,336	15,7
E. L.	3	Mile End New Town *W* † -	36	64	14,543	15,8
E.L. & N.R.	4	Whitechapel North - - -	36	58	12,530	12,1
E. L.	5	Whitechapel Church *H* ‡ -	32	47	7,818	8,0
E. L.	6	Goodman's Fields - - -	28	51	12,069	11,1
N.R. & E.L.	7	Aldgate - - - - -	19	108	10,694	9,9
		23.—St. George-in-the-East.				
E. L.	1	St. Mary - - - - -	26	62	18,067	18,1
E. L.	2	St. Paul - - - - -	27	84	20,319	21,0
E. L.	3	St. John *W* § - - -	2	97	9,990	9,6
		24 *a*.—Stepney.				
E.L. & N.R.	1	Shadwell *W* **CH** ‖ - -	7	179	16,179	12,8
E. L.	2	Ratcliff *W* - - - -	18	132	15,212	16,8
E. L.	3	Limehouse *W* - - -	10	265	22,782	27,1
		24 *b*.—Mile End Old Town.				
E. L.	1	Mile End Old Town Western -	32	191	29,582	33,7
E. L.	2	Mile End Old Town Eastern *Ww*	28	490	27,020	39,3
		25.—Poplar.				
E. L.	1	Bow *wwL* ¶ ** - - -	12	1428	18,778	35,6
E. L.	2	Poplar *W* - - - -	3	1490	28,384	43,5
		SOUTH DISTRICTS.				
		26.—St. Saviour Southwark.				
L. S.	1	Christchurch *W* - - -	2	95	16,022	17,0
S.	2	St. Saviour *H* †† - - -	4	155	19,709	19,1

* Of 138 deaths from cholera in the Temporary Cholera Hospital, Spitalfields, 103, which were dea of persons who did not belong to the district of Whitechapel, have been distributed proportionally ove the adjoining districts of Stepney, St. George-in-the-East, Poplar, and Bethnal Green.

† Of 62 deaths from cholera in the Union Workhouse 47, which were deaths of persons who did not b to Mile End New Town, have been referred to the several sub-districts from which the patients were bro t.

‡ Of 319 deaths from cholera in the London Hospital, 235 were deaths of persons who did not belo to the district of Whitechapel in which the hospital is situated. In 41 of the 235 cases the deaths are re red to the several sub-districts in which the patients had resided. In 151 cases the district, but not the sub-district, from which the patient was brought has been stated, and in these the deaths are distributed ro-portionally over the sub-districts. In the remaining 43 deaths, in which neither districts nor sub-distric are named, the deaths are distributed proportionally over the adjoining sub-districts.

erated in 1851 and 1861 ; Deaths and Annual Rate of Mortality from Cholera -4, and 1866—*continued.*

Deaths from Cholera.				Deaths from Cholera to every 10,000 Inhabitants.			SUB-DISTRICTS.
9.	From 1st July 1853 to 31st December 1854.	1866. Uncorrected	1866. Corrected	In the Year 1849.	From 1st July 1853 to 31st December 1854.	In the Year 1866.	
		For Deaths in Hospitals and Workhouses.					
	9.	10.	11.	12.	13.	14.	15.
							EAST DISTRICTS—*cont.*
							22.—Whitechapel.
4	24	21	23	28	46	37	Artillery.
0	46	246	165	72	40	107	Spitalfields.
5	100	152	105	70	50	69	Mile End New Town.
4	52	43	54	50	25	47	Whitechapel North.
5	78	355	121	83	21	150	Whitechapel Church.
4	37	56	59	37	38	57	Goodman's Fields.
4	90	36	53	97	107	57	Aldgate.
							23.—St. George-in-the-East.
5	60	123	169	33	34	95	St. Mary.
5	82	104	133	45	41	64	St. Paul.
9	33	158	159	47	33	171	St. John.
							24 *a*.—Stepney.
8	91	143	146	79	69	138	Shadwell.
6	82	171	208	63	64	122	Ratcliff.
1	93	245	298	54	50	105	Limehouse.
							24 *b*.—Mile End Old Town.
0	39	189	194	27	16	56	Mile End Old Town Western.
6	131	312	319	22	26	70	Mile End Old Town Eastern.
							25.—Poplar.
3	81	414	441	68	44	93	Bow.
0	137	423	451	66	42	86	Poplar.
							SOUTH DISTRICTS.
							26.—St. Saviour Southwark.
6	127	6	6	144	75	3	Christchurch.
3	424	26	20	156	208	11	St. Saviour.

f 91 deaths from cholera in the Union Workhouse 29, which were deaths of persons who did not to St. John, have been referred to the several sub-districts from which the patients were brought.

f 46 deaths from cholera in the Temporary Cholera Hospital at Wapping, 30, which were deaths of s who did not belong to Shadwell, have been referred to the several sub-districts from which the patients brought.

Lunatic asylum where paupers are received.

Of 27 deaths from cholera in the City of London Workhouse 7, which were deaths of persons who did not to Bow, have been referred to the several sub-districts from which the patients were brought.

Of 25 deaths from cholera in Guy's Hospital, 15 were registered in St. Saviour's, and 10 in St. Olave strict. 17 deaths of persons who did not belong to St. Saviour's sub-district have been referred to the l sub-districts from which the patients were brought.

LONDON SUB-DISTRICTS.—WATER SUPPLY; ELEVATION; AREA; POPULATION in the THREE EPIDEMICS of 18

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	AREA in Statute Acres.	POPULATION ENUMERATED 1851.	POPULATION ENUMERATED 18
Col. 1.	2.	3.	4.	5.	6.	
		SOUTH DISTRICTS—*cont.*				
		27.—ST. OLAVE SOUTHWARK.				
S.	1	St. Olave *H** - - -	6	75	8,015	7,3
S.	2	St. John Horsleydown *W* -	2	94	11,360	11,3
		28.—BERMONDSEY.				
S.	1	St. James - - - -	−1	454	18,899	25,4
S.	2	St. Mary Magdalen *W* - -	0	142	13,934	16,5
S. & L.	3	Leather Market - - -	0	92	15,295	16,6
		29.—ST. GEORGE SOUTHWARK.				
S. & L.	1	Kent-road - - - -	−1	105	18,126	19,2
S. & L.	2	Borough-road *W* - - -	2	65	15,862	16,8
L. & S.	3	London-road *L* - - -	0	112	17,836	19,0
		30.—NEWINGTON.				
S. & L.	1	Trinity Newington - - -	−1	142	20,922	22,5
S. & L.	2	St. Peter Walworth *W* - -	−2	321	29,861	44,3
L. & S.	3	St. Mary *H* - - - -	−1	161	14,033	15,2
		31.—LAMBETH.				
L. & S.	1	Waterloo-road First - - -	3	91	14,088	15,9
L. & S.	2	Waterloo-road Second - -	2	142	18,348	18,0
L. & S.	3	Lambeth Church First - -	2	206	18,409	19,9
L. & S.	4	Lambeth Church Second *W*† -	1	186	26,784	29,2
S. & L.	5	Kennington First - - -	4	459	24,261	30,5
S. & L.	6	Kennington Second - - -	8	510	18,848	20,0
L. & S.	7	Brixton - - - - -	56	1445	14,610	20,7
L. & Wells.	8	Norwood *W* - - - -	128	976	3,977	7,2
		32.—WANDSWORTH.				
S. & Wells.	1	Clapham - - - - -	21	1233	16,290	20,4
S. & Wells.	2	Battersea *Ww* - - -	3	2343	10,560	19,0
S. & Wells.	3	Wandsworth *L* - - -	12	2478	9,611	13,6
S. & Wells.	4	Putney - - - - -	12	2176	5,280	6,1
L. & Wells.	5	Streatham - - - -	72	3465	9,023	10,2

* Of 25 deaths from cholera in Guy's Hospital, 15 were registered in St. Saviour's, and 10 in St. ave sub-district. 17 deaths of persons who did not belong to St. Saviour's sub-district have been referred the several sub-districts from which the patients were brought.

erated in 1851 and 1861 ; DEATHS and ANNUAL RATE OF MORTALITY from CHOLERA 4, and 1866—*continued.*

DEATHS FROM CHOLERA.			DEATHS FROM CHOLERA to every 10,000 Inhabitants.			SUB-DISTRICTS.
	1866.					
From 1st July 1853 to 31st December 1854.	Uncorrected	Corrected	In the Year 1849.	From 1st July 1853 to 31st December 1854.	In the Year 1866.	
	For Deaths in Hospitals and Workhouses.					
9.	10.	11.	12.	13.	14.	15.
						SOUTH DISTRICTS—*cont.*
						27.—ST. OLAVE SOUTHWARK.
183	15	4	196	163	5	St. Olave.
158	6	8	169	140	7	St. John Horsleydown.
						28.—BERMONDSEY.
388	19	21	142	201	7	St. James.
275	10	11	159	169	6	St. Mary Magdalen.
260	6	6	160	179	3	Leather Market.
						29.–ST. GEORGE SOUTHWARK.
219	7	9	158	142	4	Kent-road.
301	9	12	172	167	7	Borough-road.
105	22	22	155	71	11	London-road.
						30.—NEWINGTON.
224	7	9	160	115	4	Trinity Newington.
419	17	18	141	136	3	St. Peter Walworth.
98	2	2	108	74	1	St. Mary.
						31.—LAMBETH.
62	4	5	153	49	3	Waterloo-road First.
128	9	10	147	78	5	Waterloo-road Second.
63	28	35	130	39	17	Lambeth Church First.
215	46	37	163	63	12	Lambeth Church Second.
321	13	14	85	135	4	Kennington First.
148	5	5	90	81	2	Kennington Second.
56	6	6	55	39	3	Brixton.
10	3	3	5	27	3	Norwood.
						32.—WANDSWORTH.
178	4	4	75	109	2	Clapham.
181	22	22	92	152	8	Battersea.
66	10	11	107	70	7	Wandsworth.
9	1	1	15	18	1	Putney.
16	3	3	70	19	3	Streatham.

16 deaths from cholera in the Union Workhouse 9, which were deaths of persons who did not belong beth Church Second sub-district, have been referred to the several sub-districts from which the patients rought.

LONDON SUB-DISTRICTS.—Water Supply; Elevation; Area; Popula
in the Three Epidemics of 1

Initials of Water Companies.	SUB-DISTRICTS. No.	SUB-DISTRICTS. Name.	Elevation in Feet above Trinity High-water Mark.	Area in Statute Acres.	Population enumer 1851.	Population enumer 18
Col. 1.	2.	3.	4.	5.	6.	7
		SOUTH DISTRICTS—*cont.*				
		33.—Camberwell.				
L. S. & Wells.	1	Dulwich	68	1423	1,632	1,3
S. & L.	2	Camberwell *WL* L**	5	1339	17,742	21,7
S. L. K. & Wells.	3	Peckham	4	1146	19,444	28,5
L. & S.	4	St. George	−3	434	15,849	20,3
		34.—Rotherhithe.				
S. K. & Wells.	1	Rotherhithe *W*	0	886	17,805	24,2
		35.—Greenwich.				
K.	1	St. Paul Deptford	10	1609	24,899	37,4
K.	2	St. Nicholas Deptford	4	149	7,071	8,9
K.	3	Greenwich West *H*†	12	326	18,800	21,5
K.	4	Greenwich East *WH*	7	1687	16,228	18,3
K.	5	Woolwich Dockyard *H*	66	495	17,140	22,9
K.	6	Woolwich Arsenal *H*	66	1101	15,227	18,5
		36.—Lewisham.				
K.	1	Plumstead	79	5057	13,191	32,4
K. & Wells.	2	Eltham	167	4350	2,568	3,9
K.	3	Lee	44	2399	8,478	11,7
K. & Wells.	4	Lewisham Village *W*	16	3668	6,097	7,2
L.	5	Sydenham	188	1750	4,501	10,5

* Lunatic asylums where paupers are received.

† Twenty deaths of seamen from cholera which occurred on board Her Majesty's Ship "Belle Isle, m were registered in the Greenwich West sub-district, have been distributed proportionally over the s sub-districts of Greenwich.

Note.—The sub-districts of West Ham and Stratford—out of London—are in the waterfield of the London Company. The deaths registered in each of the years 1849 and 1866, respectively, were 4 219 in West Ham, and 64 and 158 in Stratford. The deaths in each sub-district to 10,000 of populati each of the years 1849 and 1866, respectively, were 58 and 53 in West Ham, and 66 and 80 in Stratfor

rated in 1851 and 1861 ; DEATHS and ANNUAL RATE OF MORTALITY from CHOLERA 4, and 1866—*continued.*

DEATHS FROM CHOLERA.			DEATHS FROM CHOLERA to every 10,000 Inhabitants.			SUB-DISTRICTS.
From 1st July 1853 to 31st December 1854.	1866. Uncorrected	1866. Corrected	In the Year 1849.	From 1st July 1853 to 31st December 1854.	In the Year 1866.	
	For Deaths in Hospitals and Workhouses.					
9.	10.	11.	12.	13.	14.	15.
						SOUTH DISTRICTS—*cont.*
						33.—CAMBERWELL.
—	—	—	6	—	—	Dulwich.
256	11	14	127	120	6	Camberwell.
187	20	20	47	101	6	Peckham.
138	15	15	117	94	7	St. George.
						34.—ROTHERHITHE.
308	25	27	198	171	9	Rotherhithe.
						35.—GREENWICH.
108	61	66	60	45	14	St. Paul Deptford.
128	69	75	50	206	86	St. Nicholas Deptford.
173	41	23	163	35	10	Greenwich West.
124	32	34	83	62	18	Greenwich East.
20	59	63	20	12	24	Woolwich Dockyard.
60	22	24	38	43	12	Woolwich Arsenal.
						36.—LEWISHAM.
23	43	43	11	16	9	Plumstead.
3	—	—	16	12	—	Eltham.
16	2	2	41	21	2	Lee.
31	6	6	53	41	8	Lewisham Village.
12	5	5	11	29	3	Sydenham.

TABLE 28.—LONDON SUB-DISTRICTS.—**Mortality** from **Cholera** in SUB-DISTRICTS, arranged in the order of **Elevation.**

Initials of Water Companies.	SUB-DISTRICTS.	Elevation in Feet above Trinity High-water Mark.	DEATHS from CHOLERA to every 10,000 Inhabitants.		
			1849.	1 July 1853 to 31 Dec. 1854.	1866.*
L. & S.	St. George Camberwell	− 3	117	94	7
S. & L.	St. Peter Walworth	− 2	141	136	3
S.	St. James Bermondsey	− 1	142	201	7
S. & L.	Kent-road	− 1	158	142	4
L. & S.	St. Mary Newington	− 1	108	74	1
S. & L.	Trinity Newington	− 1	160	115	4
S. & L.	Leather Market	0	160	179	3
S., K., & Wells	Rotherhithe	0	198	171	9
S.	St. Mary Magdalen	0	159	169	6
L. & S.	London-road	0	155	71	11
L. & S.	Lambeth Church 2nd	1	163	63	12
C.	St. John Westminster	2	62	63	7
S.	St. John Horsleydown	2	169	140	7
L. S.	Christchurch St. Saviour	2	144	75	3
E. L.	St. John St. George-in-the-East	2	47	33	171
S. & L.	Borough-road	2	172	167	7
L. & S.	Waterloo-road 2nd	2	147	78	5
L. & S.	Lambeth Church 1st	2	130	39	17
E. L.	Poplar	3	66	42	86
S. & Wells	Battersea	3	92	152	8
L. & S.	Waterloo-road 1st	3	153	49	3
S., L., K., & Wells	Peckham	4	47	101	6
K.	St. Nicholas Deptford	4	50	206	86
C.	St. Margaret Westminster	4	72	54	5
S. & L.	Kennington 1st	4	85	135	4
W. M. and Wells	St. Peter Hammersmith	4	18	83	12
S.	St. Saviour	4	156	208	11
S. & L.	Camberwell	5	127	120	6
W. M., C., & Wells	Fulham	6	51	59	5
S.	St. Olave	6	196	163	5
K.	Greenwich East	7	83	62	18
E. L. & N. R.	Shadwell	7	79	69	138
W. M., G. J., & Wells	St. Paul Hammersmith	8	25	80	11
S. & L.	Kennington 2nd	8	90	81	2
K.	St. Paul Deptford	10	60	45	14
C.	Chelsea South	10	59	76	6
E. L.	Limehouse	10	54	50	105
K.	Greenwich West	12	163	35	10
C.	Belgrave	12	28	49	1
C.	Chelsea North-west	12	46	38	2
W. M. & C.	Brompton	12	18	34	3
E. L.	Bow	12	68	44	93
S. & Wells	Wandsworth	12	107	70	7
S. & Wells	Putney	12	15	18	1
C.	Chelsea North-east	13	27	43	2
K. & Wells	Lewisham Village	16	53	41	8
N. R. & C.	Charing-cross	17	40	26	2
E. L.	Ratcliff	18	63	64	122
N. R. & E. L.	Aldgate	19	97	107	57
N. R.	London City South-west	21	107	18	7
N. R.	London City South	21	25	18	8
N. R.	London City South-east	21	25	24	9
S. & Wells	Clapham	21	75	109	2
N. R.	West London South	24	118	12	9
E. L.	St. Mary St. George-in-the-East	26	33	34	95
E. L.	St. Paul	27	45	41	64
E. L.	Goodman's Fields	28	37	38	57
W. M.	Kensington Town	28	33	49	2
E. L.	Mile End Old Town Eastern	28	22	26	70
E. L.	Mile End Old Town Western	32	27	16	56
E. L.	Whitechapel Church	32	83	21	150
N. R. & E. L.	St. Botolph	36	42	19	19
N. R.	St. Clement Danes	36	58	12	8
E. L. & N. R.	Artillery Whitechapel	36	28	46	37
E. L.	Town Bethnal Green	36	124	24	87
E. L.	Green Bethnal Green	36	67	27	75
E. L.	Church Bethnal Green	36	51	16	49
N. R. & E. L.	Holywell	36	144	41	10
N. R.	West London North	36	70	5	7
E. L. & N. R.	Whitechapel North	36	50	25	47
E. L.	Mile End New Town	36	70	50	69
E. L.	Spitalfields	36	72	40	107

Corrected for Deaths in Hospitals and Workhouses.

LONDON SUB-DISTRICTS.—MORTALITY from CHOLERA in SUB-DISTRICTS, arranged in the order of ELEVATION—*continued.*

Initials of Water Companies.	SUB-DISTRICTS.	Elevation in Feet above Trinity High-water Mark.	DEATHS from CHOLERA to every 10,000 Inhabitants.		
			1849.	1 July 1853 to 31 Dec. 1854.	1866.
N. R.	Saffron-hill	40	42	6	8
G. J.	St. James's-square	40	15	20	5
N. R.	St. Leonard	41	116	57	16
N. R.	Finsbury	43	37	10	20
N. R.	Cripplegate	44	47	23	9
K.	Lee	44	41	21	2
N. R.	St. James Clerkenwell	44	25	12	22
E. L. & N. R.	Hackney	44	30	19	13
N. R.	London City, North-east	44	30	8	6
N. R.	London City, North-west	44	19	7	3
E. L.	Hackney-road	44	110	27	44
E. L.	South Hackney	44	24	12	17
N. R.	St. Mary-le-Strand	48	16	12	6
N. R.	St. Andrew Eastern	50	41	9	10
N. R.	City-road	52	33	8	5
N. R.	Whitecross-street	52	48	16	30
N. R.	Hoxton New Town	52	42	8	14
E. L.	Haggerstone East	52	28	15	7
N. R.	Gray's-inn-lane	52	39	6	5
N. R.	Haggerstone West	52	52	12	14
N. R.	Hoxton Old Town	52	23	14	7
N. R.	West Hackney	55	12	13	9
L. & S.	Brixton	56	55	39	3
G. J.	May Fair	56	7	12	2
N. R.	Old-street	60	12	9	7
N. R.	Somers-town	60	16	11	10
N. R.	Long Acre	60	34	16	7
N. R.	Camden Town	62	21	7	7
N. R.	St. Giles South	64	72	22	12
G. J.	Hanover-square	64	6	12	2
N. R.	St. Anne Soho	64	27	40	5
N. R.	Berwick-street	65	20	211	8
N. R.	St. George-the-Martyr	66	25	4	4
K.	Woolwich Dockyard	66	20	12	24
K.	Woolwich Arsenal	66	38	43	12
N. R.	Amwell	68	11	11	9
L., S., & Wells	Dulwich	68	6	..	..
G. J.	Golden-square	68	13	197	4
N. R.	St. Giles North	68	70	34	14
G. J. & W. M.	Rectory (Marylebone)	68	16	25	4
N. R.	St. George Bloomsbury	71	11	12	4
N. R.	Stoke Newington	72	17	11	1
L. & Wells.	Streatham	72	70	19	3
N. R. & W. M.	Tottenham-court	73	21	17	6
W. M.	Cavendish-square	73	14	10	1
W. M.	All Souls (Marylebone)	76	31	13	2
G. J.	St. John Paddington	76	8	26	3
E. L.	Stamford-hill	76	23	17	4
N. R.	Goswell-street	78	14	9	10
G. J. & W. M.	St. Mary (Marylebone)	79	10	25	1
K.	Plumstead	79	11	16	9
G. J. & W. M.	St. Mary Paddington	82	7	2	2
N. R.	Pentonville	84	25	9	6
W. M.	Regent's-park	87	20	10	6
N. R.	Islington East	88	26	9	5
W. M.	Christchurch Marylebone	92	13	18	4
N. R.	Islington West	100	13	13	4
N. R.	Kentish Town	110	12	9	3
W. M.	St. John Marylebone	124	13	13	4
L. & Wells.	Norwood	128	5	27	3
K. & Wells.	Eltham	167	16	12	..
L.	Sydenham	188	11	29	3
N. R. & W. M.	Hampstead	350	7	13	1

TABLE **29.—Mortality** of **Cholera** in Eleven Groups of LONDON Sub-districts at different Elevations.

Elevation of Sub-districts (x).	e_x (1866).	$c_x\ p_x$ (in 1866).	Area in Acres.	p_x = Population.			C_x = Deaths from Cholera.			$\frac{10{,}000\ m_x}{p_x} = \frac{C_x}{p_x}10{,}000.$		
				1849.	1854.	1866.	1849.	1853½ to 1854.	1866.	1849.	1853½ to 1854.	1866.
(Feet).												
Under 0	−2	−264,000	1,617	112,573	126,923	165,112	1,599	1,486	74	142	117	4
0−10 -	3	1,918,000	16,812	463,870	502,942	594,580	5,361	4,892	1,226	116	97	21
10−20 -	12	4,418,000	14,596	244,520	277,170	360,817	1,462	1,381	1,147	60	50	32
20−30 -	26	5,784,000	3,525	164,284	180,783	221,045	793	720	730	48	40	33
30−40 -	35	8,406,000	1,309	219,887	228,088	236,839	1,679	753	1,318	* 76	33	* 56
40−50 -	43	9,255,000	5,394	195,594	202,920	213,790	865	355	340	44	17	16
50−60 -	53	12,417,000	2,854	183,887	201,005	235,380	823	333	217	45	17	9
60−70 -	65	18,730,000	4,469	272,585	282,382	289,100	735	956	255	27	† 34	9
70−80 -	80	19,375,000	10,916	182,880	199,968	241,761	418	455	111	23	23	5
80−90 -	85	17,791,000	3,255	99,619	124,487	208,347	228	113	93	23	9	4
90 and upwards	134	36,209,000	13,250	146,936	177,632	271,220	174	217	85	13	12	3

* Upon referring to Table 31 it will be seen that nearly all the sub-districts at this elevation were supplied from the River Lea—by the East London Company. The water was near the Lea; all the Old Ford reservoirs were then in use. *See* Report of General Board of Health on Water Supply of London, App. I., p. 13.

† Exclusive of the Berwick-street and Golden-square sub-districts, where the mortality was raised by the explosion around the region of the Broad-street pump; the mortality at the elevation (60−70) was 28, 19, and 8 in the three epidemics. The sub-districts of the terrace above, also supplied by the Grand Junction Company, experienced a high rate of mortality.

TABLE **30.—Deaths** from **Asiatic Cholera** in several Stages of the DISEASE.

TERM OF DISEASE.	MALES.				FEMALES.			
	Attacked and surviving.	To die.	Dying.	Recovered or to recover.	Attacked and surviving.	To die.	Dying.	Recovered or to recover.
0 hours	8910	4335	61	4575	9593	4602	36	4991
6 „	8849	4274	582	4575	9557	4566	497	4991
12 „	8267	3692	924	4575	9060	4069	1031	4991
18 „	7343	2768	387	4575	8029	3038	463	4991
1 day	6956	2381	800	4575	7566	2575	888	4991
2 „	6156	1581	408	4575	6678	1687	411	4991
3 „	5748	1173	343	4575	6267	1276	312	4991
4 „	5405	830	232	4575	5955	964	269	4991
5 „	5173	598	153	4575	5686	695	167	4991
6 „	5020	445	106	4575	5519	528	133	4991
7 „	4914	339	135	4575	5386	395	173	4991
8 „	4779	204	56	4575	5213	222	48	4991
9 „	4723	148	25	4575	5165	174	32	4991
10 „	4698	123	62	4575	5133	142	63	4991
14 „	4636	61	38	4575	5070	79	58	4991
21 „	4598	23	16	4575	5012	21	16	4991
28 „	4582	7	5	4575	4996	5	3	4991
35 „	4577	2	2	4575	4993	2	2	4991

Note.—Out of 1932 attacks of males and 1703 of females, 940 men and 817 women died. (*See* Report on Cholera by Scientific Committee, page 91.)

The numbers attacked as given in this Table have been deduced by applying these proportions to the 4335 deaths of males and the 4602 deaths of females: thus, 940 : 1932 :: 4335 : x = 8910.

The Table may be read thus: Of 8910 men attacked by cholera 4335 will die; viz., 61 in the first six hours, leaving 8849 alive, of whom 4274 will die and 4575 will recover.

From the above Table the mean duration of fatal cases of cholera is deduced: the mean duration of fatal cases in males was 2·51 days or 60·2 hours, in females 2·61 days or 62·6 hours.

The duration of 2660 cases among men and 2781 among women was not stated in the Register Books.

ABLE **31.**—LONDON SUB-DISTRICTS. **Population,** and **Deaths** from **Cholera** in the Year **1866,** in the SUB-DISTRICTS of LONDON, arranged according to their **Elevation** and **Water Supply.** (*The Estimated Population of* 1866 *is deduced from the ratio between* 1841 *and* 1861: *it must be considered only approximative.*)

Water Company.	SUB-DISTRICT.	Elevation in Feet above Trinity High-water Mark.	Enumerated Population.		Estimated Population.	Deaths registered from Cholera in the Year 1866.	Deaths from Cholera to every 10,000 Inhabitants.
			1851.	1861.	1866.		
	Grand Junction, West Middlesex, and Chelsea Companies.						
helsea - -	St. John Westminster - - -	2	34,295	37,483	37,538	26	7
		Under 3	34,295	37,483	37,538	26	7
V. Mid. & Wells	St. Peter Hammersmith - -	4	4,467	5,415	5,739	7	12
helsea - -	St. Margaret Westminster - -	4	31,314	30,730	30,730	16	5
.Mid.,C.,&Wells	Fulham - - - - - -	6	11,886	15,539	17,102	9	5
.M.,G.J.,&Wells	St. Paul Hammersmith - - -	8	13,293	19,104	22,044	25	11
		3–10	60,960	70,788	75,615	57	8
helsea - -	Chelsea South - - - - -	10	19,050	21,654	22,659	13	6
Ditto - -	Chelsea North-west - - -	12	17,669	19,899	20,725	5	2
V. Mid. & Chel.	Brompton - - - - -	12	14,870	18,198	19,378	6	3
helsea - -	Belgrave - - - - - -	12	40,034	55,113	62,666	9	1
Ditto - -	Chelsea North-east - - - -	13	19,819	21,886	22,573	5	2
lew Riv. & Chel.	Charing Cross - - - - -	17	12,587	11,071	10,183	2	2
		10–20	124,029	147,821	158,184	40	3
Vest Middlesex	Kensington Town - - - -	28	29,183	51,910	66,641	15	2
		20–40	29,183	51,910	66,641	15	2
rand Junction	St. James's-square - - - -	40	11,469	10,753	10,217	5	5
Ditto - -	May Fair - - - - - -	56	12,980	12,885	12,487	2	2
		40–60	24,449	23,638	22,704	7	3
rand Junction	Hanover-square - - - -	64	20,216	19,773	19,162	3	2
Ditto - -	Golden-square - - - -	68	14,139	13,966	13,622	5	4
. Jun. & W.Mid.	Rectory, Marylebone - - -	68	27,633	26,692	26,692	10	4
Vest Middlesex	Cavendish-square - - - -	73	14,687	15,090	14,691	1	1
. Riv. & W. Mid.	Tottenham-court - - - -	73	28,433	29,371	28,649	17	6
Vest Middlesex	All Souls Marylebone - - -	76	28,841	29,952	29,317	6	2
rand Junction	St. John Paddington - - -	76	29,053	36,769	39,815	12	3
.Jun. & W. Mid.	St. Mary Marylebone - - -	79	22,814	22,493	22,493	3	1
		60–80	185,816	194,106	194,441	57	3
. Jun. & W. Mid.	St. Mary Paddington - - -	82	17,252	39,015	56,474	13	2
Vest Middlesex	Regent's Park Pancras - - -	87	31,918	34,927	37,447	23	6
Ditto - -	Christchurch Marylebone - -	92	33,895	34,913	34,033	12	4
Ditto - -	St. John Marylebone - - -	124	29,826	32,540	32,645	14	4
. Riv. & W.Mid.	Hampstead - - - - -	350	11,986	19,106	23,557	2	1
		80 & upwds.	124,877	160,501	184,156	64	3
	New River Company.						
N.Riv. & E.Lond.	Aldgate - - - - - -	19	10,694	9,971	9,350	53	57
		10–20	10,694	9,971	9,350	53	57
New River -	London City South-west - -	21	9,204	7,762	6,880	5	7
Ditto - -	London City South - - -	21	11,461	8,570	7,153	6	8
Ditto - -	London City South-east - -	21	10,594	8,659	7,556	7	9
Ditto - -	West London South - - -	24	15,887	15,395	14,642	13	9
Ditto - -	West London North - - -	36	12,946	11,750	10,828	8	7
N.Riv. & E.Lond.	St. Botolph East London - -	36	23,824	20,990	19,040	36	19
Ditto - -	Holywell Shoreditch - - -	36	17,245	17,313	17,318	18	10
New River -	St. Clement Danes Strand - -	36	15,467	15,207	14,568	12	8
		20–40	116,628	105,646	97,985	105	11

LONDON SUB-DISTRICTS. POPULATION, and DEATHS from CHOLERA in the Year 1866, in the SUB-DISTRICTS of LONDON, arranged according to their ELEVATION and WATER SUPPLY—*continued.*

Water Company.	SUB-DISTRICT.	Elevation in Feet above Trinity High-water Mark.	Enumerated Population. 1851.	Enumerated Population. 1861.	Estimated Population. 1866.	Deaths registered from Cholera in the Year 1866.	Deaths from Cholera to every 10,000 Inhabitants.
New River	Saffron-hill	40	13,837	12,012	10,793	9	8
Ditto	St. Leonard Shoreditch	41	19,449	19,188	19,025	31	16
Ditto	Finsbury	43	12,941	12,931	12,495	25	20
Ditto	Cripplegate	44	20,582	19,697	18,621	16	9
Ditto	London City North-west	44	11,847	9,020	7,597	2	3
Ditto	London City North-east	44	12,826	11,544	10,570	6	6
Ditto	St. James Clerkenwell	44	21,529	19,152	17,415	39	22
Ditto	St. Mary-le-Strand	48	11,615	10,346	9,434	6	6
Ditto	St. Andrew East, Holborn	50	13,971	12,947	12,020	12	10
Ditto	Gray's Inn-lane	52	26,523	27,808	27,707	14	5
Ditto	City-road	52	16,840	17,860	17,780	9	5
Ditto	Whitecross-street	52	13,657	14,778	14,860	44	30
Ditto	Hoxton New Town	52	23,505	26,516	27,363	38	14
Ditto	Hoxton Old Town	52	17,431	25,777	29,041	20	7
Ditto	Haggerstone West	52	20,276	23,260	24,013	34	14
Ditto	West Hackney	55	18,732	24,265	26,662	25	9
		40–60	275,561	287,101	285,396	330	12
New River	Long-acre	60	12,053	11,618	11,187		7
Ditto	Somers-town	60	35,641	39,099	37,000	36	10
Ditto	Old-street, St. Luke's	60	10,617	11,504	11,575	8	7
Ditto	Camden Town	62	21,115	23,266	21,466	14	7
Ditto	St. Anne Soho	64	17,335	17,426	16,881	8	5
Ditto	St. Giles South	64	19,951	19,483	18,614	22	12
Ditto	Berwick-street	65	10,798	10,607	10,316	8	8
Ditto	St. George-the-Martyr Holborn	66	18,813	19,903	19,743	8	4
Ditto	Amwell Clerkenwell	68	15,720	17,250	17,421	15	9
Ditto	St. Giles North	68	17,456	17,201	16,508	23	14
Ditto	St. George Bloomsbury	71	16,807	17,392	17,104	7	4
Ditto	Stoke Newington	72	4,840	6,608	7,454	1	1
Ditto	Goswell-street	78	15,625	16,200	15,904	16	10
		60–80	216,771	227,557	221,173	174	8
New River	Pentonville	84	11,904	13,079	13,217	8	6
Ditto	Islington East	88	47,448	79,899	101,209	49	5
Ditto	Islington West	100	47,881	75,442	92,439	33	4
Ditto	Kentish-town	110	23,326	44,317	59,556	16	3
		80 & upwds.	130,559	212,737	266,421	106	4
	East London Company.						
East London	St. John St. George-in-the-East	2	9,990	9,695	9,282	159	171
		Under 3	9,990	9,695	9,282	159	171
Ditto	Poplar	3	28,384	43,529	52,180	451	86
E.Lond. & N.Riv.	Shadwell	7	16,179	12,537	10,608	146	138
		3–10	44,563	56,066	62,788	597	95
East London	Limehouse	10	22,782	27,161	28,507	298	105
Ditto	Bow	12	18,778	35,667	47,582	441	93
Ditto	Ratcliff	18	15,212	16,874	17,083	208	122
		10–20	56,772	79,702	93,172	947	102
Ditto	St. Mary St. George-in-the-East	26	18,067	18,181	17,726	169	95
Ditto	St. Paul St. George-in-the-East	27	20,319	21,015	20,771	133	64
Ditto	Mile End Old Town East	28	27,020	39,317	45,850	319	70
Ditto	Goodmans Fields	28	12,069	11,166	10,431	59	57
Ditto	Whitechapel Church	32	7,818	8,062	8,062	121	150
Ditto	Mile End Old Town West	32	29,582	33,747	34,845	194	56
E.Lond. & N.Riv.	Whitechapel North	36	12,530	12,122	11,500	54	47
East London	Mile End New Town	36	14,543	15,392	15,303	105	69
Ditto	Spitalfields	36	15,336	15,700	15,500	165	107
E.Lond. & N.Riv.	Artillery Whitechapel	36	6,769	6,557	6,240	23	37
East London	Town, Bethnal Green	36	20,941	21,486	21,573	187	87
Ditto	Church, Bethnal Green	36	21,787	25,528	26,605	129	48
Ditto	Green, Bethnal Green	36	23,555	31,789	35,457	266	75
		20–40	230,336	260,062	269,863	1,924	71

LONDON SUB-DISTRICTS. POPULATION, and DEATHS from CHOLERA in the Year 1866, in the SUB-DISTRICTS of LONDON, arranged according to their ELEVATION and WATER SUPPLY—*continued.*

Water Company.	SUB-DISTRICT.	Elevation in Feet above Trinity High-water Mark.	ENUMERATED POPULATION. 1851.	1861.	ESTIMATED POPULATION. 1866.	DEATHS registered from CHOLERA in the Year 1866.	DEATHS from CHOLERA to every 10,000 Inhabitants.
E.Lond.& N.Riv.	Hackney	44	20,850	31,481	37,346	48	13
East London	South Hackney	44	8,458	15,458	20,175	35	17
Ditto	Hackney-road	44	23,910	26,298	26,654	116	44
Ditto	Haggerstone East	52	11,351	17,310	20,076	13	7
		40—60	64,569	90,547	104,251	212	20
Ditto	Stamford Hill	76	5,549	5,483	5,483	2	4
		60—80	5,549	5,483	5,483	2	4
	Southwark and Lambeth Companies.						
Lamb. & Southk.	St. George Camberwell	−3	15,849	20,333	22,986	15	7
Southk. & Lamb.	St. Peter Walworth	−2	29,861	44,463	53,782	18	3
Lamb. & Southk.	St. Mary Newington	−1	14,033	15,082	15,499	2	1
Southk. & Lamb.	Trinity Newington	−1	20,922	22,675	23,399	9	4
Ditto	Kent Road	−1	18,126	19,652	20,479	9	4
Southwark	St. James Bermondsey	−1	18,899	25,154	28,967	21	7
Ditto	St. Mary Magdalen Bermondsey	0	13,934	16,505	17,930	11	6
Southk. & Lamb.	Leather Market	0	15,295	16,696	17,413	6	3
Lamb. & Southk.	London Road	0	17,836	19,190	19,920	22	11
Sthk., K., & Wells	Rotherhithe	0	17,805	24,502	28,767	27	9
Lamb. & Southk.	Lambeth Church 2nd Part	1	26,784	29,542	30,831	37	12
Ditto	Lambeth Church 1st Part	2	18,409	19,839	20,466	35	17
Ditto	Waterloo Road 2nd Part	2	18,348	18,640	18,670	10	5
Ditto	Christchurch Southwark	2	16,022	17,069	18,106	6	3
Southk. & Lamb.	Borough Road	2	15,862	16,668	17,099	12	7
Southwark	St. John Horsleydown	2	11,360	11,393	11,421	8	7
		Under 3	289,345	337,403	365,735	248	7
Lamb. & Southk.	Waterloo Road 1st Part	3	14,088	15,269	15,797	5	3
Southk. & Wells	Battersea	3	10,560	19,600	26,400	22	8
Southwark	St. Saviour Southwark	4	19,709	19,101	18,316	20	11
Southk. & Lamb.	Kennington 1st Part	4	24,261	30,785	34,460	14	4
S. L. K. & Wells	Peckham	4	19,444	28,135	33,777	20	6
Southk.& Lamb.	Camberwell	5	17,742	21,297	23,288	14	6
Southwark	St. Olave Southwark	6	8,015	7,663	7,493	4	5
Southk.& Lamb.	Kennington 2nd Part	8	18,848	20,440	21,152	5	2
		3—10	132,667	162,290	180,683	104	6
Southk. & Wells	Wandsworth	12	9,611	13,346	15,549	11	7
Ditto	Putney	12	5,280	6,481	7,099	1	1
		10—20	14,891	19,827	22,648	12	5
Southk. & Wells	Clapham	21	16,290	20,894	23,395	4	2
		20—40	16,290	20,894	23,395	4	2
Lamb. & Southk.	Brixton	56	14,610	20,067	23,371	6	3
		40—60	14,610	20,067	23,371	6	3
Lmb.,Stk.,&Wells	Dulwich	68	1,632	1,723	1,767	—	—
Ditto	Streatham	72	9,023	10,082	10,536	3	3
		60—80	10,655	11,805	12,303	3	3
Lamb. & Wells	Norwood	128	3,977	7,462	10,157	3	3
Lambeth	Sydenham	188	4,501	10,595	15,689	5	3
		80 & upwds.	8,478	18,057	25,846	8	3
	Kent Company.						
Kent	St. Nicholas Deptford	4	7,071	8,139	8,694	75	86
Ditto	Greenwich East	7	16,228	18,306	19,357	34	18
		3—10	23,299	26,445	28,051	109	39

LONDON SUB-DISTRICTS. POPULATION, and DEATHS from CHOLERA in the Year 1866, in the SUB-DISTRICTS of LONDON, arranged according to their ELEVATION and WATER SUPPLY—*continued.*

Water Company.	SUB-DISTRICT.	Elevation in Feet above Trinity High-water Mark.	ENUMERATED POPULATION. 1851.	1861.	ESTIMATED POPULATION. 1866.	DEATHS registered from CHOLERA in the Year 1866.	DEATHS from CHOLERA to every 10,000 Inhabitants.
Kent	St. Paul, Deptford	10	24,899	37,834	46,433	66	14
Ditto	Greenwich West	12	18,800	21,696	23,206	23	10
Kent & Wells	Lewisham Village	16	6,097	7,372	7,824	6	8
		10–20	49,796	66,902	77,463	95	12
Kent	Lee	44	8,478	11,807	13,448	2	2
		40–60	8,478	11,807	13,448	2	2
Kent	Woolwich Dockyard	66	17,140	22,919	26,387	63	24
Ditto	Woolwich Arsenal	66	15,227	18,776	20,759	24	12
Ditto	Plumstead and Charlton	79	13,191	32,974	50,315	43	9
		60–80	45,558	74,669	97,461	130	13
Kent & Wells	Eltham	167	2,568	3,009	3,144	—	—
		80 & upwds.	2,568	3,009	3,144	—	—

TABLE **32.**—LONDON. **Mortality** from **Cholera** in **Sub-districts** in 1849 and 1853½-54, grouped according to their **Elevation** and **Water Supply.** (*Reprinted from Registrar General's Seventeenth Annual Report, Appendix, p.* 97.)

Signature of Water Companies.	Name of Company and Source of Supply.	Years	80 feet and upwards.	60 to 80 feet.	40 to 60 feet.	20 to 40 feet.	10 to 20 feet.	3 to 10 feet.	Under 3 feet.
			MORTALITY by CHOLERA to every 10,000 Inhabitants.						
N.	NEW RIVER (*Springs, Artesian Wells, and River Lea.*)	1849	(4)* 18	(14)* 25	(17) 42	(8) 72	(2) 73	—	—
		1854	11	30	14	19	67	—	—
H.	HAMPSTEAD (*Springs, Artesian Wells, and New River.*)	1849	(2) 16	(1) 26	—	—	—	—	—
		1854	10	7	—	—	—	—	—
E.	EAST LONDON (*River Lea at Lea Bridge.*)	1849	—	(1) 23	(4) 46	(15) 60	(4) 67	(2) 75	(1) 59
		1854	—	17	18	31	66	56	33
J.	GRAND JUNCTION (*Thames, 360 yards above Kew Bridge.*)	1849	(1) 7	(5) 14	(2) 14	—	—	(2) 22	—
		1854	2	57	16	—	—	82	—
W.	WEST MIDDLESEX (*Thames, at Barnes, 1¼ miles above Hammersmith Bridge.*)	1849	(5) 11	(5) 20	—	(1) 33	(1) 18	(3) 31	—
		1854	11	18	—	49	34	74	—
C.	CHELSEA (*Thames at Battersea.*)	1849	—	—	—	—	(6) 38	(1) 72	(1) 62
		1854	—	—	—	—	44	54	63
S.	SOUTHWARK (*Thames at Battersea.*)	1849	—	—	—	(1) 70	(2) 58	(3) 148	(4) 171
		1854	—	—	—	109	44	174	170
L.	LAMBETH (*Thames at Thames Ditton, 3 miles beyond the influence of the tide.*)	1849	(2) 8	(1) 171	—	—	—	—	—
		1854	28	19	—	—	—	—	—
S. & L.	SOUTHWARK AND LAMBETH (*Thames at Battersea; and Thames at Thames Ditton, 8 miles beyond the influence of the tide.*)	1849	—	—	(1) 55	—	—	(5) 95	(12) 147
		1854	—	—	39	—	—	97	103
K. & S.	KENT AND SOUTHWARK (*Ravensbourne, below Lewisham Mills; and Thames at Battersea.*)	1849	—	—	(1) 41	—	(2) 112	(2) 67	—
		1854	—	—	21	—	40	134	—
Wells	Wells, Pumps, and other Sources	1849	—	(1) 6	—	—	(1) 62	—	—
		1854	—	—	—	—	41	—	—

* The small figures of this Table represent the number of sub-districts at each elevation supplied by the respective Companies.

The Table may be read thus:—The *New River Company* supplied 14 sub-districts on an average elevation ranging from 60 to 80 feet above high-water mark, and in those sub-districts the mortality by cholera in 1849 was on an average 25 in 10,000 inhabitants; in 1854, 30 in 10,000 inhabitants. At the lower elevation of 40 to 60 feet the mortality by cholera in 17 sub-districts was 42 in 1849, and 14 in 1854, in every 10,000 inhabitants.

TABLE 33.—AREA, ENUMERATED POPULATION 1851 and 1861, NUMBER of DEATHS REGISTERED from Cholera and Diarrhœa in 1849, 1853-4, and 1866, MORTALITY from Cholera and Diarrhœa per 10,000 of POPULATION in 1849, 1853-4, and 1866, ANNUAL RATE of INCREASE per CENT. of POPULATION 1851-61, DENSITY of POPULATION in 1866, and ELEVATION in FEET above TRINITY HIGH-WATER MARK, in the FIELDS of the DIFFERENT LONDON WATER COMPANIES. (*See also Table* 31.)

WATER COMPANY.	Area in Statute Acres.	Enumerated Population.		Number of Deaths registered from									Mortality to 10,000 Persons living from									Annual Rate of Increase per Cent. of Population, 1851-61.	Density of Population in 1866.	Elevation.
				Cholera.			Diarrhœa.			Cholera and Diarrhœa.			Cholera.			Diarrhœa.			Cholera and Diarrhœa.				Persons to an Acre.	Number of Feet above Trinity High-water Mark of the Thames.
		1851.	1861.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866. (corrected)	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866. (corrected)	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.			
Chelsea	2,362	162,181	186,765	789	1,002	74	250	304	153	1,039	1,306	227	50·0	59·2	3·7	15·9	18·0	7·6	65·9	77·2	11·3	1·42	84·8	8
Grand Junction	2,414	117,040	146,056	184	578	42	114	139	138	298	717	180	16·4	46·2	2·6	10·2	11·1	8·5	26·6	57·3	11·1	2·24	67·6	5
West Middlesex	1,915	143,634	152,837	224	312	63	189	197	175	413	509	238	15·8	21·3	4·0	13·3	13·5	11·1	29·1	34·8	15·1	·62	82·3	90
Chelsea and West Middlesex	2,532	26,756	33,737	87	153	15	37	41	45	124	194	60	34·1	53·3	4·0	14·5	14·3	11·9	48·6	67·6	15·9	2·34	15·0	9
Grand Junction and West Middlesex	3,137	80,992	107,304	154	272	51	114	125	140	268	397	191	20·1	30·9	4·1	14·9	14·2	11·3	35·0	45·1	15·4	2·85	39·4	64
Chelsea and New River	263	12,587	11,071	60	41	2	15	11	6	75	52	8	47·7	32·6	1·8	11·9	8·5	5·4	59·6	41·1	7·2	—	42·1	17
West Middlesex and New River	2,397	40,419	48,477	69	105	19	46	52	30	115	157	49	17·7	24·6	3·6	11·8	12·2	5·7	29·5	36·8	9·3	1·83	22·1	180
New River	8,755	698,450	794,738	2,664	1,323	661	985	1,043	846	3,649	2,366	1,507	39·1	18·2	7·8	14·5	14·4	10·0	53·6	32·6	17·8	1·30	96·8	64
New River and East London	2,254	108,091	110,971	759	406	378	230	208	122	989	614	500	70·6	37·3	33·6	21·4	19·1	10·9	92·0	56·4	44·5	·26	49·9	33
East London	6,426	355,451	438,858	2,010	1,248	3,570	613	648	763	2,623	1,896	4,333	59·0	33·0	73·2	18·0	17·1	15·7	77·0	50·1	88·9	2·13	75·9	27
Lambeth	7,614	19,133	29,862	162	38	11	17	24	17	179	62	28	92·5	17·4	2·9	9·7	11·0	4·6	102·2	28·4	7·5	4·54	4·9	127
Southwark	9,150	113,658	140,137	1,470	1,862	102	273	305	150	1,743	2,167	252	134·9	153·9	6·6	25·0	25·2	9·6	159·9	179·1	16·2	2·11	17·0	6
Kent	21,727	147,504	207,334	1,161	994	363	299	325	169	1,460	1,319	532	84·2	60·9	14·8	21·7	19·9	6·9	105·9	80·8	21·7	3·46	11·3	39
Lambeth and Southwark	5,905	316,896	367,707	4,252	3,140	225	696	713	363	4,948	3,853	588	138·2	94·8	5·7	22·6	21·5	9·2	160·8	116·3	14·9	1·50	67·1	5
Southwark, Lambeth, and Kent	1,146	19,444	28,135	92	187	20	21	39	30	113	226	50	50·9	86·1	5·9	11·6	18·0	8·9	62·5	104·1	14·8	3·76	29·5	4

The table may be read thus:—The districts supplied with water by the East London Company extend over an area of 6,426 acres, having a population, in 1861, of 438,858. The number of deaths registered in these districts, in each of the epidemics 1849, 1853-4, and 1866, was, from cholera, 2,010, 1,248, and 3,570 respectively; from diarrhœa 613, 648, and 763 respectively; and from cholera and diarrhœa 2,623, 1,896, and 4,333 respectively. In proportion to 10,000 of population, the mortality in each of the epidemics 1849, 1853-4, and 1866 was, from cholera, 59·0, 33·0, and 73·2; from diarrhœa 18·0, 17·1, and 15·7; and from cholera and diarrhœa 77·0, 50·1, and 88·9. The population of these districts increased between the censuses of 1851 and 1861 at the rate of 2·13 per cent. per annum. Their density of population, in 1866, was 76 persons to an acre; and their mean elevation above Trinity high-water mark of the Thames was 27 feet. The mortality from Cholera in 1866 has been corrected for deaths in hospitals and workhouses.

* CHOLERA AND DIARRHŒA IN 1853-4. The numbers in the above columns, relating to what is usually known as the "epidemic of 1854," extend over 18 months, from 1 July 1853 to 31 Dec. 1854. As in several months of every year much diarrhœa prevails, which cannot be identified with the more important epidemic, a third part of the total deaths from *diarrhœa* in 1853-4 may be taken to represent the mortality from the common complaint, and is therefore deducted in this Table.

LONDON.

TABLE 34.—AREA, ENUMERATED POPULATION **1851** and **1861**, NUMBER of DEATHS REGISTERED from **Cholera** and **Diarrhœa** in **1849, 1853–4,** and **1866**, MORTALITY from **Cholera** and **Diarrhœa** per **10,000** of POPULATION in **1849, 1853–4,** and **1866**, ANNUAL RATE of INCREASE PER CENT. of POPULATION **1851–61**, DENSITY of POPULATION in **1866**, and ELEVATION in FEET above TRINITY HIGH-WATER MARK, in the FIELDS of the DIFFERENT LONDON WATER COMPANIES. (*Derived from Table* 33., *except that the Sub-districts of West Ham and Stratford have been added to the London Sub-districts supplied by the East London Company. See also Table* 31.)

GROUPS OF SUB-DISTRICTS SUPPLIED BY THE SEVERAL WATER COMPANIES, NAMELY, BY—	Area in Statute Acres.	ENUMERATED POPULATION.		NUMBER OF DEATHS REGISTERED FROM									MORTALITY TO 10,000 PERSONS LIVING FROM									Annual Rate of Increase per Cent. of Population, 1851–61.	Density of Population in 1866.	Elevation.
				Cholera.			Diarrhœa.			Cholera and Diarrhœa.			Cholera.			Diarrhœa.			Cholera and Diarrhœa.				Persons to an Acre.	Number of Feet above Trinity High-water Mark of the Thames.
		1851.	1861.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.	1849.	From 1 July 1853 to 31 Dec. 1854.*	1866.			
LONDON, with WEST HAM and STRATFORD.	86,645	2,382,790	2,845,178	14,249	11,770	5,973	3,920	4,238	3,197	18,169	16,008	9,170	61·8	46·5	19·3	17·0	16·8	10·3	78·8	63·3	29·6	1·78	35·7	—
Chelsea, Grand Junction, and West Middlesex - - -	15,020	583,609	686,247	1,567	2,463	266	765	869	687	2,332	3,332	953	27·7	40·2	3·6	13·5	14·2	9·2	41·2	54·4	12·8	1·63	49·5	56
New River - - -	8,755	698,450	794,738	2,664	1,323	661	985	1,043	846	3,649	2,366	1,507	39·1	18·2	7·8	14·5	14·4	10·0	53·6	32·6	17·8	1·30	96·8	64
New River and East London - - -	2,254	108,091	110,971	759	406	378	230	208	122	989	614	500	70·6	37·3	33·6	21·4	19·1	10·9	92·0	56·4	44·5	·26	49·9	33
East London (including West Ham and Stratford) - - - -	15,074	376,005	480,047	2,122	1,357	3,947	634	712	813	2,756	2,069	4,760	59·1	33·6	72·1	17·7	17·6	14·8	76·8	51·2	86·9	2·47	36·3	27
Southwark, Lambeth, and Kent - - -	45,542	616,635	773,175	7,137	6,221	721	1,506	1,406	729	8,443	7,627	1,450	121·1	94·3	8·3	22·2	21·3	8·4	143·3	115·6	16·7	2·29	19·0	19

NOTE.—The mortality from Cholera in 1866 has been corrected for deaths in hospitals and workhouses. The elevation is drawn from the *London* sub-districts.

* CHOLERA AND DIARRHŒA IN **1853–4.** The numbers in the above columns, relating to what is usually known as the "epidemic of 1854," extend over 18 months, from 1 July 1853 to 31 Dec. 1854. As in several months of every year much diarrhœa prevails, which cannot be identified with the more important epidemic, a third part of the total deaths from

TABLE 35.—**Deaths** registered from **Cholera** and **Diarrhœa** in STREETS, &c. of POPLAR, alphabetically arranged.

NAME OF STREET, &c.	DEATHS registered from	
	Cholera.	Diarrhœa.
Albert-place	1	—
Alfred-street	6	—
Alpha-road	1	—
Annie-street (near North-st.)	1	2
Ashton-street	1	1
Augusta-street	6	4
Barque-terrace (Millwall)	4	—
Bath-cottages	—	1
Bath-place	1	—
Bath-street	4	—
Bettons-terrace	3	—
Bisterne-place	2	—
Blackwall Harbour	9	—
Blackwall Pier	2	—
Bow-lane	3	—
Bradshaw's-cottages (Millwall)	1	—
Brig-street	1	—
Brunswick-street	4	1
Burford's-ct. (Robinhood-lane)	2	—
Canton-street	—	1
Caroline-place (near Wells-st.)	2	—
Charles-street	2	—
Charles-terrace (Millwall)	1	1
Chrisp-street	1	2
Church-street	7	2
Cold-harbour	—	1
Collins-court (High-street)	2	1
Commerce-place	2	—
Commodore-place (High-street)	2	—
Cordelia-street	1	1
Cottage-row	6	1
Cottage-street	4	—
Cotton-street	1	—
Crews-street (Millwall)	2	—
Dahlia-cottages	1	—
David-place (Bow-lane)	1	—
Davis-terrace (Millwall)	1	—
Deals-yard (Cotton-street)	1	2
Dock-cottages	4	—
Dock-street	2	—
Dolphin-lane	3	—
Dorset-terrace	1	—
Drill-pl. (West India Dock-rd.)	1	—
Duff-street	2	—
Duff's-fields	1	—
Duke-street	1	1
*East India-buildings (additional house for Cholera).	—	1
East India Dock Wharf	2	—
East India-road	—	—
Clyde-house	1	—
India-row (Well-street)	2	—
Prospect-place	1	—
Providence-place (Woolmore-street).	3	—
Elizabeth-place	1	—
Elizabeth-street	6	2
Ellerthorpe-street	3	3
Ellesmere-street	3	1
Emily-place	2	2
Emmet-street	1	—
England-row (High-street)	1	—
Essex-pl. (near Robinhood-lane)	1	—
Flint-street	2	—
Fountain-terrace (Millwall)	1	1
Garden-place (Well-street)	4	—
Giraud-street	1	2
Glasshouse-pl. (Orchard-house)	2	—
Glengall-road	4	3
Goodliffe-street	2	—
Gough-street	1	—
Green's Almshouses (North-st.)	2	—
Green Man-lane (High-street)	1	—
Grove-street	5	1
Grove-street Upper	2	2
Grove-villas	2	1
Grundy-street	1	—
Hale-street	2	1
Harrap-street (Brunswick-st.)	1	—
High-street	9	3
Hill-place-street	2	2
Hind-street	3	1
Hind-terrace	1	—
Hunt's-row (Dock-street, off Well-street).	1	—
Ingleheim-terrace	1	—
Island-row (Millwall)	3	1
Ivy-cottages (Bath-place)	3	—
James-place (near James-st.)	1	—
James-street	1	2
Jane-street	2	—
Johnson-street	2	—
Johnson's-terrace	1	—
Kerby-street	5	2
Kingsbridge-place (Millwall)	2	—
King's-terrace (Millwall)	—	1
Langton-street	1	—
Laura-cottage	1	—
Lead-street	1	—
Leicester-street	3	—
Lion-street	4	—
Manchester-row (Millwall)	1	—
Manor-place (Manor-street)	1	—
Margaret-street	1	1
Market-street	2	1
Marsh-fields-street	1	—
Marsh-street (Millwall)	1	—
Mary-place (Bow-lane)	3	—
Mary-street	3	—
Montague-place	1	—
Morant-street	—	2
Morris-terrace	—	1
Naval-row	1	1
New-street	3	—
Norfolk-street	2	—
Norfolk-terrace	3	1
North-street	3	1
North-street, Upper	2	—
Northumberland-street	2	—
Orchard-place	1	—
Oriental-street	3	1
Osborne-place (Union-street)	1	—
Oxford-terrace (Millwall)	1	—

* 14 deaths from cholera registered here have been distributed over the streets, &c. from whence the patients were brought.

Deaths registered from **Cholera** and **Diarrhœa** in Streets, &c. of Poplar, alphabetically arranged—*continued.*

Name of Street, &c.	Deaths registered from	
	Cholera.	Diarrhœa.
Paris-terrace (Paynton-street)	—	1
Park-buildings	1	—
Park-place	2	1
Park-street	6	—
Pennyfields	6	—
Phœbe-street	4	—
Pontifex's Lead Works	—	1
Prestage-street	—	1
Queen's-cottages (Millwall)	1	—
Queen's-terrace (Millwall)	3	—
Quixly-street (Naval-row)	1	—
Ralph's-cott. (New-rd., High-st.)	1	—
Randall-street	2	—
Reeve-street	2	—
Regent-street	8	1
Richard-street	5	1
Robert-street	1	—
Robin Hood-lane	6	1
Rumsey-place	2	—
Russell-street	1	—
Sabbarton-street	7	1
St. Leonard's-road	2	—
Samuda-street	2	1
Sarah's-cottages	1	—
Scouler-street	3	—
Ship-street	1	—
Ship-terrace (Millwall)	—	1
Sidney-place (Cotton-street)	1	—
Simpson's-road (High-street)	2	—
Slater's-buildings	2	—
Sophia-street	5	—
South Hill-street	—	1
Stebondale-road (Millwall)	1	—
Stebondale-row	1	—
Stebondale-street	3	4
Stevens Acre (Naval-row)	1	—
Stewarts'-street	—	1
Stewarts'-terrace	—	1
Suffolk-street	7	—
Sun and Sawyer-ct. (High-st.)	1	—
Susannah-street	2	1
Sussex-place	2	—
Sussex-street	5	—
Sydney-street	2	1
Thomas-street	2	—
Tooke-place	1	—
Tooke-street	2	—
Unicorn-street	1	—
Union-buildings	1	—
Union-row	1	—
Union-street	3	—
Victoria-place	1	—
Victoria Docks	2	—
Vulcan-street (Millwall)	1	—
Wade-street	3	—
Walton-court (High-street)	1	—
Wellington-alley	1	—
Wells-street	6	—
West-cottages	1	—
West India Docks	2	—
West India Dock-road	1	—
West-street	1	—
White-hart-place	4	—
William-street	4	—
Woodstock-road	1	—
Woolmore-court	3	—
Woolmore-street	4	1
Workhouse	4	4
Wright's-place (Cotton-street)	2	1
Bromley.		
Bishopsgate-street	1	—
Bow-lane	1	—
Nelson-street	1	—
Prospect-place	1	—
Walker-street	1	—
Bow.		
Baston-terrace	1	—
Coborn-terrace	1	—
Old Ford.		
Usher-road	1	—
Barge in Bow Creek (Orchard House).	1	—
" "William Vokens," West India Docks.	1	—
Ship "Caroline," W. I. Docks	1	—
" "Gloria Deo," South Dks.	1	—
" "Lady Milne," W. I. Dks.	1	—
" "Waterford," Thames	—	1
Unknown and no residence	2	—
Total	418	89

Note.—423 deaths from cholera were registered in the sub-district of Poplar, and it has been estimated that of the fatal cases of cholera in the London Hospital, Whitechapel, about 27 were attacked in Poplar. The Table annexed only localizes distinctly 418 deaths by cholera, 89 by diarrhœa.

In several streets no deaths were registered, among them may be mentioned the following:—Gates-street, Evans-street, Wades-place, John-street, Jeremiah-street, Sarah-street, Newby-place, Church-street (Poplar) and Bedford-street.

II. NARRATIVE OF PROCEEDINGS AT GENERAL REGISTER OFFICE DURING THE CHOLERA EPIDEMIC, 1866.

The following is a narrative of the proceedings which were taken in conformity with the instructions of the Registrar General for giving the public the exactest information about the cholera epidemic of the year, and for detecting the causes and effects of its prevalence in London.

In this instance the attack was dreadful, threatening the metropolis with desolation; but the early discovery of the channel of distribution, and the application of hygienic measures, cut it short, and secured the circumscription of its ravages within the bounds of East London.

Cholera had been prevalent on the Continent, and was very fatal in Paris and several other cities in 1865.

A few cases occurred in England during the year at Southampton and Portsmouth. They are referred to in the Weekly and Quarterly Returns.

I expected that the epidemic would attack English towns in 1866. This expectation was announced so far as was necessary to urge the local authorities into activity, and no further. (See Quarterly Return, No. 67., for the three months, July, August, September.) Looking at the improved drainage and to the improved water supply, I did not expect that the epidemic, when it came to London, would be very fatal.

Only one case of death by cholera in an adult was registered in the week ending July 7; 13 in children.

For the *week ending July* 14, the deaths from cholera were 32, including 18 adults. Several of the cases were unequivocally epidemic. It was noticed that 20 of the 32 cases were in the east districts, and the authorities were urged to institute house-to-house visitation, and to destroy the "cholera excretions."

The "intense heat of the weather," it was stated, favoured the development of diarrhœal disorders.

Week ending July 21.—Cholera killed 346 persons in the week. The cause was not clear. It is true it had begun in the East districts chiefly, but would it spread? "This fatal explosion occurred chiefly in the comparatively poor districts of the East of London." There 308 deaths occurred; no hint of malpractice on the part of any water company had been given.

Week ending July 28.—Deaths from cholera 904. This was alarming. The circumscribed area of attack for three successive weeks, and the non-extension of the attack, led me, however, to suppose that the cause of the mortality was something local. I went down to Poplar on Monday morning, visited several streets, and saw many patients with Dr. Bain, an eminent practitioner of that quarter, examined the Registrar's books, found at Poplar the Clerk of the Board, at Bow the health officer,* both dead of cholera, but I met the Registrar, Mr. Dunstan—vestry clerk, an intelligent, well-informed officer—who said that the cases occurred not in bad streets only, but all over his district. We spent some time in the London Hospital. I returned to the General Register Office before 4 o'clock.

Observations in this visit, the returns for each sub-district, and the maps accessible, furnished the materials for the report in the Weekly Return.

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* Dr. Ansell. I had met him at dinner a few days before in apparent health.

The following letters to Professor Frankland show the further progress of the inquiry :—

" My dear Sir, [*Monday*,] *July* 30*th*, 1866.

" The cholera outbreak is almost confined to the area of the East London Water Company's region ; the water showing no signs of impurity in Poplar, where I have been, but of course that proves nothing.

" Will you make a searching inquiry ?

" Can the Lea above their source of supply be infected by barges or boats, or towns ? The Regent's Canal, Limehouse basin, is in an abominable state. It is about the centre of the attack. The cases are scattered all about the region.

" Ever yours,

" W. Farr."

" My dear Sir, [*Tuesday*,] *July* 31*st*, 1866.

" On further studying the subject * my suspicions of the East London water are very much strengthened.

" The weather has been dry, and it is probable that the Lea water has been scanty, and the canals and cuts, in a vile state, are in dangerous proximity.

" If you will arrange for getting analyses of the water, such as you think may test its present quality, immediately, we will publish it in the next week's table. You must send it to us on Monday at 4 p.m. If you are disposed to go a little further, and to visit the river Lea, I will accompany you with pleasure to-morrow, or we could get some one to go to the spot and to the works for information. I will write to the engineer to-day.

" The mortality is terrible just in the area of East London supply, and in other parts slight ; it has been so for two weeks, and quite reminds me of the Southwark slaughter.

" I am, &c.

" W. Farr."†

Professor Frankland's assistant on August 1st (*Wednesday*) took some of the Company's waters from pipes coming from Lea Bridge and analyzed it, as the two sources of supply were then unknown.

Against the hypothesis that the East London water was the channel of infection, it was urged that parts of their field were comparatively free ; I found this to be the case, and came to the conclusion that their water was distributed from two different sources. This proved to be correct.

The Weekly Return (July 28) was published on the morning of Wednesday, August 1st in the newspapers. It contained the following passages :—

" It is a peculiarity of the case that the greater part of this slaughter in seven days of 1253 people of all ages took place within a limited portion of the London area. 924 of the deaths, 811 by cholera, and 113 by diarrhœa, were registered in the six districts of Bethnal-green, Whitechapel, St. George-in-the-East, Stepney, Mile-end Old Town, and Poplar, including Bow, among about a seventh part of the population of London and on one-fourteenth of its area. The attack extends all along the north side of the Thames, from the River Lea and the Isle of Dogs to the Tower of London. Limehouse basin and the Regent's Canal are the Central line of the attack, which stretches as far north as Victoria-park. This is essentially the port of London, inhabited by its maritime population. The canals and the basin are full of foul water, and are apparently connected with the Limehouse cut, the Hackney cut, and the River Lea. The East London Waterworks canal draws

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* From 4 to 8 o'clock on Monday evening, with Wyld's water supply map and the returns,—Mylne's map of water supply was with Professor Frankland at the College of Chemistry, and the Report of the Government Engineers was inaccessible,—as people were dying of cholera at the rate of one to two hundred a day, it was determined to publish the opinion formed in a way to warn the Company, but not to create panic among the people.

† Professor Frankland in reply from Bettws-y-Coed stated that his principal assistant Mr. Valentin would perform any analyses required by the Registrar General.

its supply from the river at Lea Bridge, where there is a reservoir, and runs for a couple of miles by the side of the Hackney cut down to its other reservoirs north of Bow and near the Lea. The present cholera field derives its waters from these works. It is right to add, that the water has hitherto borne a comparison with the other London waters in Professor Frankland's analyses. To-day at Poplar the water looks clear, and no complaints are made of its quality. The Company will, no doubt, take exemplary pains to filter its waters; but it is not easy to guarantee the purity of water drawn from such a river as the Lea, in dangerous proximity to sewers, cuts, and canals.

"Whoever will take the trouble to go among the people now suffering in crowded dwellings will see the danger of the water butt; poor women are washing the dirty linen of patients with water drawn from those vessels, which are often found close to the waterclosets. It would be a source of additional safety to London if the tanks and butts were all abolished, and the pipes were filled on the system of constant supply. The time has come for this reform.

"The mortality is overwhelming in some of the districts. In Poplar alone 145, in Bow 188 people died last week, including Dr. Ansell, the meritorious health officer, and Mr. Ceeley, clerk to the Board of Works, whose name figures on the placards. The people are falling ill every hour; you see them of all ages, children and adults, lying about their beds like people under the influence of a deadly poison, some acutely suffering, nearly all conscious of their fate and of all that is going on around them. Here the doctor is drawn in by the husband to see the wife now attacked; there the husband lies in spasms; here is an old woman seated dead, with eyes wide open; there lies a fine four-year old child, his curly head drooping in death, but his mother says the pulse is strong, and he takes what she gives him. An older brother just recovered is running about. Several wards of the London hospital are full of patients, many of them very young children in all stages of the disease; some dying, some well again and playing. The medical men have no rest, and with the Health Officers are nobly doing their duty; brave men ready to lay down their lives for their patients. The people themselves are most patient; most willing to help each other, the women always in front, and none shrinking from danger. There is no desertion of children, husbands, wives, fathers, or mothers from fear.

"In the midst of this scene the authorities have been to some extent paralyzed. The nuisance inspectors are not sufficiently numerous, neither are the medical officers. The administrative work has not been organized with sufficient promptitude, and is not carried out with sufficient energy.

"Such a calamity as this may well call forth the whole resources of London, and what is especially wanted is executive power well organized in conjunction with the Medical Health Officers. The people of East London want help."

It will be observed that this report calls attention to two things: (1) the sufferings of the people of East London, and (2) the probable cause of these sufferings.

(1) "The people of East London want help" met with a noble and surprisingly prompt response from the fountain of English charity.

The Bishop of London, on the same day, addressed a letter, of which a copy is annexed, to the *Times*, where it appeared on the day following (2d August).

With the promptitude which characterises her acts of beneficence, Her Majesty addressed the Bishop of London on 2d August.

On behalf of the little children Mrs. Gladstone made an appeal on the same day.

The Bishop of London wrote the following letter to the Editor of the *Times* newspaper, which appeared in that journal on the 2d of August:—

"Sir,—I shall feel obliged to you if you will allow me through your columns to make an appeal on behalf of the families which suffer from the present visitation of cholera. No one can read the reports of the state especially of the east of London, without understanding that there must be a great amount of unusual suffering at this time among the poor. I have information from the clergy, who are labouring with much self-denial, and often at the risk of their lives, in visiting the afflicted

districts, that money is imperatively required to purchase the necessary support both for those who, as yet in health, are exposed with insufficient food and clothing to the malignant influences prevailing in infected districts, and also for such sufferers as by God's mercy are recovering from illness. We trust, indeed, that parochial authorities will do all they can, but there are many ways in which additional charitable relief is much needed. I propose to arrange with the Metropolitan District Visiting and Relief Association for the proper administration of a Special Cholera Fund, and I cannot doubt that there will be an immediate and abundant answer to the earnest request that I now make, that those who have the means will help us, for Christ's sake, in this emergency. It seems my best course to employ the well-known Society for Relieving the Poor of London, of which I am President, and which has its machinery already extended all through the infected districts. A special account will be kept of all donations sent to the Cholera Fund, and a careful statement published, from time to time, of the way in which the sums contributed are applied."

The following letter was addressed by Her Majesty's command to the Bishop of London :—

" My dear Lord, *Osborne, August* 2.

" The sufferings of a large number of poor persons from cholera in a particular district of London, though fortunately as yet only in a limited one, have most painfully attracted the Queen's attention, and Her Majesty consequently learnt with satisfaction the proposal contained in your letter published this morning, to arrange with the Metropolitan Relief and District Visiting Association, of which your Lordship is President, for the proper administration of a special Cholera Fund.

" Her Majesty, feeling sure that under your Lordship's presidency any funds which may be collected will be judiciously applied, has commanded me to forward a cheque for 500*l.* to Messrs. Herries for the Cholera Fund, to be applied to the relief of the sufferers, most of whom, the Queen regrets to know, are in such a position of life as to be totally unable to provide themselves with the necessary means either to ward off the disease or to support themselves under its influence.

" I have, &c.

" The Lord Bishop of London. T. M. Biddulph."

" To the Editor of the Times.

" Sir,—It has struck me that one of the most effectual means at this pressing moment of assisting the excellent London Hospital is to provide a temporary home for the children (many of them orphans) who are recovering from cholera. I have already acted upon this plan, and I now appeal to you for your valuable aid. We are in want of funds ; and donations, which should be described as intended for this particular purpose, will be gratefully received by the Rev. Thomas Scott, London Hospital, E.

" I cannot speak too highly of the work which is being done in this hospital by the chaplain, the doctors, and the nurses—indeed, by all connected with it.

" I am, &c.

" 11 Carlton-house-terrace, S. W., Catherine Gladstone."

" August 2."

The Prince of Wales subscribed 200*l.*, and other subscriptions from all classes of persons flowed in with so much promptitude, that in less than a week 10,000*l.*, in less than a month 18,000*l.*, was placed at the disposal of the Committee, for the Relief of distress arising from cholera. The total amount raised by this fund, the Mansion House fund, and other contributions is estimated at 70,000*l.**

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* 21st Report of Association for Relief of Destitution in the Metropolis, 21 Regent-street.

Mr. Hughes, the Secretary of the Metropolitan Relief Association, states that in the interval from August to December the total receipts reached 19,333*l.* 19*s.* 3*d.*; the expenditure was as follows :—

	£	*s.*	*d.*
Grants to clergy for relief of cholera	7,003	18	10
Grants to institutions for ditto	2,785	0	0
Grants to 661 cholera orphans	6,611	0	0
Expenses, advertising, &c.	403	16	0
Balance paid to the Metropolitan Visiting Association, to assist in meeting increased distress caused by cholera	2,530	4	5

The city of London, always conspicuous for its charity, was worthily represented this time by the Lord Mayor, Sir B. S. Phillips, who placed himself at the head of a "Cholera Relief Committee," which held its first meeting at the Mansion House on the 7th of August.

The want of organization in the cholera districts, noticed in the weekly table of July 21st, met the committee in the face : "the great want," they say, "was local "organization to grapple with the disease;" and their first care was to create local committees for relief, house-to-house visitation, preventive and remedial measures. Through the local committees the grants were administered. They worked in concert with the Metropolitan Relief Association. The amount collected by this fund was 18,763*l.*; and in their report they affirm that 70,000*l.* is below the sum contributed from all sources from the relief of "sufferers from this calamity." By their latest but incomplete returns they learnt, that, almost entirely in the east and north-east of London, 10,424 persons were attacked, 4,396 killed by cholera; 68,975 attacked, 647 killed by diarrhœa. Exclusive of paupers, and of children whose relatives could support them, 1,260 cholera orphans, under 15 years of age, nearly all fatherless, were on the list of the two committees. The Lord Mayor placed half the number (630) on his list, which rose by additions to 710 orphans, whose fate must have been lightened by distributing amongst them 6,570*l.*, and by placing them in the charge of friendly people.

The following statement shows how the Mansion House fund was expended :—

	£
By grants varying in amount from 5*l.* to 300*l.*, to 92 committees, comprising hospitals, dispensaries, orphan homes, and district boards	9,121
„ amount voted for convalescents, dispensed through 26 local committees	2,000
„ amount voted to 277 widows	541
„ amount voted to 710 orphans	6,570
„ expenses, viz., advertising, printing, stationery, and stamps, &c., 336*l.* 1*s.*, salaries and attendance, 116*l.* 11*s.*	453
Balance at bankers	78
	18,763

(2) The second thing to which the Report called attention was the cause of the excessive mortality. If this cause could be determined it might lead to its removal. The epidemic poison must evidently have been diffused either through the air or through the water of the infected locality. Now, the air is not supplied by a company, and is consequently left unrepresented in court. It is otherwise with the water.

Mr. Greaves, engineer to the East London company, came up to the General Register Office, and complained that the implied charge against the company was ill founded, and that the description of the works was incorrect.

I showed him the information in our possession, and engaged that if he would send up a correct description of the works the Registrar General would forward it to the newspapers that day. He promised to do so, but failed. Instead of doing this, he sent a letter to the Times and to the other newspapers (on August 2d), at the same time addressing a private explanatory note to the office.

Letter from the Times of Thursday, 2d August 1866.

"To the Editor of the Times.

"Sir,—I observe in the Weekly Return of the Registrar General, published in the Times of to-day, a statement so injurious to the East London Waterworks Company, and so likely to create public alarm, that, although I might on the com-

pany's behalf have been prepared to remain silent, I think you will feel me justified in asking a place in your columns for the purpose of allaying what I fear may be greatly misapprehended, and may, if unexplained, cause considerable public alarm.

"In the return to which I allude 'the present cholera field' is reported as 'deriving its water from the East London Waterworks,' of which the 'canal draws its supply from the river at Lea Bridge, where there is a reservoir, and runs for a couple of miles by the side of the Hackney-cut down to the other reservoirs of the works north of Bow and near the Lea.' It is also added that 'the company will, no doubt, take exemplary pains to filter its waters, but it is not easy to guarantee the purity of water drawn from such a river as the Lea, in dangerous proximity to sewers, cuts, and canals.'

"From these passages every reader must infer, that the East London Waterworks Company's supply is, when taken from the water of the Lea, at no higher point than Lea Bridge; that it is thereafter led in an open canal in dangerous proximity to pollution; and that, although the company may have intentions about filtration, they, in fact, supply unfiltered water.

"The facts are :—

"1. That, although taken from the Lea at Lea Bridge, the waters of that river have been, at the expense of the East London Waterworks Company and the New River Company, protected from impurity, by intercepting drains and otherwise, as high as Enfield, which is several miles above Lea Bridge; and the water, although locally taken by the company from the river some two or three miles above Lea Bridge, has, in fact, the purity of Enfield, where the river is running in a purely rural district.

"2. That the water enters the filter beds of the company at Lea Bridge, and is conducted thence to their pumping establishment at Old Ford in an iron pipe, and never sees light or risks pollution between the filter bed and the consumer; and that the 'canal' alluded to by the Registrar, having been since 1853 disused for all purposes of supply, is only maintained as a drain from the filter to a lower part of the river.

"3. That not a drop of unfiltered water has for several years past been supplied by the company for any purpose.

"It is true that the Registrar notices that the East London Company's 'water has hitherto borne a comparison with the other London waters in Dr. Frankland's analyses,' and that 'to-day the water looks clear, and no complaints are made of its quality;' but these statements are in such 'dangerous proximity' to the other less correct portions of the report and to the affecting facts which appear to be stated as consequences of the assumed impurity of the water supply, that I have felt it my duty to request publicity for the above written explanations.

"I impute no intentional misrepresentation, and I make no complaint, although when I found on calling this afternoon at the Registrar General's office that he was using and acting upon an obsolete map of this district I felt that better information should be in use by so important an officer, and that if it had been so the East London Waterworks Company would have escaped an unmerited censure and the public mind an unfounded cause of alarm.

"I am, &c.

"*East London Waterworks, Old Ford,*
"*August* 1 [*Wednesday*].

CHARLES GREAVES,
Engineer of the East London Waterworks Company."

Friday, August 3.—I returned Mr. Greaves's visit with his full permission, and made myself acquainted with the whole of the works at Old Ford, so far as they were visible and were explained by Mr. Greaves himself, who was apparently deeply impressed with the serious nature of the inquiry, and answered candidly all the questions which it appeared right to address to him in his responsible office. While I was there the *Lancet* Commissioner and one of the health officers called to see the engineer and the works. Afterwards I walked down to the Registrar's house (Mr. Dunstan, 3 High-street, Bromley), and made inquiries on the way

where cholera was prevailing. Three persons came in to register a death from cholera while I was there, and I found from the book that the epidemic could not be localized in any particular portion of the district.* Several deaths had occurred in the houses drained into the middle-level sewer south of Victoria Park.

On that day, Friday, was formed the plan which is sketched in the subsequent letter to Mr. Valentin. Mr. Valentin was, like everybody else, out of town. He came to town from Ramsgate, and set out, note-book in hand, after going over the subject carefully with me.

" *General Register Office, Somerset House,*
" Dear Sir, *August 3d*, 1866.

" You will see that the cholera has raged very badly in the East of London. Professor Frankland tells me that you will kindly undertake any analyses of the water that may be thought useful.

" The Registrar General will be very much obliged if you will attend to the following suggestions at your earliest convenience.

" The East London Water Company pumps its water from two points:—

" (1) The first is the well of the filtering beds at Lea Bridge, where they have their most powerful engine; this supply is distributed over the region of their works *north* of *Victoria Park*, the pipes inosculating with those of the lower region, which is supplied from the well of the engines at

" (2) Old Ford, Bow, where they have, (a) A *covered reservoir*. (b) *Two large uncovered reservoirs*, in connexion with the East London Waterworks: (c) Canal *running from Lea Bridge* by the side of the Lea navigation waters.

" The engineer, Mr. Greaves, states that there is still a connexion between the *wells* of the *engines* at *Old Ford* and the uncovered reservoirs, but denies that these waters are ever used.

" The covered reservoir is separated from the uncovered reservoirs by the river Lea, in a most filthy state, varying, however, with the state of the tide, for it is tidal, the tide running up about $1\frac{1}{2}$ miles beyond Old Ford.

" The East London Water Company takes its water from the Lea about $2\frac{3}{4}$ miles above Lea Bridge, into subsidence reservoirs, covering 75 acres of land, through which the water flows down a canal to the filtering beds at Lea Bridge; from these beds the filtered water descends through an iron pipe 48 inches in diameter to the Old Ford covered reservoir. So much for description of the works, drawn up chiefly from information supplied by Mr. Greaves.

" The *cholera field* does *not extend* over the region supplied from Lea Bridge, and does extend over all the rest of the region supplied by East London water, namely, from Isle of Dogs to Tower of London northwards to southern edge of Victoria Park, and across the Lea in West Ham and Stratford.

" Will you do this: go to Mr. Greaves, whom you will find at Old Ford, and get him to allow you to take waters for analysis:

" 1. From his covered reservoir at Old Ford.
" 2. From the two reservoirs uncovered.
" 3. From the Lea Bridge, where you can get the water.
" (1) Before filtration.
" (2) After filtration.

" Whether it is worth while to get the waters of the Lea for examination above the point at which the water of the company is taken I do not know. It may be, but that may be left at present.

" We want especially to know, if you can discover any and what chemical differences between (1) the waters of the Lea Bridge works, before and after filtration; (2) the waters of the covered and uncovered reservoirs at Old Ford;

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* Mr. Dunstan had an ingenious scheme for keeping informants at a respectful distance. A chair was placed in front of his desk, and upon attempting to draw it nearer to him I found it was tied by a rope, and could not be pulled from its place. In one week (July 14-21) he registered 141 deaths by cholera alone. He was not ill and lost none of his household.

(3) the waters in the pipes of the company in the regions north of Victoria Park, and in Poplar.

" The Registrar General will publish the analyses.

" It will be very desirable to complete the view, by analyzing the *waters of the Lea* at Old Ford; taking *suspended* matter into account.

" I am, &c.
" W. Farr."

" *Bickley, Kent, August 4th*, 1866,
" My dear Sir, (*Saturday*).

" I went over the Old Ford East London works with Mr. Greaves (Friday, August 3d), and find that they have two separate pumping establishments, one at Lea Bridge supplying the north, suffering little from cholera;

" Another at Old Ford supplying the infected districts; there they have reservoirs, *one* covered.

" Mr. Greaves will allow Mr. Valentin to analyse the waters of all his reservoirs, if you think it desirable.

" I have written to Mr. Valentin, in conformity with the suggestion in your note, and have told him all that occurs to me.

" My theory is, that in some strait they supplied for some day or days their water from the *uncovered reservoirs* at Old Ford, contaminated in some way or other. These reservoirs are in possible communication with their pumping wells; but they do not admit that they ever take water from any but the covered reservoir containing filtered water.

" I propose to print extracts from your notes; and have communicated them to Mr. Greaves.

" I am, &c.
" W. Farr."

Professor Frankland took the water for monthly analysis, published by the Registrar General, from a main supplied chiefly from Lea Bridge; this note calls his attention to the existence of *two* sources, which had not been discovered until they were brought to light by the cholera returns.

" My dear Sir, *Bickley, Kent, August 7th*, 1866.

" You will see that the East London water is supplied from two sources, the pipes inosculating in the centre of their area. The lower portion is the most extensive; it appears to lie south of Victoria Park.

" You will perhaps ask Mr. Valentin to look into this, and to ascertain whether your last water (for ordinary monthly analysis) came from Old Ford or Lea Bridge.

" Thanks for your excellent letter, extracts from which I immediately printed, and left with Mr. Greaves (on August 3d). He passes the water now through 12 acres of filtering beds of sand 3 or 4 feet thick: he does not think he could pass the water through charcoal of moderate extent in time. He will consider, and will now have the opportunity of studying your letter, which is published with the Weekly Return, and which I hope all the papers will publish.

" I am, &c.
" W. Farr."

Dates of Professor Frankland's Letters and Report.

Dated.		Publication.
Letters, August 4th.	-	Return for week ending August 4th, published August 7th, Wednesday.
Report, August 25th.	-	Return for week ending September 1st, published on September 5th.
Letter, September 8th.	-	Return for week ending September 8th, published September 12th.

Mr. Greaves, at Old Ford, received Mr. Valentin on August 9th (Thursday), and so did Mr. Maine, the officer at Lea Bridge, who incidentally mentioned that he had eaten some excellent eels out of the Old Ford reservoir. A day or two

after Mr. Valentin had called at the General Register Office to report progress I received by a curious coincidence, the "East-end News" for August 11th, a local paper, containing letters (one dated August 7th) referring to eels found in the supply pipes of the company.*

Professor Frankland made some suggestions for purifying the waters, and these were immediately forwarded privately to Mr. Greaves. His first Report and extracts from his letters were published in the Weekly Return for August 4th, with a description by me of the water supply of the East districts, to serve until Professor Frankland's elaborate inquiry was completed.

Mr. Greaves in his letter to the *Times* (August 2d) had stated that all the water of the company "had been filtered;" this was published in the "East-end News," whereupon Mr. Ferguson a plumber of Bow-lane, and Mr. Russell, wrote to the Editor, stating that they had found eels in their water pipes. One, *nine* inches long, was dead. Others were found alive in the water butts. Mr. Russell, who found his eel about the *second week of June*, asked significantly, "can an eel pass through a filter bed?"

On a subsequent visit to Poplar I went to the houses, saw the cut pipe from which the eels were taken: the facts were certain. These letters were published in the Weekly Return of September 1st; but no further reference was made to them, although the coincidence between Mr. Maine's accidental mention of eels in the open reservoir and the facts in these letters was singularly striking. Eels are known to travel by land, but there can be little doubt that they had been distributed with the waters of the open reservoirs.

Upon the occasion of this visit I found that the panic had subsided; and proper hygienic arrangements had been made. The Registrar, an excellent officer, was in distress; his wife had died of cholera after a short illness. An example of a frequent fallacy in these inquiries struck me. "We never drank water, neither my wife nor myself." What then do you drink? "Beer, and a tumbler of spirits and water at night." Hot water? "No; cold."

Professor Frankland came from Wales expressly for the purpose, inspected the Company's works on 23d, and found them apparently in the same state as they were on the 9th, when they were visited for him by Mr. Valentin. Professor Frankland's Report, dated August 25th, appeared in the Weekly Return for week ending September 1st.† The deaths from cholera in that week were 198: they had been, four weeks ago, 1053, when their further rise was arrested. The immediate decline of the deaths following Mr. Greaves' visit to the General Register Office was shown in the Return for the week ending August 11th.

It happened strangely enough that a part of the afflicted field remained still without the advantage to be derived from the lower level sewer, and I wrote immediately to Mr. Bazalgette on the subject: in his reply‡ he said "it is unfortunately just the locality where our main drainage works are not complete. * * * To-morrow I shall recommend our board to erect a temporary pumping station at Abbey Mills, to lift the sewage of this district into the northern outfall sewer."

West Ham, over the Lea in Essex, is out of London, and is drained independently of the metropolitan works into the Lea: the district is partly supplied by the East London Company; and it became important to ascertain how far the epidemic extended in that direction. For this purpose I went over to Stratford-le-Bow on one day, where, after an interview with Mr. Vallance, the surgeon and registrar, I visited the streets where the disease had been most rife among the families of the railway ironworkers and others. Subsequently I went by the Great Eastern railway from the Shoreditch station to Lea Bridge, passing close by the open reservoirs on the left, which looked as placidly in the light as if they had never held poison that had killed thousands. This railway, with the branch to North Woolwich, gives in one view the greater part of the water field.

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* See letters, p. 129. † See pp. 122–126. ‡ See p. 117.

In going from the station along Lea Bridge road you cross the Company's supply canal and the Lea. The boathouse at Lea Bridge looked deserted, which the landlord, who had suffered by no fault of his own, ascribed to the evil reports of the Registrar General about the innocent river. Here at the turnpike gate is the boundary of London. The police on each side of the gate were apparently different; and the registrars were not the same. A death had occurred in the night, and after some difficulty I discovered the house in which it happened. It was on the Hackney side, in a small row of white cottages south of the "dock," a mere projecting loop of the Lea, where several pleasure boats lay moored. The house was empty. The man was a labourer; he had been attacked in the night about 2 o'clock, when he and his young wife were alone, and he got no assistance, except from her, until the morning, when some of the neighbours were roused, and the doctor was brought from a distance. The man was in collapse, died, and was immediately buried: the house was disinfected. I walked in the direction of the doctor; but returned as I found that it was at a considerable distance; and learnt all the particulars from the wife yesterday, widow to-day, who was kindly taken in by the husband's sister. She had on the table a bottle of wine which the clergyman had just left, but neither she nor her sister-in-law had any medicine for premonitory diarrhœa. No disinfectants were in the house. Her husband when she took his dinner yesterday said it was nice, but he did not care for it; she did not know whether he had diarrhœa. By the want of such simple precautions lives are lost.

The Lea Bridge filter beds were all full except one or two; gnats were playing over the waters; and the swallows in active pursuit clustered over a particular reservoir that appeared to afford them especially good sport. The workmen were wheeling away barrows full of gravel or sand. The great engine was at work. The waters lie in the midst of rich meadows, on which many cows were feeding, and are surrounded by an amphitheatre of houses and churches, crowned to the north with the Alexandra palace.

The Lea was full to the brim of fresh running water, which looked well to the eye, although it was not perfectly clear. I was walking by its side with a young visiting clergyman, where we observed marks on the ground of pipes, and on inquiries found that the Company, at the instance of the Hackney Board, had laid their water on the cottages. A hale man of fifty was indignant at the evil spoken of the river itself, which had supplied him with water for some thirty or forty years, and insisted on fetching a glass to show us its excellent quality. He told some stories he had heard to the disparagement of the Thames, which he could easily believe, but insisted strongly on the spotless purity of the Lea. The cottage at which the labourer had died of cholera had also had the water laid on a fortnight ago; but the wife admitted that she did not always draw her water from the tap, but took it from the dock of the Lea, in front of the cottage, where a woman was washing her dirty linen on my return.

I then walked over the low spongy fields, and finding the way long took a carriage to Walthamstow on rising ground, and saw the registrar, Mr. Browne, surgeon, in his comfortable house. There had been no deaths from cholera Mr. Browne said in any previous epidemic, and none in this. The East London Company supplies many of the new and best houses. The people are also supplied by a deep artesian well in the street, as the wells about are shallow, and the water brackish.

This further inspection confirmed the conviction that the cholera stuff was not distributed in the waters supplied from Lea Bridge, and that on the whole the waters of the Lea at that point are not impurer to any appreciable extent than those of the Thames.

The account of the West Ham district, including West Ham, Stratford, Leyton, and Walthamstow, is in the Weekly Return, No. 36 (September 8th).* The registrar of West Ham was overpowered with work and sickness in his family; the dead were buried hurriedly; many of the people fled; and he had difficulties in getting information.

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* See p. 132.

In the course of the inquiry I told Mr. Greaves that we had by the sheer force of circumstantial evidence come definitively to the conclusion that the company had used the open reservoirs for a certain time up to the outbreak of the cholera ; but that if he would of his own knowledge affirm that they had not been used, I would engage to say that the Registrar General would publish his letter, and that I for one would accept his statement as conclusively true. He did not answer ; but the following statement was made and published in November by the health officer of Stepney, Mr. Orton, in his special Report on cholera* : "The charge against the "Company consists, in an emergency, of distributing foul water from two old "uncovered reservoirs at Old Ford. It is nothing to the point to say that "gentlemen sitting on the bench of justice, of unspotted private life, have protested "that the water from the suspected reservoirs at Old Ford has not been used, "*and that the subordinate employés are all ready to a man to come forward, if* "*required, on oath, to declare that the sluice has not been opened for such purpose* "*for the last two years!*"

On December 10th, I had the satisfaction of hearing Mr. Greaves, in evidence before the Rivers Commission, state that his foreman at Old Ford having died he appointed a successor, who was instructed to use the open reservoirs in cases of absolute necessity. The reservoirs were used in the year 1866, and he believed they were used in June. (See Evidence cited, pp. 100, 101.)

It is right to state that the Registrar General was supplied with oral and other evidence from various quarters; among other things a trustworthy passenger on the Great Eastern railway stated that one of the open reservoirs had been emptied, contained much mud, and filled again by soakage of the waters shortly before the outbreak of cholera. The foul waters of the Lea would get through the bottom, which was near, and certainly many feet below the water at high tide.

It appeared singular to a casual observer that while the cholera was raging at Blackwall on the north side of the Thames it was scarcely felt on the southern shore at Greenwich, although people were freely crossing the river ; and I recollect, at the time the ministerial white bait dinner was about to take place, calling upon Mr. Walpole's private secretary at the Home Office, to inquire if the dinner was to be at Greenwich or at Blackwall. A dinner at Blackwall was then a hazardous experiment, while a white bait dinner at Greenwich was attended with no unusual risk.

After the epidemic had subsided in East London to the ordinary level of the metropolis, it lingered strangely in the Greenwich district, covering Deptford and Woolwich, and in the beginning of September a partial outbreak there extended to the contiguous part of West Charlton. A dispute arose as to the cause. By one party in Woolwich it was unhesitatingly referred to exhalations from the ill-ventilated, so said, metropolitan sewer, while by others the outbreak was referred to bad hygienic conditions. Under these circumstances I visited Woolwich and Charlton ; and the Registrar, Mr. W. Jackson, an intelligent pensioner, who had been a petty officer in the engineers, accompanied me to many houses and streets where deaths had occurred in the Woolwich dockyard sub-district. Several of the observations there made are recorded in the Weekly Return No. 45.† The people were here serious, as is usually the case, in an attack of cholera, which kills men suddenly. The workmen were at home in the middle day at dinner. One fine intelligent Scotchman employed at the arsenal had kept the doors of his house open to purify the air. The skin of this man and others of his class was begrimed with black dirt. Why should not the artisans be supplied at the works with warm water for ablution? The people generally received us well ; but in some cases looked at us with suspicion, as if we were going to seize their goods or do them some harm. One woman had a ferocious bull-dog, which she kept behind her, on the ground that he had an ill-inclination to fly at people's throats. Some of the houses were empty; the people had fled, and no information could be got. The water of the Kent company is supposed to be good ; but, singularly enough, at the first house we went to the woman complained that when first on it stank so offensively that she was obliged to let it run off, and open the window; it in the end

* See p. 9 of Mr. Orton's Report on Cholera in 1866. † See p. 142.

became sweet. No sickness, no death had occurred; but I observed in the returns that a child died there a few days afterwards in the house. The engineer, Mr. Morris, was informed of the fact, and he surmised that the pollution was due to corrosion of the lead supply pipe, which he promised should be looked to. Such cases account for some mysterious local outbreaks.

Charlotte-street is a good looking street, leading down a mount to Woolwich; some deaths had occurred in the street; and I noticed at a house where a young man had died, in a stalwart woman, that peculiar pale dusky hue of the skin, common alike in cholera and ague regions. The sewage ran down the street to a cesspool, against a corner house of Mount-street, which is well described by Mr. Grant.* The house was empty. A woman in the shop opposite said that it had been inhabited by a family of fine children, of whom three had perished with their mother and grandmother, who had come to visit them, and died on her return home. She pointed out a very clean well-dressed woman of middle age in black at the door of an adjoining house, who had lodged in No. 1., and had devotedly nursed the whole of the family to the end. She lived on the first floor, the other on the ground floor, and told me there was at the back of the house one of the sunk Woolwich rain-water tanks which had recently been cleansed by the landlord. Whether it had been used she did not know. She had two months ago, I was told, herself lost two children by fever. Subsequently I visited with Mr. Grant the great outfall sewage works at Crossness, Erith, where there are some excellent cottages for several of the workmen and their families, among whom no case of cholera had been. The wages are good. The South London sewage is stored in three floors of acres of vaults below; but the engine rooms are as fine as the halls of Eblis, and I perceived no odour, except that of carbolic acid, which is becoming the frankincense of the day. The river was brimful; it was the highest tide that for some time had been witnessed; but as the sun declined and the tide turned the flood gates were opened, and the surging Stygian streams gurgled up in vast volumes from the bottom of the river, flowing away down the wide tidal way. We were carried back. Mr. Grant the engineer, and Mr. Lewis accompanied me, with some of the workmen, in a rough horse carriage, drawn by a horse on a tramway, by Plumstead, over some three miles of marsh, as the shades of evening descended, and we reached the Woolwich railway in safety.

I am told that in some circumstances a reflux of the sewage discharged at the outlets of Barking or Crossness is observed higher up the river than Woolwich, and I cannot but entertain the hope to see the marshes some day drained, and irrigated with this sewage water now wasted. It will be necessary to take a part of the marshes in the river districts, which are now very unhealthy, and to drain them.

Personal inspection, the use of maps, such information as we had the means of getting from the registrars, the health officers, and other persons, enabled us week by week to track the epidemic through this vast metropolis. Where testimony is so much biassed by either the interest and power of well-organized companies, or by the fears and ignorance of the public, actual inspection of the people suffering in their houses, and of the mechanism of works either for supplying water or for carrying away sewage, is indispensable. The eyes help the ears wonderfully.

In conclusion, I may here state that the general policy of the Registrar General, in plague seasons, is to keep the Government, the scientific world, and the public accurately informed of the number of deaths by the epidemic and other diseases, week by week, or day by day, in each district, according to the urgency of the case. This in itself has several advantages. It shows the extent of the danger; the place of the danger; and its progress. It shows the necessity of remedies; and traces their effects; but its great utility consists in the assistance it supplies, in conjunction with other knowledge, in the investigation of causes. In conformity with this policy the Registrar General undertook the publication of a Daily Return of deaths during the severest manifestation of cholera in 1866. This proceeding involved much additional labour for the departmental staff, but it

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* See p. 202.

was felt to be for the public good that it should be done, and its utility was acknowledged by the medical profession and by the sanitary authorities generally. The Daily Returns were commenced on Monday August 6th, and continued up to Saturday October 6th ; the decline of the epidemic then appeared to render their further publication unnecessary, and they were discontinued, but in compliance with the public wishes they were resumed on Monday October 15th, and only discontinued finally on Saturday December 8th, when the epidemic had entirely ceased.

Our first question in the outbreak of cholera is : *what is its cause?* or rather the cause of its lethality ? For once its cause is discovered the chance arises that the action of the cause may be mitigated, or even annihilated by human effort. The zymotic theory of cholera was advanced from the first ; it appeared generally to explain the phenomena. Thus cholera, I assumed, is propagated by a stuff, which in 1842 I proposed to call *cholrine*, in a paper containing the outline of the theory of zymotic disease ;* and that stuff is contained in the secretions of the intestines, ejected by vomiting or by evacuation. In my opinion non-choleraic evacuations sometimes produce sporadic cases of cholera, and possibly, under favourable conditions, an epidemic cholera itself.

Cholrine is a light fluid, inodorous, and probably tasteless. It does not affect *every person* with whose mucous membranes it comes in contact, either directly through the dirty hands, or contaminated food, or drinking water, or the steam of water arising from choleraic infusion, as in washerwomen, who cannot be suspected of drinking the water, or finally of the *cholrine* in floating dry clouds of dust.

That cholera stuff can be distributed through the river waters of London was demonstrated in 1854, in the weekly returns of 1849 and 1854, from the experiment in South London on a large scale of the two qualities of Thames water, one containing much sewage (the Southwark), the other containing little sewage (the Lambeth). Dr. Snow first propounded distinctly the theory that cholera is propagated exclusively by cholera discharges, and that *water* is the chief medium of diffusion. He collected many examples (see his book on cholera) ; and in 1853 this passage occurred in the supplement to the Weekly Return No. 47. (November 19th), headed " Cholera and the water supply of London." " It is believed that " through nearly the whole of this Table *the impurity of the waters* with which " the inhabitants of the *several districts are supplied is in nearly a direct pro-* " *portion to the mortality from cholera.*" This was placed beyond dispute in the observations on the great epidemic of 1854 ; and was admitted by my friend Dr. Baly, who had up to that time been sceptical about the water theory. Lord Llanover, then at the head of the Board of Health, procured returns from the water companies (Southwark and Lambeth), and from the General Register Office, at my instance, and on a plan which enabled us to show the mortality of cholera in the houses respectively supplied by the two water companies.†

I was therefore prepared in 1866 to closely scrutinize the water supply ; but there were extraordinary difficulties in the way of getting evidence of any contamination of the East London water ; for the chemical analysis had led to no discovery of peculiar impurity in former years ; perhaps because the waters had been taken by Dr. Thomson and by Professor Frankland from the mains chiefly filled from the Lea-bridge engine pump. Again, neither Mr. Mylne in his map of the districts supplied by the nine metropolitan waterworks companies, nor the government engineers (Messrs. Austin, Ranger, and Dickens), in their report on the metropolis water supply, set down the inculpated reservoirs in their maps. There no trace of them is found. The engineer inspectors say " the East London water " company employed no means of filtration before the Act of 1852. The large " depositing reservoirs upon which they had to rely for clearness of the water have

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* See Registrar General's Fourth Annual Report, pp. 197–205, published in 1842.

† See the Report of the Board of Health Committee for Scientific Inquiries. The committee consisted of Arnott, Baly, Farr, Owen, and Simon ; the latter wrote the Report, which was not signed by the other members. The analysis of the facts was conducted at the General Register Office, where all the calculations for the Report were made. See also the Report of the Medical Council of the Board of Health (p. 7), who did not admit the conclusiveness of the "Broad-street Pump" case. See also Mr. Simon's Report on Newcastle epidemic.

"*now been abandoned, and all communication between them and the mains has* "*been cut off.*" This is explicit. The communication either was not then cut off in 1856, or it has since been re-established. Who could suspect either alternative? Mr. Greaves said that the connexion existed in 1866, and was used in June; but this was unknown. Neither Wyld's map nor Stanford's map shows the underground iron pipe; hence the omission of its notice in the Weekly Return of July 28th, which gave the company a legitimate ground of complaint and a defence, until the other facts were discovered. At this we laboured several weeks until the cause of the dreadful loss of life, so far above that in every other district, was distinctly pointed out and removed.

The simple description of some of the scenes I witnessed under the authority of the Registrar General's name at once called public attention to the distress and the courage of the people. The facts expressed in the often-cited sentence, "the people of East London want help," was sufficient in England to set hundreds of benevolent people in motion.

The defective municipal organization of the metropolis became painfully apparent in the course of the epidemic; and upon observing the imperfect organization of East London to meet the calamity I wrote (I believe on Monday, June 30th,) a private note to Sir John Thwaites, suggesting that the Metropolitan Board should intervene, send down a superior health officer, an engineer, and a staff of medical men and nurses, to organize the infected district, and to help the suffering populations. In reply I was informed, to my great regret, that the constitution of the Board allowed no such interference, and that no money could be so expended legally. I had urged that it was a case in which the life of the whole of London was concerned.

London is not only the greatest but the wealthiest city in the world, and it is quite able to succour the sick, to provide hospitals, and to relieve the orphans rendered destitute by the death of heads of families, provided the whole of the property is evenly rated, and the relief is judiciously administered on a well-considered plan. Instead of this all was left to hazard, and to the providence extemporized of private charity, which shone with splendour, but with unequal and uncertain light, in the darkest quarters of London.

March 1867. W. Farr.

III.—MR. GREAVES'S EVIDENCE.

Extract from the Evidence of Mr. Charles Greaves, Engineer to the East London Water Company, before the Royal Commission on the Pollution of Rivers. 10th December 1866. [*Second Report of the Commissioners appointed to inquire into the best means of preventing the Pollution of Rivers* (*River Lea*), Vol. II., pp. 5 and 6.]

142. (*Chairman,—Mr. Rawlinson, C.B.*) You have 12 acres of filter bed in use and your pure water reservoirs from which you pump; have you any conduit or open reservoirs in which water is stored, or into which you can bring water, which are not regularly in use?—I have reservoirs still in existence which were originally made as depositing reservoirs where the simple water is received from the river; *those reservoirs until lately were in a position to be drawn upon in the way which you mention.*

143. Are those reservoirs capable of being filled by a conduit or by a pipe, would they be filled by sluices directly connecting with the Lee, or by what means would they be filled?—They were capable of being filled by a sluice connected with a disused canal, a canal which was in use as the company's principal line of conduit previously to the year 1852.

144. And that conduit and those reservoirs exist now ?—That conduit and the reservoirs exist at present.

145. Are they now full of water ?—They have been absolutely severed.

146. Are they full of water ?—One of them is considerably depressed and has been emptied, the other one is not full.

147. Are they now in a position so that you could connect them with your lower pumping engines ?—No, not now at all.

148. When where they disconnected ?—In the last autumn.

149. Could they have been connected this spring ?—One reservoir could have been drawn upon this spring.

150. To your knowledge were they or were they not drawn upon this spring ?—A small quantity of water was taken out of one of them.

151. Then the water from one or other of those open reservoirs was drawn upon this spring ?—Yes.

152. Can you give us the date ?—I have not the date.

152*a*. Was it drawn upon by your order ?—Not precisely, but there was an implied sanction.

153. For what purpose was it drawn upon ? Was it because you were short of water in your store ?—I should think that it was because the foreman thought so.

154. He thought that it required it ?—Yes.

155. Would he do it without consulting you ?—Yes, if I were not present. I lost my foreman early this year ; he died quite suddenly of apoplexy, and I had to appoint a new man, and in giving him discretionary instruction as to how he was to manipulate the water I described this possibility as something which he must keep in mind, rather than suffer an accident, and so I suppose he may have acted in that sense.

156. Do you know about the date when those reservoirs were last drawn upon ? Was it before the outbreak of cholera in the east end of London ?—I have not the date. I cannot answer that question now.

157. Do you know whether it was or not before the outbreak of cholera ?—You mean the last occasion that they were drawn upon ?

158. Yes ?—I cannot say.

159. Do you remember the period of my visit ?—Quite so ; it was I think on the 2nd of August.

160. Have they ever been drawn upon since that visit ?—Certainly not.

161. Then it was previous to that visit ?—Certainly.

162. I suppose that the cholera had been prevailing a month when I visited you ?—Yes.

163. Then the probability is that the reservoirs had been drawn upon previously to that time ?—Probably June was the latest date, but I cannot say.

164. You did not think it of sufficient importance to ascertain that fact when that charge was brought against your company of supplying impure water ?—I certainly did inquire into it, but I cannot give the date now.

182. Why did you abandon those old works ; that is to say, why did you abandon their use and yet retain them ?—They were abandoned because the system of filtration, as a matter of course, put them out of use, then they were not applicable to any other purpose, and I thought myself more justified in keeping them full than I was in emptying them, considering that the question of quantity was at times of such importance with reference to accidents, that it was advisable to keep reservoirs which were already constructed and which I could not apply to any other purpose, to meet such necessities as might arise.

IV.—THE BOARD OF TRADE AND THE WATER SUPPLY OF EAST LONDON.

[*See Parliamentary Papers, No.* 339. *and No.* 574., *Session of* 1867.]

In November 1866 a memorial was addressed to the Board of Trade by certain inhabitants of East London, concerning the quantity and quality of the water supplied by the East London Waterworks Company. The allegations contained in the memorial were as follow :

" 1. That the said water supply is within the knowledge of your memorialists deficient in quantity.

2. That as publicly stated by Professor Frankland in official reports to the Registrar General, and as your memorialists believe, the works of the said Company at Old Ford, comprise two open ponds, where no sufficient care is provided to protect the water against impurity ; and also an underground reservoir, which is several feet below the level of the River Lea, immediately contiguous thereto, and into which water from that river (which is no better than an open sewer) can and does percolate, and which reservoir is in communication by a pipe or pipes, with the said open ponds, so that the water from them may be used in time of emergency by the Company, and as suggested by Professor Frankland has been so used, and thus been one of the principal, if not the sole cause of the fearful mortality from cholera at this end of London.

3. That the works of the said Company at Lea Bridge, from whence the whole water supply of this portion of London is derived, are situated at a point where the water has been contaminated by the sewage of Broxbourne, Hoddesdon, Bishop's Stortford, Enfield, Ware, and many other places, comprising a population of many thousand inhabitants."

The memorialists therefore prayed the Board of Trade, pursuant to the provisions of the 9th and subsequent sections of the 15 & 16 Vict. c. 84, " to appoint a competent person to inquire into and concerning these grounds of complaint, and generally into the connexion of the said water supply with the recent epidemic, and to take the steps prescribed by the said Act to require the Company to remove the grounds of such complaints, so as to avert a similar calamity in the future."

The Board of Trade thereupon directed Captain Tyler to make the investigation, and the following extracts from his Report show the conclusions at which he arrived on the chief points at issue :

" At Lea Bridge there are a large steam engine of 250 horse-power, and a smaller one of 50 horse-power, as well as two water-wheels which work as long as there is surplus water to turn them. The Company are constructing two additional engines of 150 horse-power each, to be completed in the spring of next year. There are here twelve acres of filter beds, and the Company are seeking powers to obtain land for six additional acres of filtering area. Part of the water filtered at Lea Bridge passes through cast-iron pipes 48 inches in diameter and 2½ miles in length to the works at Old Ford, and the remainder is pumped out direct to the district.

" At Old Ford there are two engines of about 70 horse-power and four larger engines, altogether of 560 horse-power. There are also at these works two covered reservoirs, measuring at the upper surface of the water when they are full about 2½ acres, and containing together about 6,000,000 gallons. There are walls of separation between them, with a connecting channel through the walls, but these walls are five feet under water when they are full. These reservoirs were constructed in 1807, and were first used in 1809. From the latter date up to the year 1829, the Company took their whole supply from the river Lea at Old Ford. The reservoirs were filled by sluices with brick channels, which were opened at high water, and the river was thus emptied twice a day ; but little has since been done to the reservoirs, except that they were covered over in 1854–5 by piers and arches of brickwork. They were kept dry for several months while this operation was going on, and the only soakage into them that was then observed was, as far

as the engineers of the Company remember, supposed to come from the sluices, and it was collected in channels and pumped out. They are stated to have been at times nearly emptied for examination since 1855 without any soakage being discovered. The latest date at which such examination occurred is believed to have been six or seven years ago. They have never been cleansed since 1855.

"It was, of course, impossible, to come to any satisfactory conclusion as to the truth or otherwise of the allegation that the water of the Lea found its way into these reservoirs without actual examination when the water was pumped out of them, and I therefore intimated to the Company my desire to make such an examination. They did not at first see their way to it without interfering with the supply of the district, but at length they were good enough to appoint Sunday, the 24th of February, as being the least inconvenient day for the purpose; and the reservoirs were emptied in thirty-six hours, between Saturday morning at 6 a.m. and Sunday evening at 6 p.m., to within about a foot of the bottom, which was as far as the engines would draw the water from them. I devoted three hours on the Sunday afternoon to wading about in the water, and thus making the best examination which the circumstances would permit. I found a spurt of water issuing from the brickwork across an old sluice through which water had formerly been admitted to one of the reservoirs from the river, and I saw water issuing from more than one of the piers by which the arched covering was supported. I observed also a considerable amount of soakage into the reservoir from the slopes of the brickwork at its side, and from the gravel at the foot of the brickwork, over a distance of 210 or 215 feet. In one part there was a tolerably distinct line of soakage some six feet above the foot of the slope. There were also, as it were, springs issuing below the level of the water, and producing motion at the surface, which became more visible as the water decreased in depth; and it was impossible to avoid the conclusion that if more of the bottom could have been laid bare more of these issues would have been seen, and a greater quantity of water would have been found to enter the reservoir. There was much discolouration in different places where the water entered, which appeared to indicate a want of purity, though the water itself appeared to the eye when taken in a glass from the spurts from the brickwork to be bright and sparkling. It was less agreeable to the taste than the Company's filtered water. Samples were handed by the Company to Dr. Letheby for analysis, * * * * and it was ascertained that there were 3·3 grains of matters lost by incineration per gallon, against 1·1, the average by the same chemist for the Company's filtered water for nine months, from April to December 1866; against 2·5 for the water in the main at the London Hospital on the next day; against 1·76 for the water in the Company's main on the 9th of August 1866; and against 1·89 for the water in the uncovered reservoir at the same date. It will further be observed that the water left in the covered reservoir on the evening of the 24th of February was nearly as bad by this test as that which issued from the wall in the old sluice, and was worse than that which spurted from the slope at the north end of the reservoir. But the result of the test by permanganate of potash, relied upon by Dr. Letheby, who appeared for the Company, and objected to by Professor Frankland, is still worse. According to that test, the water which remained in the reservoir was the worst of all, showing 1·28 grains of organic matter per imperial gallon, against 1·12 grains in the spurt from the old sluice; 0·56 grains in the spurt from the slope; the same in the uncovered reservoir, on the 9th of August 1866; ·48 in the London Hospital main at that date, ·80 in the main at the London Hospital on the 25th of February, and ·55 as the general average of the Company's filtered water for the seven months, April to December 1866. The question then arises, how did the water in the covered reservoirs become, at the end of the inquiry, so strongly tainted with organic matter? How could it become, in the case of the first test, nearly as bad as the water leaking through the old sluice, and worse than that leaking from the slope; and, in the case of the second test, worse than the water issuing from either of these places? The only answer that I can make to these questions is, that there must have been, if these tests are to be relied on, means of contamination worse than those supplied by the particular issues of water which were tested; that as the filtered water with which the reservoirs had been filled was pumped out, the

remaining mass of the water was contaminated, either by something at the bottom of the reservoir, or by water soaking into it. During the investigation, I noticed a strong and disagreeable odour, confined within narrow local limits, in two places near the surface of the water, but I was unable to trace it in either case to any source. And there was a considerable amount of deposit from the water in all parts of the reservoir, wherever such deposit could find a resting-place. But this deposit, which was analyzed by both Dr. Letheby and Professor Frankland, was found, as taken from the brickwork, about half way down the slope, to be innocuous. It contained, according to Dr. Letheby, only 0·7 per cent. of organic matter; it consisted principally of carbonate of lime; and it was, according to Professor Frankland, such a deposit as might have been expected from a hard water stored in a reservoir lined with brickwork in mortar. I am therefore driven back to the conclusion that there must have been some soakage through some part of the bottom of the reservoirs of a more hurtful character than the water which issued from the points at which samples were taken. And I must not omit to mention, in connexion with this point, that Mr. Knight, the Surveyor to the Vestry of Mile End Old Town, dug up from below the gravel in one part of the reservoirs a substance which was offensive to the smell.

"I learn that the ordinary pond level of the River Lea, at Old Ford, is two feet below Trinity high-water mark, and that the river stood at or near that level during the above examination. The water in the reservoirs pumped down to a depth of about one foot, would have been ten feet below the level of the water then in the river. The river may rise in extreme flood to 1′ 6″ or 2′ above Trinity high-water mark, and it would in that case be above the full level of the water in the reservoirs, which is ordinarily the same as that of the pond level in the river. The bottom of one reservoir is about twelve, and that of the other about thirteen feet deep below Trinity high-water mark. They are filled every night, and pumped down about five feet every day; and they are thus, taking into account their irregular shape, emptied daily of about one half of their contents. About 11,000,000 gallons of water are delivered daily from Old Ford to the district, all passing through these reservoirs. Of this quantity, about 8,000,000 gallons is drawn through them from Lea Bridge; and out of 6,000,000 gallons which they contain each morning, 3,000,000 gallons is drawn upon during the day, the same quantity remaining in them in the evening, though at times much less water would remain in them. The water in these reservoirs may thus be above that in the river in the morning, and would be below it every evening. The sources of contamination above referred to would come into play as the depth of the water in the reservoirs decreased during the day, but they would be very much diluted, and they would not in the practice of daily working have operated so strongly as on the 24th of February, inasmuch as it was necessary to remove some of the brickwork to enable the engine to draw the water down to so low a level, and the pumping was prolonged at a slow rate to an unusual extent. * * * *

"Under all the circumstances of the case, I am of opinion that the allegation has been proved that the water of the Lea finds its way into these covered reservoirs. There is no doubt as to the impure quality of that water. It would be more or less naturally filtered in making its way through soil and gravel, and the proportion of contamination would be very small in the ordinary operations of the Company, though it would increase as the level of the water in the reservoirs diminished. * * * *

"In addition to the above covered reservoirs, there are at Old Ford two open reservoirs, which were formerly used as depositing reservoirs, in connexion with an aqueduct by which they were supplied until 1855. The one (northern) open reservoir contains four, the other (southern) about five acres of water. There was a sluice from the south to the covered reservoirs, which was otherwise applied in 1855; and a sluice from the north to the covered reservoirs which was used occasionally up to September 1866. The smaller (north) open reservoir receives by night the surplus water, when there is any, from the covered reservoirs. It would run in frequently, but not in great quantity. The sluice into it from the old canal or aqueduct has been opened since 1855, but rarely. The rain goes to supply loss by evaporation. The mass of the water in it is therefore unfiltered, and if the soil

below it be permeable, the water from the river would, when differences in level permit, leak into it.

"Communication was retained between the smaller open and the covered reservoirs after 1855 as a possible resource in case of emergency; and the water from the open reservoir might, before the sluice was filled up in September 1866, have been drawn by the engines and supplied to the district without passing through the covered reservoirs, but this has never been done. The engineer of the Company admits that water from the open reservoir was used during a time of drought in 1864, but he does not believe that it was used in 1865, and he has no knowledge of its having been used more than three times in 1866. He considers that about three inches of water, or 300,000 gallons, would have been drawn from it on each of those three occasions; and this would have been done to maintain such a level in the covered reservoir as was required to keep both of the engines going. The engineer of the Company was aware at the time that water from the open reservoirs was sent out to the district in March 1866, but he was not personally aware of its being so used later in the year.

"The foreman of the Works at Old Ford, who entered the Company's service on the 23d of February 1866, received explanations from the engineer of the Company as to the use of that sluice at that time, and therefore considered the water in the open reservoir available as a reserve in the event of the water getting low in the covered reservoir, to prevent the engine with the higher suction from being damaged. He made no notes on the subject, but he allowed water to run with that view from the open to the closed reservoir, he believes not more than three times during the year 1866. He thinks that those times would have been at the latter end of March, the latter end of June, and some time in the early part of July. He is certain that the sluice of the open reservoir was never opened after cholera broke out in the district. He had no fear of its doing harm. But it so happened that it was not required. He might, of course, have stopped the engine, to prevent it from being damaged, instead of admitting water from the open to the covered reservoir, "but that would not have supplied the district. The extra water from the open reservoir was wanted to complete the supply."

"A carpenter at Old Ford, who has been there for twenty-four years, and assists generally in the engine-houses and on the Works, appears to have been the only man who worked the sluice between the open and the closed reservoirs. He opened that sluice frequently in 1864, frequently in 1865, and three times in 1866. In March 1866 he was in or near the engine house when the engine began to draw air, and he was ordered by the engineer of the Company to open the sluice, which he did. He left it open for two hours to two and a half hours. About two p.m. on some day in the latter part of June he was about the yard when the engine-driver called to him, and "ordered him to let him have some water." He went to the foreman, who ordered him to open the sluice. He did so, and left it open for about the same length of time. Early in July the foreman again gave him orders to open the sluice, and he opened it and left it open for about the same length of time at the same period of the day. These were the only occasions in which he worked that sluice in 1866. He considered the water in the open reservoir to be very good, and had often drank it.

"Such is the evidence which I have received in regard to the allegation of the Memorialists. The truth of it is admitted by the officers and servants of the Company. The use of such unfiltered water so stored in an uncovered reservoir is indefensible, and was a distinct infringement of the provisions of the Metropolis Water Supply Act of 1852. That Act directs (Clause 2) that every reservoir within five miles of St. Paul's Cathedral in which water for the supply for domestic use of the Metropolis is stored or kept shall, after 1855, be roofed or covered over; and (Clause 4) that every Company shall, after 1855, effectually filter all water supplied by them within the Metropolis for domestic use, before the same shall pass into the pipes for distribution, excepting any water which may be pumped from wells into a covered reservoir or aqueduct without exposure to the atmosphere, and which shall not be afterwards mixed with unfiltered water."

The opinion of the Board of Trade upon Captain Tyler's Report was communicated to the Secretary to the East London Waterworks Company in the following letter :—

"Board of Trade (Railway Department),
Sir, Whitehall, 20th June 1867.

I am directed by the Lords of the Committee of Privy Council for Trade to inform you that on the 13th November 1866 their Lordships received from certain inhabitant householders paying rents for, and supplied with water by the East London Waterworks Company, a memorial complaining of the insufficient quantity and impure quality of the water supplied by the East London Waterworks Company.

In pursuance of the 9th Section of the Metropolis Water Supply Act, 1852, (15 & 16 Vict. c. 84), my Lords appointed Captain Tyler to inquire into the grounds of that complaint, and to report to their Lordships thereupon. My Lords have now received from Captain Tyler his report upon the matter so referred to him, and I am to transmit to you herewith a copy of it.

Upon consideration of that report it appears to their Lordships that the complaint of the memorialists is well founded, and I am therefore directed, in pursuance of the 12th section of the Metropolis Water Supply Act, 1852, hereby to give notice thereof to the East London Waterworks Company, and to point out to you that, after the receipt of this notice, the Company are by the 13th section of the same Act required, within a reasonable time, to remove the grounds of such complaint.

I am to request that the receipt of this notice may be acknowledged, and to state that my Lords will be glad to be informed of the steps which the Company propose to take to remove the grounds of the complaint.

I am, &c.
The Secretary to the (Signed) Robert G. W. Herbert.
East London Waterworks Company,
16, St. Helen's-place, Bishopsgate-street."

In reply to this letter the Secretary of the East London Company addressed, on 29th July 1867, a rejoinder to the Board of Trade, from which the following is an extract :

"Into the question raised by the memorialists respecting the connexion of the Company's water with the fearful epidemic of last year, the Directors abstain from entering, not merely because Captain Tyler found it only a 'case of grave suspicion,' and one in which 'proximity to absolute proof' had only been 'nearly reached,' or because the Directors are conscientiously satisfied that the water neither caused nor continued the mischief, but because it appears to the Directors that this is by no means the real issue, for the Board fully admits, and the public is entitled to expect, that if it were conceded on all hands that the water had no connexion with or bearing upon the epidemic, the duty of protecting it from impurity, and of supplying it in the best practicable condition, would still be imperative.

"The Directors do not controvert nor comment upon Captain Tyler's report respecting the Old Ford reservoirs.

"Unfiltered water was to some slight extent, and under special and unfrequent circumstances, admitted into the covered reservoirs from the uncovered reservoirs. The fact is to be regretted ; although the Directors believe (and in this Captain Tyler acquiesces) that no actual mischief resulted from it. In September last, at all events, any repetition of such a proceeding was rendered impossible by cutting off the connexion between the uncovered and the covered reservoirs ; and by clauses introduced by the Company into an Act which has now received the Royal Assent (see section 17 of the 'East London Waterworks (Powers) Act, 1867') provision is made for absolutely filling up the uncovered reservoirs within a limited period.

"Again, it was suggested that there was involuntary soakage of water from these uncovered reservoirs into the covered reservoirs. This suspicion (which appeared to Captain Tyler not well founded) will of course be at an end by filling up the uncovered reservoirs.

"It was further suggested that there was soakage of water under similar circumstances from the river Lea into the covered reservoirs, or one of them, and the Company gave every facility by emptying the reservoir for making the inspection which Captain Tyler desired. The indications which he then observed may or may not support the inferences drawn from them, but the Company at once proceeded to introduce into the same Act a provision (see the section already referred to) of a fully preventive and remedial character, which I will proceed to explain. The covered reservoirs at Old Ford cannot be to any considerable extent interfered with, or their depth or capacity lessened until a further filtering area has been perfected on the Company's supply above them; but the Company has, by the Act I have already quoted, acquired the power and undertaken the duty of forming this further filtering area, and immediately thereupon one of the covered reservoirs at Old Ford is to be filled up, and the depth of the other (which is to be rendered water-tight to the satisfaction of the Board of Trade) is to be considerably lessened.

"Observance of all these remedial proceedings has been secured by heavy penalties voluntarily imposed, and the Company will of course perform what it has in this respect undertaken; thus incurring a very considerable outlay, not perhaps necessary for the remedy or prevention of any actual mischief, but, at all events, desirable as cautionary measures, and for quieting the public mind.

"Such are the steps which the Directors are taking with reference to the special cases in respect of the quality of the Company's supply, which were discussed before Captain Tyler."

In a subsequent memorandum, dated 15th August 1867, Captain Tyler remarks:—

"Upon a review of the whole of the evidence, I found that a case of grave suspicion had been established against the Company, and that while absolute proof in such a matter would be exceedingly difficult, a proximity to absolute proof, which I pointed out, had been nearly reached. Cholera matter would have found its way into the Lea at an early stage of the epidemic, and might have soaked from the Lea into the covered reservoirs, and I expressed an opinion that if, as was possible, choleraic poison did find its way into the Company's mains, it must have passed directly from the river Lea into the closed reservoirs, rather than from the Lea into the open reservoirs, and so to the district through the water that was so improperly supplied from the open reservoirs.

"The four allegations have reference to the quality only of the water. Chemical analysis, though valuable as an auxiliary, is unfortunately a very imperfect guide as regards the absolute condition of water. Chemical evidence avails but little in proof of purity when it is known that the Company's filtered water is more or less contaminated by soakage in the Old Ford covered reservoirs; that unfiltered stagnant water has frequently been served out to the district from the open reservoirs at Old Ford; and that the Lea is itself subject to so much pollution. Admitting that the Company are now doing, or are ready to, or have done, what they can towards removing these means of contamination, there still can be no question as regards the past, that the complaints of the memorialists on the subject of quality may fairly be said to have been well founded."

The subjoined letter from the Board of Trade to the Secretary of the East London Waterworks Company closes the official proceedings in regard to the complaints against the company:—

"Board of Trade (Railway Department),
Whitehall, 18th September 1867.

Sir,

I am directed by the Lords of the Committee of Privy Council for Trade to acknowledge the receipt of your letter of the 29th July, explaining what the Directors of the East London Waterworks Company have done, and propose to do, for the purpose of improving their water supply. This letter has been referred to Captain Tyler for his observations, a copy of which I am now to transmit for the information of your Directors, and from which it will be seen that the action taken and contemplated by the Company is, in the opinion of that officer, satisfactory.

With reference to the third paragraph of your letter, in which you state that your Directors feel constrained to reserve the right of objecting, whenever they

consider it necessary, that the inquiry conducted by Captain Tyler travelled in several respects into matter beyond the legal jurisdiction of an inspector appointed by the Board of Trade ; that his report is liable to the same objection ; and that the very general and unqualified finding by their Lordships, 'that the complaint of the memorialists is well-founded,' goes far beyond the conclusions of Captain Tyler's report ; I am to observe that my Lords are unable to perceive, either in Captain Tyler's report, in your reply, or elsewhere, any sufficient grounds for the objections which, on the part of the Directors, you reserve the right of making at a future time, and cannot admit that Captain Tyler's inquiry or report travelled beyond his legal jurisdiction, which would appear to have been intentionally made extensive by the terms of 'The Metropolis Water Act, 1852,' directing 'inquiry, 'examination, and report, with reference to the grounds of complaint as to the 'quantity or quality of the water supplied.'

With regard to your observations on what you term the 'very general and unqualified finding' of their Lordships, I am to state that it was formally notified to the Company that 'it appeared to the Board of Trade that the complaint of 'the memorialists was well founded' (in the precise terms of the 12th section of the Act), because all the allegations of the memorialists admitting of absolute proof had been found by Captain Tyler to be substantiated, while there were at least strong facts in support of the remaining (the fourth) allegation.

I am to add that, while preferring, with the Company, the extension of a system of constant supply, their Lordships are at the same time of opinion that a Sunday supply should in the meantime be afforded in all those cases in which, as has been clearly pointed out, it is so urgently required, and that no time should be lost in carrying out the various improvements which the Company have now obtained power, or bound themselves, to effect.

The questions of the conservancy of the Lea, of the Company's obligations as regards fittings, and other questions connected with the subject-matter of this inquiry, will receive due consideration from their Lordships in the preparation of any further Bills which it may seem desirable to introduce into Parliament.

I am, &c.

The Secretary of the East London Waterworks Company, 16, St. Helen's Place, Bishopsgate."

(Signed) Robert G. W. Herbert.

Note.—To the Rev. Septimus C. H. Hansard, M.A., Rector of St. Matthew, Bethnal Green, great credit is due for promoting and bringing the local inquiry to a successful issue.

V.—CHOLERA IN LONDON, 1866.

1. Extracts from the Registrar-General's Weekly Returns during the Course of the Epidemic.

[Note.—*The figures quoted throughout the following Extracts are those which were given week by week in the several Returns, and will consequently differ in some degree from the revised figures given in the Tables prepared specially for the Cholera Report.*]

Week ending Saturday, June 2.

The deaths registered in London during the week were 1540. It was the twenty-second week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1195. The mortality is still very high. It is in excess of the estimated amount by 345.

The following two deaths from cholera were registered :—

On 28th May, at 58 North-street, Walworth, the son of a labourer, aged 10 months, died of "Asiatic cholera (one day)."

On 31st May, at 3 Charles-street, Bethnal-green, the son of a warehouseman, aged 5 years, died of "choleraic diarrhœa (24 hours); convulsions (6 hours)."

Week ending Saturday, June 9.

The deaths registered in London during the week were 1383. It was the twenty-third week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1196. The actual number exceeds the estimated amount by 187.

The following three deaths from cholera were registered in the week :—

At 18 North-street, Marylebone, on the 1st June, the widow of a journeyman carpenter, aged 49 years, died of "choleraic diarrhœa (48 hours)."

At 1 Duke's-lane, Kensington, on 2d June, a needlewoman, aged 33 years, "English cholera."

At 47 South-street, May-fair, on 6th June, the daughter of a physician, aged 6 months, "choleraic diarrhœa (4 days)."

Week ending Saturday, June 16.

The deaths registered in London during the week were 1370. It was the twenty-fourth week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1218. The actual return exceeds the estimated number by 152.

The following three deaths from cholera were registered :—

On 12th June, at 3 Archibald-street, Bromley, the daughter of a mariner, aged 8 months, "choleraic diarrhœa."

On 12th June, at 16 Dowson's-place, Mile-end New Town, the daughter of a rag-sorter, aged 11 months, "choleraic diarrhœa (7 days)."

On 13th June, at 6 Swan-court, Newington, a watchman, aged 55 years, "cholera (3 days)."

Week ending Saturday, June 23.

The deaths registered in London during the week were 1295. It was the twenty-fifth week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1208.

Diarrhœa is increasing with the summer heat, and 43 fatal cases of it are returned. A death from cholera was registered as follows:—

On 21st June, at 4 Nursery-place, Walworth, the daughter of a herbalist, aged 7 weeks, "cholera (4 days)."

Week ending Saturday, June 30.

The deaths registered in London during the week were 1400. It was the twenty-sixth week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1263. The actual return is therefore higher than the estimated number by 137.

The following six deaths from cholera were registered in the week:—

On 27th June, at 12 Priory-street, Bromley, a labourer and his wife, both of the age of 46 years, died of "cholera Asiatica," the former after 15 hours', the latter after 12 hours' illness.

On 25th June, at 20 New-street, Berwick-street sub-district (St. James Westminster), two girls, the daughters of a tailor's porter, aged respectively 2 years and 6 years, "English cholera (18 hours)."

On 21st June, at 21 Old Bethnal-green-road, a boy, aged 11 months, "choleraic diarrhœa, exhaustion."

On 22d June, at 51 Wellington-place, Holloway, a girl, aged 14 years, "English cholera (38 hours), syncope."

Week ending Saturday, July 7.

The deaths registered in London during the week were 1292. It was the twenty-seventh week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1269.

There were 102 deaths from diarrhœa, 92 of which occurred under two years of age. The corrected average number of deaths from this complaint in the twenty-seventh or corresponding week of ten previous years is 105. In the corresponding week of 1863 it was 47; in that of 1864 it was 81; in that of 1865 it was 301. Although there is much diarrhœa, it can hardly be considered excessive for the beginning of July.

The following deaths from cholera were registered in the week:—

On 29th June, at 3 George-street, Hammersmith, a labourer, aged 50 years, "cholera."

On 30th June, at 58 Myddelton-square, Clerkenwell, a boy, aged 7 years, "English cholera (24 hours)."

On 5th July, at 96 Borough-road, a boy, aged 6 weeks, "cholera (38 hours)."

Besides these, eleven deaths of children, chiefly infants, are returned as caused by "choleraic diarrhœa."

Week ending Saturday, July 14.

The deaths registered in London during the week were 1540. It was the twenty-eighth week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1293. The actual return exceeds the estimated number by 247.

The intense heat of the weather has favoured the development of diarrhœal disorders. Diarrhœa was fatal in 150 cases; and 32 deaths by cholera are recorded in the week, of which 2 were in the West, 4 in the North, 3 in the Central, 20 in the East, and 3 in the South districts. About half of the number are cases of death by choleraic diarrhœa, or summer cholera. The 17 following are of a severer character:—

London City; *North-west.*—At 27 London-wall, on 12th July, the wife of a blacksmith, aged 40 years, "cholera (24 hours)."

Shoreditch; *Hoxton New Town.*—At St. Luke's workhouse, on 9th July, a japanner, aged 62 years, "cholera (2 days)."

Bethnal Green; *Green.*—At 29 Wellington-place, on 12th July, a porter, aged 37 years, "cholera (12 hours)."

In same sub-district, at the workhouse, on 13th July, a bricklayer, aged 42 years, "Asiatic cholera (30 hours)."

Whitechapel; *Church.*—At the London Hospital from Whitechapel, on 11th July, a female, aged 25 years, "cholera."

St. George-in-the East; *St. Paul.*—At 14 Lower Chapman-street, on 13th July, a railway porter, aged 30 years, "Asiatic cholera (9 hours)."

Stepney; *Ratcliff.*—At 10 The Orchard, on 14th July, a ballast-getter, aged 22 years, "cholera (14 hours)."

Stepney; *Limehouse.*—At 72 Lower North-street, on 11th and 13th July, the son and wife of a dock labourer, aged respectively 9 and 46 years, "cholera Asiatica (9 hours), exhaustion;" "cholera Asiatica (14 hours)."

In same sub-district, at 73 Lower North-street, on 13th July, the daughter of a painter, aged 6 years, "cholera Asiatica (13 hours)."

Mile-end Old Town; *Eastern.*—At 1 Washington-street, on 14th July, a rope-maker, aged 37 years, "cholera Asiatica (22 hours)."

Poplar; *Bow.*—At 1 Crown-terrace, Bromley, on 11th July, a domestic servant (female), aged 50 years, "cholera Asiatica (12 hours)."

In same sub-district, at 5 Catherine-street, Bromley, on 12th July, the wife of a shipwright, aged 41 years, "Asiatic cholera (16 hours)."

In same sub-district, at 8 Wellington-street, Bromley, on 12th July, an excavator, aged 56 years, "Asiatic cholera (14 hours)."

In same sub-district, at 1 Halsey-court, Bow, on 13th July, a mariner, aged 63 years, "choleraic diarrhœa (30 hours)."

Bermondsey; *St. James.*—At 23 Keeton's-road, on 8th July, a mate in the merchant service, aged 29 years, "Asiatic cholera (11 hours)." The medical attendant states that the man arrived with a cargo of fruit on the 7th instant from Rotterdam, where cholera has prevailed.

Camberwell; *Camberwell.*—At 60 Waterloo-street, on 13th July, a carrier, aged 47 years, cholera (18 hours)."

Immediate measures should be adopted by house-to-house visitation and otherwise to treat the disease in its earliest stage of diarrhœa. And the cholera excretions should be effectually removed or destroyed.

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k ending Saturday, July 21.

The deaths registered in London during the week were 1798. It was the twenty-ninth week of the year; and the average number of deaths for that week was, with a correction for increase of population, 1370. The deaths in the present return exceed by 428 the estimated number.

While epidemic cholera has been for months prevalent in several cities on the Continent, and in some cities, such as Amiens, as Dr. Druitt shows, has been extraordinarily fatal, London has hitherto remained free from its ravages. At the end of June the temperature was excessively high, and after that date cholera cases were noticed; their character was not at first grave; but in the first week of July 14 cases, in the second 32 cases of cholera, were registered, half of them at least of the epidemic type. In the week that ended on Saturday last 346 deaths

from cholera were recorded. This fatal explosion occurred chiefly in the comparatively poor districts of the East of London. The mortality by the epidemic is much greater than it was in the corresponding week of 1854, but not so great as it was in the epidemic of 1849.

Of the 346 fatal cases now recorded, 308 occurred in the East districts of the metropolis. In the sub-district of Bow, the total number of deaths was 77 ; of these 39 were referred to cholera. In the sub-district of Poplar 93 deaths were registered, and the deaths from cholera were 52. In the sub-district of Limehouse, the deaths were 54 ; of these 43 were from cholera. In the Green sub-district, Bethnal-green, 59 deaths occurred ; 30 of these from cholera. In the sub-district of Mile-end Old Town Eastern, 57 deaths were recorded, 33 from cholera. Eleven deaths from cholera were registered in the West districts, 6 in the North, and 20 in the South. Only one death from the epidemic occurred in the Central districts. Former experience should now be turned to account; and the authorities should be as prompt in defence as the cholera is in attack.

Week ending Saturday, July 28.

The deaths registered in London during the week were 2600. It was the thirtieth week of the year ; and the average number of deaths for that week is, with a correction for increase of population, 1387. The deaths in the present return exceed by 1213 the estimated number.

The excess of deaths is caused entirely by cholera and diarrhœa. 904 deaths by cholera, 349 by diarrhœa, were registered in the week, making in the aggregate 1253 deaths. The deaths by cholera in the last five weeks have been 6, 14, 32, 346, and 904 ; by its allied disease diarrhœa 67, 102, 150, 221, and 249. The epidemic takes the form of diarrhœa chiefly in young children ; thus 309 of the 349 deaths from diarrhœa last week were children under 5 years of age, including 244 infants. Of cholera 179 children of the same age died ; 160 boys and girls of 5 and under 20 years of age ; 455 men and women in the prime of life ; and 110 people of ages above 60.

[*See ante*, pp. 88, 89, *for the remainder of this Week's Report.*]

POPULATION and WATER SUPPLY of SUB-DISTRICTS, also DEATHS from CHOLERA, in each of the Three Weeks ending 28th July 1866.

Water Company furnishing chief Supply.	REGISTRARS' SUB-DISTRICT.	Population, 1861.	Deaths from Cholera in the Week ending Saturday, July 14 1866	July 21 1866	July 28 1866
	WEST DISTRICTS.				
G.Jun.&W.Mid	St. Mary Paddington *W* H	39015	-	1	1
Grand Junction	St. John Paddington H	36769	-	-	1
West Middlesex	Kensington Town* *W* -	51910	-	1	1
W. Mid. & Chel.	Brompton* H - -	18198	-	-	1
W.Mid. & Wells	St. Peter Hammersmith	5415	-	2	2
W.Mid.,G.Jun., & Wells.	St. Paul Hammersmith -	19104	-	5	-
W. Mid., Chel., & Wells.	Fulham *W* - - -	15539	-	2	1
Chelsea - -	Chelsea South H - -	21634	-	-	1
Ditto - -	Chelsea North-west H *Ww*	19899	-	-	-
Ditto - -	Chelsea North-east -	21886	-	-	-
Grand Junction	Hanover-square - -	19773	-	-	-
Ditto - -	May Fair *W* - -	12885	-	-	-
Chelsea - -	Belgrave H - - -	55113	1	-	2
Ditto - -	St. John Westminster -	37483	1	-	1
Ditto - -	St. Margaret West. *W* H	30730	-	-	-
NewRiv.&Chel.	Charing Cross *W* H -	11071	-	-	1
New River -	Long Acre - - -	11618	-	-	-
Ditto - -	Berwick-street - -	10607	-	-	-
Grand Junction	St. James's-square -	10753	-	-	-
Ditto - -	Golden-square *W* -	13966	-	-	-
	NORTH DISTRICTS.				
West Middlesex	All Souls Marylebone H	29952	-	-	1
Ditto - -	Cavendish-square - -	15090	-	1	-
G.Jun.&W.Mid	Rectory Marylebone *W*	26692	-	1	1
Ditto - -	St. Mary Marylebone -	22493	-	-	-
West Middlesex	Christchurch Marylebone	34913	-	-	1
Ditto - -	St. John Marylebone -	32540	-	-	-
N.Riv. &W.Mid	Hampstead *W* - -	19106	-	-	-
W. Middlesex -	Regent's Park Pancras -	34927	1	-	-
N.Riv.&W.Mid.	Tottenham-court *w*H -	29371	-	-	-
New River -	Gray's-inn-lane H -	27808	-	-	1
Ditto - -	Somers-town - - -	39099	1	-	2
Ditto - -	Camden-town *W* -	23266	-	-	4
Ditto - -	Kentish-town - -	44317	-	-	3
New River -	Islington West *W* HH -	75442	1	-	1
Ditto - -	Islington East *Ww* -	79869	1	-	1
Ditto - -	Stoke Newington - -	6808	-	-	-
East London -	Stamford-hill - - -	5483	-	-	1
New River -	West Hackney - -	24265	-	-	1
E.Lond.&N.Riv.	Hackney *W* H *w* - -	31481	-	3	-
East London -	South Hackney L -	15458	-	1	3
	CENTRAL DISTRICTS.				
New River -	St. George Bloomsbury -	17392	-	-	1
Ditto - -	St. Giles South *W* -	19483	-	-	-
Ditto - -	St. Giles North - -	17201	-	-	-
Ditto - -	St. Anne Soho - -	17426	-	-	-
Ditto - -	St. Mary-le-Strand -	10346	-	-	1
Ditto - -	St. Clement Danes H -	15207	-	-	1
Ditto - -	St.George-the-Martyr H.	19903	-	-	-
Ditto - -	St. Andrew East.Holb. *W*	12947	-	-	-
Ditto - -	Saffron-hill - - -	12012	-	-	-
Ditto - -	St. James Clerkenwell *W*	19152	1	-	-
Ditto - -	Amwell Clerkenwell -	17250	-	-	1
Ditto - -	Pentonville - - -	13079	-	-	-
Ditto - -	Goswell-street - -	16200	1	-	1
Ditto - -	Old-street - - -	11504	-	-	-
Ditto - -	City-road HL - -	17860	-	-	1
Ditto - -	Whitecross-street - -	14778	-	-	-
Ditto - -	Finsbury - - -	12931	-	-	1
N.Riv.&E.Lond.	St. Botolph East London	20900	-	-	4
New River -	Cripplegate - - -	19697	-	-	1
Ditto - -	West London North *W* H	11750	-	1	1
Ditto - -	West London South -	15395	-	-	1
Ditto - -	London City South-west	7762	-	-	-
Ditto - -	London City North-west	9020	1	-	-
Ditto - -	London City South	8570	-	-	-
Ditto - -	London City South-east	8659	-	-	-
Ditto - -	London City North-east	11544	-	-	1

Water Company furnishing chief Supply.	REGISTRARS' SUB-DISTRICT.	Population, 1861.	Deaths from Cholera in the Week ending Saturday, July 14 1866	July 21 1866	July 28 1866
	EAST DISTRICTS.				
N.Riv.&E.Lond.	Holywell Shoreditch -	17313	-	1	1
New River -	St. Leonard Shoreditch L	19188	-	-	1
Ditto - -	Hoxton New Town *w* -	26316	1	3	5
Ditto - -	Hoxton Old Town - -	25777	-	-	-
Ditto - -	Haggerstone West *W* -	23260	1	1	-
East London -	Haggerstone East - -	17310	-	-	-
Ditto - -	Hackney Road - -	26298	-	3	8
Ditto - -	Green,Bthnl.Grn. *W* HL	31789	2	30	49
Ditto - -	Church, Bethnal Green -	25528	1	8	18
Ditto - -	Town, Bethnal Green -	21486	1	2	15
E.Lond.&N.Riv.	Artillery Whitechapel -	6557	-	2	1
East London -	Spitalfields - - -	15700	-	-	9
Ditto - -	Mile End New Town *W*	15392	-	7	25
E.Lond.&N.Riv.	Whitechapel North -	12122	1	2	9
East London -	Whitechapel Church H	8062	1	8	70
Ditto - -	Goodman's Fields - -	11166	-	5	12
N.Riv.&E.Lond.	Aldgate - - - -	9971	-	1	5
East London -	St. Mary St. Geo. East	18181	-	10	26
Ditto - -	St. Paul St. Geo. East -	21015	1	8	23
Ditto - -	St. John St. Geo. East *W*	9695	-	7	30
E.Lond.&N.Riv.	Shadwell *W* - - -	12537	-	10	22
East London -	Ratcliff *W* - - -	16874	2	14	38
Ditto - -	Limehouse *W* - -	27161	4	43	75
Ditto - -	Mile End OldTown,West.	33747	-	19	47
Ditto - -	MileEnd OldT., East. *Ww*	39317	1	33	75
Ditto - -	Bow *w*eL - - -	35667	4	39	141
Ditto - -	Poplar *W* - - -	43529	-	52	113
	SOUTH DISTRICTS.				
Lamb.&Southk.	Christchurch Sthwark. *W*	17069	-	-	1
Southwark -	St. Saviour Sthwark. H -	19101	-	-	-
Ditto - -	St. Olave Southwark H -	7663	-	2	1
Ditto - -	St. John Horsleydown *W*	11393	-	-	-
Ditto - -	St. James Bermondsey -	25154	1	1	2
Ditto - -	St. Mary Magdalen *W*	16505	-	-	-
Southk.&Lamb.	Leather Market - -	16696	-	-	-
Ditto - -	Kent Road - - -	19652	-	1	-
Ditto - -	Borough Road *W* -	16668	-	-	1
Lamb.& Southk.	London Road L - -	19190	-	1	1
Southk.&Lamb.	Trinity Newington -	22675	-	1	-
Ditto - -	St. Peter Walworth *W*	44463	-	1	-
Lamb.& Southk.	St. Mary Newington H	15082	-	-	-
Ditto - -	Waterloo Road 1st - -	15269	-	1	-
Ditto - -	Waterloo Road 2nd -	18640	-	-	1
Ditto - -	Lambeth Church 1st -	19839	-	-	1
Ditto - -	Lambeth Church 2nd *W*	29542	1	1	3
Southk.& Lamb.	Kennington 1st - -	30785	-	1	1
Ditto - -	Kennington 2nd - -	20440	-	-	-
Lamb.& Southk.	Brixton - - -	20067	-	-	1
Lamb. & Wells	Norwood *W* - - -	7462	-	-	-
Southk. & Wells	Clapham - - -	20894	-	-	-
Ditto - -	Battersea *Ww* - -	19600	-	-	3
Ditto - -	Wandsworth L - -	13346	-	-	-
Ditto - -	Putney - - - -	6481	-	-	-
La., Sk., & Wells	Streatham - - -	10082	-	-	-
La., Sk., & Wells	Dulwich - - - -	1723	-	-	-
Southk.& Lamb.	Camberwell *W* LL -	21297	1	3	2
Sk.La.K.& Wells	Peckham - - -	28135	-	-	4
Lamb.&Southk.	St. George Camberwell -	20333	-	4	3
Sk. K. & Wells	Rotherhithe *W* - -	24502	-	-	4
Kent - -	St. Paul Deptford - -	37834	-	1	4
Ditto - -	St. Nicholas Deptford -	8139	-	1	1
Ditto - -	Greenwich West H	21696	-	1	1
Ditto - -	Greenwich East *W* H -	18306	-	-	4
Ditto - -	Woolwich Dockyard H -	22919	-	-	-
Ditto - -	Woolwich Arsenal H -	18776	-	-	-
Ditto - -	Plumstead and Charlton	32974	-	-	-
Kent & Wells -	Eltham - - - -	3009	-	-	-
Kent - -	Lee - - - -	11807	-	-	-
Kent & Wells -	Lewisham Village *W* -	7372	-	-	-
Lambeth -	Sydenham - - -	10595	-	-	-

NOTE.—The letters placed against the names of the sub-districts denote public institutions situated therein, namely,

W—Workhouse;
H—Hospital;
L—Lunatic asylum;
w—a workhouse not belonging to the district in which it is situated.

The following are OUTLYING WORKHOUSES:

St.Geo.Hanover Sq. Workh. is in Chelsea North-west sub-dist. 2:2.
The Strand - - ,, ,, Tottenham-court sub-district. 9:2.
West London - ,, ,, Islington East. 10:2.
East London - ,, ,, Hackney sub-district. 11:4.
St. Luke Middlesex ,, ,, Hoxton New Town sub-dist. 20:3.
London City - ,, ,, Mile End Old Town Eastern sub-dist. 24b: 2, and Bow sub-dist. 25:1.
Stepney - - - ,, ,, Bow sub-district. 25:1.

* The Medical Officer of Health states that Kensington parish is supplied by three Water Companies.

Week ending Saturday, August 4.

The deaths registered in London during the week were 2661. It was the thirty-first week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1395. The deaths in the present return exceed the estimated number by 1266.

There is a slight increase in the high rate of mortality that ruled in the previous week. 1053 persons died of cholera, 354 of diarrhœa, making 1407 deaths from both forms of disease.

The deaths returned in the four last weeks from cholera were 32, 346, 904, and 1053; from diarrhœa 150, 221, 347, 354. The deaths from cholera exceed by 149 the deaths in the previous week; the excess in the total deaths is only 61.

Of cholera and diarrhœa 573 children under 5 years of age, 114 boys and girls of the age of 5–10; 79 of the age 10–20; 255 men and women of the age 20–40; 248 of the age 40–60; 127 of the age 60–80; and 11 old people of 80 and upwards.

Deaths from diarrhœa or cholera in small numbers occurred all over the London districts; in Kensington, Marylebone, Pancras, Islington, Holborn, the numbers were considerable. In the West districts of London 12 persons died of cholera; in the North districts 46 (including 19 in Islington, 20 in Hackney); in the Central districts 31, including 12 in St. Botolph; in the South districts 47, including 21 in Deptford and Greenwich; while in the East districts 916 persons died of unequivocal cholera. Only 16 of the deaths from cholera occurred in one of the largest of the East districts, Shoreditch. The violence of the attack is still expended on Bethnal-green, Whitechapel, St. George-in-the-East, Stepney, Mile-end Old Town, and Poplar, including Bow. There is some subsidence in Poplar and Stepney, but increased virulence in Bethnal-green and Whitechapel. The attack has been circumscribed by nearly the same lines for three weeks in succession. This is no accident; the phenomena are due to some specific cause.

These violent outbreaks are almost invariably in England the result of contamination of the waters; and the question is subsequently noticed. Upon the assumption that the waters were at some time impure, there is this further aggravation that in the lower districts the water is not carried away. "It is unfortunately," says Mr. Bazalgette, "the locality where our main drainage works are not complete." A temporary pumping station is to be erected forthwith, and will be in operation in about three weeks at Abbey Mills.

The East London waters have been analyzed by Professor Frankland, whose report is reassuring; and Mr. Greaves, the engineer, is fully alive to the extreme importance of pure water at the present moment. The waters of shallow wells and pumps are polluted; and in this crisis the health of London is very much in the hands of our hydraulic engineers.

The local authorities, who had not instituted generally house-to-house visitation, are now on the alert. The sympathy of the whole nation with the sufferers has been touchingly expressed by Her Majesty, and has been proclaimed by the Prime Minister. Under these auspices, and with the intelligent exertions of the people themselves, we may hope ere long to see the destructive progress of the plague stayed.

The Water Supply of the East Districts.—The cause of the epidemic of cholera consists, as is well known now, of a zymotic matter in various degrees of activity all over the London area; affecting the people in various ways, through air, contact, and water. Hitherto, in all great outbreaks here, the *cholrine*, which this stuff may be called, has been distributed chiefly through water, as was shown in the Registrar General's reports on the previous epidemics.

When it was observed, therefore, that the present fatal explosion of cholera fell on the East districts in the first week, suspicion was aroused; and that was strengthened by the observations of the week ending July 28th, and by personal inspection, which showed that the attacks were diffused over a wide area, among many people in bad hygienic conditions, and also among many in ordinary conditions,

often well to do, living in streets by no means so poor or so dirty as the streets of the south and of other regions of London. The population was principally in the port of London, but not exclusively; and little more exposed to infection than the districts along the south side of the Thames, which had formerly been decimated by cholera, when the water supply on that side was polluted. The air of East London is often charged with impurities, which are undoubtedly noxious; and so are other parts; but any impurity of the air is rapidly diffused all over London.

Nearly all of the infected districts are supplied by one water company, which now derives its water, not as was stated last week at Lea Bridge where its filtering beds lie, but about $2\frac{3}{4}$ miles higher up the river, and above Tottenham; as far as Enfield the river is protected from sewage by an intercepting drain; but it receives the drainage of all the country and towns in its basin.*

The New River takes a large portion of its supply higher up the Lea; and engages to deodorize the sewage of Hertford before it is discharged into the water. There is no such protection against the sewage of Ware. Upon the whole, the upper waters of the tributary Lea are not worse than the waters of the Thames, which are exposed to similar contaminations; and the filtering arrangements of the East London Company are elaborate, and probably as effective as those of the Thames companies. The 13 filter beds at Lea Bridge cover an area of 12 acres. A part of the water is distributed from the well of those beds by the most powerful engine of the company; the rest of the filtered water is carried three miles down to a covered reservoir of about $2\frac{1}{2}$ acres at Old Ford, where it is distributed over the area now suffering so much from cholera. The water in this reservoir looks perfectly pure. Close by its side, which is well built, flows the tidal end of the Lea, black and full of the foulest impurities.

The company in its first years drew its waters mainly from the Lea at this point, and the first improvement was effected by carrying its intake up the river to Lea bridge beyond the tidal range. The water was brought down an open canal by the side of Hackney cut, and terminated in two large reservoirs on the other side of the black Lea. This canal and these reservoirs of about nine acres still exist; they are marked in the most recent map by Stanford as the "East London Waterworks canal," and the "East London Waterworks reservoirs." One of these reservoirs was recently emptied, and was filled again perhaps by springs or soakage. These old reservoirs are not, it is said, used, the covered reservoirs containing the only water fit for use; but the old reservoirs retain their old channels of communication with the pumping wells, and the company has the power in an emergency to distribute the water from the old reservoirs all over the region of the cholera field. But this the company professes not to do,—and it could scarcely be the result of accident, otherwise the diffusion of the waters of the old reservoirs over the area would afford a probable explanation of the sudden outbreak in East London.

It is a notable circumstance that the parts north of Victoria park, supplied by the East London company direct from their filter beds, have not hitherto suffered from cholera, notwithstanding contiguity to the infected districts, more than other districts supplied by other companies. This implies that the East London water as it leaves the filter beds is as good as any other water in London.

It is natural, as land is valuable in East London, to inquire why a commercial company has for many years retained some miles of a canal and nine acres of reservoirs for no purpose? Mr. Greaves replies that the canal serves to carry off the waste of the filter beds, and that the company proposes to convert one of the old ponds into a covered reservoir. When this is done, and the other pond, which, we are told, is of no use, is filled up, or has no longer any connection with the pumping wells of the company, the public may well rest satisfied, until some great general reform is effected in the water supply of London. In the interests of the public health the country has a right to demand this security.

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* Mr. J. N. Radcliffe has remarked that the Cobbin, which flows into the Lea through Waltham Abbey, drains Epping, where the late small outbreak of cholera was observed. That stream is said to be dry.

The following are Extracts* from LETTERS which have been received from PROFESSOR FRANKLAND, F.R.S. :—

"I have seen an abstract of the Registrar General's Return. The mortality is frightful. I write to suggest the addition of permanganate of potash to the water in the Company's reservoirs. The amount required would be 80 lbs. of permanganate to every 1,000,000 (million) gallons of the water. The permanganate should be dissolved in a few hundred gallons of the water, and then run into the reservoirs with the rest of the water in such a manner as to get a thorough admixture. If the water retains a pink hue so much the better; it will lose it before it reaches the consumer; in fact the permanganate ought to be added until a pink tint lasting half an hour is obtained in the reservoir. The quantity may appear large, but it is of no use to employ a smaller amount. It should be applied, if possible, *after filtration*, and immediately before transmission to the consumer. Mr. Condy, near Battersea, manufactures this material largely, but I do not know if he could meet so large a demand.

"The expense of the permanganate at a shilling per lb. will be considerable; but what is such an expense in the face of this mortality? It will cost much less than the disinfection of the London sewage, which was contemplated some time ago. Of course the effect of the permanganate is not a matter of certainty, but it is the only thing, capable in this emergency of such application, that I should have any faith in. It is quite innocuous, and could therefore do no harm. It is much better than boiling the water, even if that were possible, for water containing a slight leakage from a watercloset is not deprived of its noxious qualities by being boiled for a short time.

"When I state that permanganate is the only purifier in which I should have faith, I have regard of course to what is practicable in the present emergency, for, if its use were practicable, I should prefer filtration through animal charcoal, which, as you will see from my three recent reports, removes practically *all organic* matter. 1½ tons of *animal* charcoal would be required for each 1,000,000 gallons sent out daily. The animal charcoal should be in grains about the size of blasting powder, and the filtered water would simply have to pass through the mass of this charcoal contained in a suitable tank. The London Water Purifying Company between the entrances to King's College and Somerset House use this material, and it is through one of their filters that the New River water passes for my monthly determinations. I think, after all, that such a mode of purifying the whole of a company's water is by no means an insuperable undertaking. The charcoal will continue to act for six months at least. It is the charcoal used by sugar refiners, and care should be taken that it is fresh, and has not been already used."

Royal College of Chemistry,
August 4th, 1866.

SIR,

IN compliance with your request I have made a special analysis of the water supplied by the East London Company, and collected on the 1st instant. The following are the results, together with those yielded by the water supplied by the same Company on the 1st of July, and on the average of a whole year.

———	Solid Matter in 100,000 parts.	Organic and other volatile Matter in 100,000 parts.	Oxygen required to oxidise the organic Matter.	Degree of Hardness.
East London Company's Water, collected 1st August 1866	26·14	1·44	·0328	17·7
East London Company's Water, collected 1st July 1866	24·38	1·94	·0344	16·0
East London Company's Water (average of one year)	27·98	1·62	·0504	21·12

It is the amount of organic matter contained in this water which is of especial importance in connection with the outbreak of cholera in the district supplied by

* These extracts were immediately forwarded to Mr. Greaves.

this company. The above results show that, in this respect, the water supplied on the 1st of August is considerably better than that supplied on the 1st of July, when the amount of this ingredient was markedly above the average. Chemical analysis, therefore, although it shows a larger quantity of organic matter than ought to be contained in water used for drinking purposes, does not reveal any exceptional degree of pollution in this water. It must be borne in mind, however, that chemical investigation is utterly unable to detect the presence of choleraic poison amongst the organic impurities of water, and there can be no doubt that this poison may be present in quantity fatal to the consumer, though far too minute to be detected by the most delicate chemical research.

It is thus that the occurrence of cases of cholera, or of choleraic diarrhœa, upon the banks of any of the streams, from which the water supply of London is so largely derived, may at any moment diffuse this poison over large areas of the metropolis. For the prevention of such a catastrophe there is a method which deserves considerable confidence. In my last three monthly reports to you on the metropolitan waters, I have shown that filtration through *animal* charcoal (bone-black) removes, practically, the whole of the organic matter from the New River water; and in numerous other experiments, I have ascertained that this process is equally efficient even when applied to the foul waters of ponds and ditches. I have also proved that its action continues unimpaired for three months, and will probably last for a year, even when very large volumes of water are passed through it. *Animal* charcoal alone has this power; *vegetable* charcoal being perfectly inert.

I would, therefore, most earnestly recommend, that during the prevalence of cholera, the whole of the water supplied to the metropolis should be passed through animal charcoal immediately before transmission to consumers from the reservoirs of the respective companies. For this purpose 300 tons of bone-black in the condition in which it is used by sugar refiners would be required to purify the total supply of the metropolis, as I find that water passed at the rate of 1,000,000 gallons in 24 hours through 3 tons of bone-black is completely purified. This operation, even when performed upon the water supply of London (100,000,000 gallons daily), would be neither formidable nor expensive. Three or four days would suffice to fix the necessary filtering boxes, whilst the animal charcoal, being an article which is now manufactured on a very large scale, can be had on the shortest notice. It is scarcely necessary to add, that the water should be passed through the animal charcoal after it has undergone the usual process of filtration.

I have, &c.

E. Frankland.

In reply to an inquiry Mr. Bazalgette has favoured the Registrar General with a short account of the drainage of the cholera district.

"It is unfortunately just the locality where our main drainage works are not complete. The low-level sewer is constructed through the locality, but the pumping station at Abbey Mills will not be completed until next summer; therefore the drainage of the district does not yet flow into the low-level sewer. We are deodorizing the sewers and gullies freely with chloride of lime, and to-morrow I shall recommend the Board to erect a temporary pumping station at Abbey Mills to lift the sewage of this district into the Northern Outfall Sewer. This can be accomplished in about three weeks time.

"Yours faithfully,

"J. W. Bazalgette."

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ek ending Saturday, August 11.

The deaths registered in London during the week were 2299. It was the thirty-second week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1366. The deaths in the present return exceed the estimated number by 933.

The weekly deaths are declining. 2299 deaths were registered last week; 2661 in the week preceding. The deaths are less by 52 daily than they were in the previous week; and the whole of the decrement is accounted for by the fall of the deaths by cholera and diarrhœa from 1407 to 1045.

Of cholera 781, of diarrhœa 264 persons died last week; of both forms of disease 1045; which is less than the numbers in the previous week by 362, thus distributed in respect of ages: under 20 the decrease of children's deaths is 228, at 20–40 the decrease is 80, at 40–60 it is 42, at 60–80 it is 16; of old people of 80 and upwards the deaths have increased by 4.

The decrease in the mortality of children is gratifying evidence of the good effects of increased care for their lives.

As the East districts were devastated to the greatest extent, they last week experienced the greatest relief; the deaths in them from the epidemic, including diarrhœa and cholera, fell from 1041 to 774, and the decline is observable in each of the districts.

10,898 persons have died in London during the last five weeks; a number exceeding the corrected average by 4213. Within the five weeks 3116 persons died of cholera, 1338 of diarrhœa. The mortality in the West districts was at the annual rate of 24, in the East districts at the rate of 82 per 1000 inhabitants. In the West districts 225, in the East districts 3182 persons died of cholera and diarrhœa; the estimated population being respectively 511,258 and 607,945.

To facilitate the inquiry into the causes, and to supply information to those who are engaged in combating the epidemic, the particulars of every death in London are now published daily; records of all the deaths for instance registered on Monday in the districts of London from Fulham to Woolwich can be procured on Tuesday evening, by scientific men, at the Queen's printers.

The deaths registered from cholera in the East districts during the seven days of the week were 223 on Sunday and Monday, 114 on Tuesday; 90, 98, 71, and 78 on the four following days: in all London on the same days 249, 130, 109, 114, 85, 94.

No greater mistake could be made than to relax the efforts for combating the disease, or for relieving the distress which it has already wrought.

The Water companies, Professor Frankland has suggested, should filter their supplies through animal charcoal; and the suggestion is well worthy of the consideration of their engineers at this time, when the waters of no shallow wells can be used without risk. In epidemic districts the water butts should be emptied, disinfected, and refilled.

Week ending Saturday, August 18.

The deaths registered in London during the week were 1799. It was the thirty-third week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1332. The deaths in the present return exceed the estimated number by 467.

The deaths are less by 500 than the numbers recorded in the previous week. The deaths by cholera have fallen from 1053 and 781 in the two previous weeks to 455. The decrease of deaths by the two forms of cholera and diarrhœa is absolutely greatest in childhood, but relatively greatest in manhood. Thus the deaths under the age of 20 have fallen in the week from 538 to 373, at the age of 20–40 from 175 to 121, at 40 and upwards from 332 to 155. Thus this epidemic explosion which has slain in a few weeks so many people in the East, and has threatened the whole population of London, is subsiding. It has been felt in every district, but its great ravages have not yet extended beyond the original limits.

Mortality of the several London Districts from Cholera.

We may now venture to look back, and draw some deductions from the facts as they are recorded in the Tables for the five weeks ending August 11th, during which 4454 men, women, and children died of cholera and diarrhœa.

The mortality in the five weeks has been at the rate of 37 per 1000 living annually; but in both the SOUTH and the WEST districts, covered by 1,400,000 people, the mortality has scarcely exceeded the average by 1 per 1000. The annual rate of mortality by cholera was 1 in Kensington and Paddington, 0·3 in Chelsea, 0·4 in St. George Hanover-square, 1 in Westminster, 0·5 in St. Martin-in-the-Fields, 1·5 in St. James Westminster. The mortality from cholera and diarrhœa was highest in Kensington (6) and lowest (2) in St. James Westminster, the scene formerly of the Broad-street pump mortality. The west districts are supplied chiefly by the Thames water companies, the New River supplying portions of St. James Westminster and St. Martin's.

The mortality in the SOUTHERN DISTRICTS by cholera was 3 in 1000 in St. Saviour Southwark, 2 in St. Olave, 2 in Bermondsey, 2 in St. George Southwark, 0·3 in Newington, 1 in Lambeth, 2 in Wandsworth, 3 in Camberwell, 3 in Rotherhithe, 3 in Greenwich where Mr. Glaisher has observed the famous "blue mist," and 0·2 in Lewisham. The mortality by cholera and diarrhœa was highest in St. Saviour Southwark (8), and lowest in Lewisham (1). These southern districts are generally poor; they lie low; and they were decimated by cholera in the epidemics of 1849 and 1854, wherever the impure water of the tidal Thames was distributed. Their water is now drawn above Teddington Lock from the Thames.

The five north districts fared nearly as the CENTRAL DISTRICTS; the mortality by cholera was 0·5 in Marylebone, 0·4 in Hampstead, 1·2 in Pancras, 1·9 in Islington, and 4·9 in Hackney; the mortality by cholera and diarrhœa was lowest in Hampstead (3) and highest in Hackney (8). These districts are chiefly supplied by the New River, one of the Thames companies, and a portion of Hackney, it is believed, from the Lea Bridge reservoir of the East London Company.

The dense CENTRAL DISTRICTS are, some of them, such as St. Luke's, remarkable for poverty, others, such as the City of London within the walls, for their wealth. The mortality by cholera was at the rate of 1 per 1000 in St. Giles, 2 in the Strand, 0 in Holborn (which appears to return all its cases as diarrhœa), 1 in Clerkenwell, 1 in St. Luke, 7 in East London, 7 in West London, and 2 in the City district; from cholera and diarrhœa the mortality was highest in the City without the walls, 10; and St. Giles, 9; lowest in the City within the walls, 3. The whole of the central districts are supplied by the New River, which draws part of its supply from the Lea river and part from springs. The East London Company enters the City sub-district in St. Botolph, where a few deaths from cholera have been registered.

There are seven districts in the east; the mortality by cholera in the poor district of Shoreditch was at the annual rate of 4, by cholera and diarrhœa 8 in 1000: five of its sub-districts are supplied by the New River, one partially, and one wholly by the East London probably from Lea Bridge. In the rest of the east districts the mortality by cholera was at very different rates; it was at the rate of 39 per 1000 in Bethnal-green, 50 in Mile-end Old Town, 60 in St. George-in-the-East, 70 in Whitechapel, including deaths in the London Hospital from other eastern districts, 70 in Poplar and Bow, and 80 in Stepney. Bethnal-green is one of the poorest districts of London, if we may judge by the annual value of the houses; but the people of Bow and Poplar are not conspicuous for poverty. The whole of these districts where the mortality from cholera was from thirty to forty-fold higher than it was either in the west or the central, in the north or the south of London, were supplied with water from the Old Ford reservoirs. London is divided into thirty-seven districts; *six* districts are supplied from Old Ford, and every one has been ravaged by the epidemic; the other thirty-one districts have for six weeks in succession suffered slightly. The 37 districts are sub-divided into 135 sub-districts; 21 are supplied with the same water, and have all suffered six weeks in succession; 115 sub-districts have suffered inconsiderably, except in St. Botolph and a few other districts, where the same water has crept in, and the mortality is partially swollen.

By the doctrines of chances, it is impossible that the coincidence between this particular water and the high mortality should be fortuitous, in 135 cases, during six weeks in succession.

The induction extends over all the area of observation in previous epidemics, where sewage water has so often led to cholera outbreaks.

The persistence of the epidemic in the east London districts is no proof that the supply of the company is now worse than that of other companies, as its effects on the place, and on the population only subside slowly.

This great lesson should be taken to heart by every water company and every community in the kingdom. Unclean water cannot be consumed with impunity; its consumption is the sin of which cholera is the punishment.

Week ending Saturday, August 25.

The deaths registered in London during the week were 1477. It was the thirty-fourth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1304. The deaths in the present return exceed the estimated number by 173.

The mortality from cholera and diarrhœa is declining. 265 deaths from cholera and 129 from diarrhœa were registered last week. In the five preceding weeks the deaths from cholera were 346, 904, 1053, 781, 455; the deaths from diarrhœa in the same periods were 221, 349, 354, 264, 194. Of the deaths registered last week from cholera and diarrhœa, 198 persons died from cholera and 41 from diarrhœa in the East districts, 3 from cholera and 15 from diarrhœa in the West, 12 from cholera and 21 from diarrhœa in the North, 13 from cholera and 13 from diarrhœa in the Central, 39 from cholera and 39 from diarrhœa in the South districts.

One hundred and fifteen young persons under 20 years of age died from cholera, and 115 from diarrhœa; at the age of 20 and upwards, 150 deaths occurred from cholera and 14 from diarrhœa.

Week ending Saturday, September 1.

The deaths registered in London during the week were 1413. It was the thirty-fifth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1259. The deaths in the present return exceed the estimated number by 154. The excess is accounted for by 198 deaths from cholera.

The deaths from cholera during each of the last five weeks have been 1053, 781, 455, 265, and 198; from cholera and diarrhœa 1407, 1045, 649, 394, and 326. The deaths from cholera and diarrhœa in ten weeks have been 6012.

Of the 198 deaths from cholera, 6 occurred in the West districts, 15 in the North districts, 9 in the Central districts, 122 in the East districts, and 46 in the South districts. While in the East districts cholera has declined rapidly, it is nearly stationary in the Southern districts, the deaths happening chiefly by the river at Deptford and Woolwich; where it is to be feared the authorities and the people are negligent. The pumps demand attention. Due care is not taken to prevent the diffusion of the cholera matter. Dr. Greenhill gives* a remarkable instance of mortality due apparently to the introduction of a dirty cholera bed, thus enforcing the importance of the precept: burn all the dirty bedding and linen of cholera patients. Undoubtedly much credit is due to the people for their exertions in suppressing cholera; but with steadier efforts on their part, and on the part of the water companies, the disease will die out more rapidly.

Cholera and the London Water Companies.

London is divided into fields among the water companies; the Chelsea company, the Grand Junction, and the West Middlesex have the west districts,—the Southwark, the Lambeth, and the Kent companies have the south districts, for their respective domains; out of 10,000 inhabitants in each of these fields six deaths

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* See page 130.

occurred in seven weeks from cholera and diarrhœa, and the proportion in all the other fields except one is nearly the same.

The New River company supplies nine north and central districts from the river Lea* and from springs ; the deaths by cholera and diarrhœa out of 10,000 inhabitants in these districts were nearly 8.

The East London company supplies six districts with the waters of the Lea, and the deaths out of every 10,000 inhabitants were 79 ; or, without calculation, the deaths were 415 out of 536,576 inhabitants supplied by the New River ; the deaths were 3721 out of 471,109 inhabitants supplied by the East London company. The two companies are neighbours, and take their waters from the same Lea river.

Hackney, Shoreditch, and the East London Union are jointly supplied by the two companies ; the deaths by cholera and diarrhœa were 10 in 10,000 inhabitants. But the East London company sends water to these districts chiefly from Lea Bridge ; and, strange to say, only its waters from the Old Ford reservoirs two miles down, have gone to the fatal districts. Every district to which these waters have gone has suffered in an extraordinary degree ; the other districts have not suffered to a tenth of the extent.

It is of such vital importance to determine accurately the exact operation of the water in causing so many deaths, that Professor Frankland has been requested to make a careful analysis of the East London water in the various reservoirs. This he has done, and briefly described the works in a very able paper. (*See next page.*)

Underground hydraulic works cannot be easily inspected, and still less easily described ; much less can their operations, and the flow of their waters in past months, be now learnt. Mr. Greaves alone can write the history of these eventful weeks.

But nearly all that is really essential can be learnt from the papers in the appendix. The Lea is formed by the confluence of five or six streams in Hertfordshire ; divides Middlesex from Essex ; and empties its residual waters into the Thames at Bow Creek. At Lea Bridge the East London company has its 13 filter beds in two groups, one on each side of the Lea ; they are fed by an open aqueduct which carries down the water two or three miles after it has passed through subsidence beds. In ordinary circumstances a part of this filtered water is distributed directly from Lea Bridge over "Tottenham, Hackney, Shoreditch, Haggerstone, during the day, and the whole of the company's district during the night ;" here cholera, in the parts north of Victoria Park, was not fatal, The rest of the water is conveyed down two miles or more of a large iron main to Old Ford, where it is lodged in a small covered underground reservoir, for distribution by three powerful pumping engines : the pipes of Old Ford inosculating freely with those of Lea Bridge, the water system in the pipes sways backwards and forwards at their juncture according as the waters above or below prevail.

What resource has the engineer if the filter beds in July refuse to act, or if, as lately happened to the New River, a main bursts, or if any accident happens to the complicated apparatus ? This has to some extent been provided against. The waters of the aqueduct at Lea Bridge can be passed directly without filtration into the main ; and as the waters from the filter beds at Lea Bridge are carried down the company's canal to two large open reservoirs of nine acres at Old Ford, the water of these reservoirs can be used, as they can at once be thrown in any quantities into the pumping wells.

The bottoms of all the Old Ford reservoirs are much below the dirty sewage waters of the Lea at Trinity high-water mark ; and Professor Frankland shows the possibility of the accidental contamination of the waters of the covered reservoir. It is evidently as difficult to obviate this evil as to keep the upper waters of the Lea perfectly free from sewage like that which infests the Thames.

There is another hypothesis. During certain days of June or July, perhaps in the absence of the engineer, there was a hitch in the supply ; and the waters of

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* 82 per cent. of their water in 1865 was drawn from the Lea. (Appendix to First Report of Commission on Pollution of Rivers, p. 37.)

the two, open, almost stagnant reservoirs, one filled by soakage in part from the Lea, were mixed with the comparatively purer water in the mains of the company. This hypothesis is in accordance with all the known facts, and with the circumstance that the cholera began to subside in all his districts immediately after the engineer's attention had been directed to the dangerous state of the waters. If this hypothesis is rejected the Company can exercise no immediate control over its supply.

The East London Company is in the condition of a grand hotel which has one small cellar of good wine and two of bad vintages, which, as in the words of its manager, it never uses, "except in cases of emergency," its customers would be pleased to learn were suppressed.

The open reservoirs near the Lea in communication with the pumps of supply at Old Ford are a public danger, not only to the population that has been decimated in the East, but to the population of all London, for the diseases they engender spread like fire. The reservoirs, as well as the canal, should be abolished, and the water be stored somewhere else in safety.

LONDON.—TABLE showing the ESTIMATED POPULATION 1866, the DEATHS registered in the 7 Weeks ending August 25th, and the NUMBER of DEATHS in 7 Weeks to 10,000 PERSONS living; from ALL CAUSES, and from CHOLERA and DIARRHŒA, in the SEVERAL GROUPS of DISTRICTS supplied chiefly by DIFFERENT WATER COMPANIES.

No. of Districts.	Companies furnishing the greater Part of the Water Supply.	Estimated Population 1866.	Deaths registered in the 7 Weeks ending August 25th, 1866.				Number of Deaths in 7 Weeks to 10,000 persons living.			
			All Causes.	Cholera.	Diarrhœa.	Cholera and Diarrhœa.	All Causes.	Cholera.	Diarrhœa.	Cholera and Diarrhœa.
14	Districts supplied by the Thames Water Companies, viz.:—									
	5 (a) by Grand Junction, West Middlesex, and Chelsea	615,604	2,024	57	311	368	32·9	·9	5·1	6·0
	9 (b) by Southwark and Lambeth	638,292	2,194	142	273	415	34·4	2·2	4·3	6·5
18	Districts supplied by the Lea Water Companies, viz.:—									
	9 (c) by New River, drawing its water from upper part of Lea River (82 per cent.), from Chadwell Spring, and other sources	536,576	2,020	113	302	415	37·6	2·1	5·6	7·7
	6 (d) by East London from Old Ford Reservoir	471,109	5,406	3,237	484	3,721	114·8	68·7	10·3	79·0
	3 (e) by New River, and by East London from Lea Bridge	271,617	1,022	158	117	275	37·6	5·8	4·3	10·1
3(f)	Districts supplied by the Grand Junction, New River, and West Middlesex Companies	269,537	868	36	130	166	32·2	1·3	4·8	6·1
2(g)	Districts supplied mainly by the Kent Company from artesian wells, and partially by Southwark and Lambeth Companies	235,256	640	93	44	137	27·2	4·0	1·9	5·9

(a) Comprising Kensington, Chelsea, St. George Hanover-square, Westminster, and Marylebone.
(b) Comprising St. Saviour, St. Olave, Bermondsey, St. George Southwark, Newington, Lambeth, Wandsworth, Camberwell, and Rotherhithe.
(c) Comprising St. Martin-in-the-Fields, a small part of which district is also supplied by the Chelsea Company, Islington, St. Giles, Strand, Holborn, Clerkenwell, St. Luke, West London, and London City.
(d) Comprising Bethnal Green, Whitechapel, St. George-in-the-East, Stepney, Mile End Old Town, and Poplar.
(e) Comprising Hackney, East London, and Shoreditch.
(f) Comprising St. James Westminster, Hampstead, and Pancras.
(g) Comprising Greenwich and Lewisham.

PROFESSOR FRANKLAND'S REPORT ON EAST LONDON COMPANY'S WORKS.

Royal College of Chemistry,
August 25th, 1866.

Sir,

AT your request I have made a careful inspection of the waterworks of the East London company, and, in addition to my usual monthly analysis of the water as delivered to consumers, I have collected and analysed various samples taken on

the 9th instant from the company's reservoirs, consumers' cisterns, and the river Lea. In this inspection I have been assisted by Mr. Valentin of this college, whose valuable aid, promptly and willingly given, I have much pleasure in here acknowledging.

The whole of the company's works at Lea Bridge and at Old Ford were inspected on two separate days, viz., on the 9th and on the 23d instant, but, as everything was in the same condition on the two occasions, it will not be necessary to describe the visits separately. On both occasions Mr. Greaves, the company's engineer, and Mr. Maine, the manager of the works at Lea Bridge, gave, in the most courteous manner, every facility for the inspection of the reservoirs, filter beds, and machinery, and furnished, frankly and unreservedly, all the information asked for.

At Lea Bridge I found the water being brought to the company's premises by a special open canal leaving the river Lea at Tottenham Mills, above the great sewage contaminations of the river, but below the outfall of the sewage from Hertford and Ware. I was informed by Mr. Maine that the sewage of the former town is deodorized by lime and then filtered before it flows into the river, but that the sewage of Ware enters the Lea without undergoing any purifying process.

The company's premises at Lea Bridge are chiefly devoted to filtration, but there is also a magnificent pumping engine which raises and delivers a portion of the day supply and the whole of the night supply of the East London company. There is no storage reservoir upon these premises, the whole of the water not raised by the pumping engine being transmitted as fast as it runs from the filter beds through a closed conduit down to a covered storage reservoir at Old Ford. There are 13 large filtering reservoirs at the Lea Bridge works. The area which they occupy is bisected by the river Lea, with which, however, the reservoirs have here no connexion. The filtering apparatus is of the most approved construction, and the filtered water is delivered into the so-called Essex and Middlesex Wells situated respectively on the right and left banks of the river Lea in a condition of transparency leaving nothing to be desired in this respect. In fact, so far as the removal of mechanically suspended matters from the water is concerned, the result could not possibly be better.

The upper stratum of fine sand forming the floor of these reservoirs, and through which the water filters, requires frequent removal and cleansing, so that one or two of the reservoirs are usually empty and undergoing this operation. Mr. Maine told me that the rapidity of filtration from these reservoirs is very variable, and that in the month of July in every year a slimy matter very rapidly deposits upon the sand, blocking up its pores, and stopping the filtration altogether. In the month of August (according to Mr. Maine's clear and intelligent description) this slimy matter begins to grow, producing green confervoid fibres such as I saw on the 23d instant in the water of the filtering reservoirs, and especially upon the surface of the sand of one of them which was being cleaned. As soon as the confervoid growth begins, the filtering power of the reservoirs is entirely restored ; but during the month of July, whilst the slimy matter continues to be deposited, the work of filtration is always, as Mr. Maine informed me, attended with great difficulties.

There are two provisions at the Lea Bridge works by which water from the special canal above mentioned can be transmitted without filtration to the storage reservoirs at Old Ford. One of these is an iron main at the canal head communicating with the main used for transmitting filtered water, and the other an open conduit or canal, formerly used to convey the whole of the water from Lea Bridge to Old Ford. From the condition of the sluice closing the iron main, I am convinced that no unfiltered water has been transmitted through that main for some months past. On the other hand, unfiltered water is frequently transmitted to Old Ford through the open conduit, for into this conduit the water from the filtering reservoirs is discharged whenever the latter require cleansing. It is scarcely necessary to remark that the water so discharged from the blocked-up filters is far more impure than the unfiltered water from the special canal, because the lighter portions of the suspended matter, from large volumes of water which have passed

through the filter, are here concentrated in a comparatively small bulk, and as the open conduit down to Old Ford has much organic mud and slime in its bed, the water so transmitted down to Old Ford must be exceedingly impure when it arrives there. At Old Ford lock there is an overflow pipe which conveys this water into the river Lea, but there is also at the same place a sluice through which this water can be admitted into the uncovered reservoirs. From the nature of the mud deposited in these uncovered reservoirs I am inclined to believe that this water is sometimes admitted into them. Both Mr. Greaves and Mr. Maine assured me that no unfiltered water is ever now transmitted from Lea Bridge to Old Ford for the supply of the public.

The Old Ford Works may be described as a storage and pumping station, no filtering or purifying operations being here performed. There is a covered reservoir $2\frac{1}{2}$ acres in extent, capable of containing water to the depth of 10 feet 6 inches, and when full the surface of the water is about 6 feet below the general level of the ground. Mr. Greaves informed me that, when the reservoir is filled to its highest point, the surface of the water is at the level of Trinity high-water mark. From this covered reservoir the water is supplied to the public by three pumping engines which furnish the greater part of the day supply of the East London Company. I observed fish of 3 or 4 inches in length swimming about in this reservoir. As already mentioned, there is a direct delivery to the public from Lea Bridge, which supplies Shoreditch, Hackney, Haggerstone, and Tottenham during the day, and the whole of the Company's district during the night; but, inasmuch as there is free communication between the branch mains of the Lea Bridge and Old Ford systems, there is no sharp line of demarcation between the two supplies. I was informed, however, that, owing to the hydraulic conditions of the two pumping stations, the above-mentioned districts would be mainly supplied from Lea Bridge; the rest of the East London company's district would chiefly receive its day supply from the Old Ford reservoir; whilst Stamford Hill is always, on account of its elevation, specially supplied from Old Ford.

Along one side of the covered storage reservoir at the latter station, and within a few yards of it, runs the navigation branch of the river Lea, the water of which stands at about the same level as the water in the reservoir when the latter is completely filled. Pending the completion of the main drainage works, this branch of the river receives much of the sewage of the surrounding district, and being nearly stagnant is in a most offensive condition; in fact it is here little better than an open cesspool. A sample of the river water was taken at this point on the 9th instant; but the river had been flushed out at low water two days previously, by which its condition had been greatly improved. The sample analysed, bad as it is, does not therefore represent the quality of the river water at this point in what may be called its normal condition of filthiness.

On the opposite bank of the river are the two large uncovered reservoirs of which mention has already been made. These reservoirs have a considerable deposit of mud, which is not, however, putrescent; one was full and the other partially empty; the latter, as I was informed, was being emptied by pumping into the river Lea. Communication can be established between these reservoirs and the pumping wells supplying the public, but Mr. Greaves assured me that it was never done, except in case of emergency. It was not done in the event of a fire, but he wished to retain the power of having recourse to these reservoirs in case of defective supply from the filtering apparatus at Lea Bridge. These reservoirs, as I am informed by Mr. Greaves, are excavated in gravel; they are consequently doubtless subject to considerable soakage, both from the river Lea, the surface drainage, and the sewage which here saturates the soil.

The samples of water collected on the 9th instant yielded, on analysis, the following results :—

Place of Collection.	Solid Matter in 100,000 parts.	Organic and other volatile matter (included in previous col.)	Amount of oxygen required for oxidation of organic matter.	Appearance of Water.
Uncovered North Reservoir	24·64	1·07	·0452	Slightly turbid and of a milky appearance.
Uncovered South Reservoir	25·56	1·53	·0564	Slightly turbid and milky.
River Lea at Old Ford -	39·03	3·73	·2792	Very turbid. Suspended matter ·36 in 100,000 parts of the water.
Main leading from pumping engine at Old Ford. Water supplied to consumers.	25·91	1·14	·0204	Transparent.
Essex Well, Lea Bridge -	24·85	1·19	·0220	Transparent.
Unfiltered water from special canal at Lea Bridge.	27·39	1·71	·0404	Greenish; slightly turbid.
Main in Stewart's Buildings, High Street, Bromley, where cholera had caused great mortality.	24·94	1·54	·0268	Dirty, depositing more sediment than the sample of unfiltered water from the canal at Lea Bridge.
Cistern at the Police Station, Poplar.	6·34	1·20	·0256	Transparent.

A comparison of the results yielded by the water from the canal at Lea Bridge with those obtained with the same water taken from the Essex well, after filtration, shows the important extent to which the water is purified by passage through the filtering reservoirs. The substitution of unfiltered for filtered water would at once increase the organic matter supplied to consumers to the extent of 43 per cent. With the exception of the dirty sample drawn from the company's main at Stewart's Buildings, and which contained the same amount of organic impurity as the water of the uncovered south reservoir at Old Ford, none of the samples of water upon the company's premises exhibit, in comparison with the Thames water supplied to the Metropolis, any excessive amount of impurity; but, as I have already pointed out in a previous report, chemical analysis, like every other mode of investigation, is powerless to detect the presence of matter like the choleraic poison amongst the organic impurities of water, for this poison may be present in quantity fatal to the consumer though far too minute to be detected by the most delicate chemical research. Further, when water has once become polluted by such matters, we possess no *certain* means, of a practical character, for destroying or rendering innocuous the poisonous matter. I have conclusive evidence that even boiling, which is generally regarded as the most efficacious means, will not prevent water which is so contaminated from producing violent cramp and diarrhœa.* The use of permanganate of potash or of animal charcoal, in the manner I have already recommended, is the only practicable means in which I should have much confidence for the removal of such noxious matters from water.

This impossibility of proving either the presence or absence of choleraic and other allied poisons in water, and the uncertainty of all processes for their removal, renders it the more important to guard with the most scrupulous care against the possibility of such contamination. It is precisely at this point that the otherwise excellent arrangements of the East London company appear to me to exhibit some grave defects. I do not specially allude to the admission of the sewage of Hertford and Ware to the river Lea at a point above that whence the water supply is drawn, because this defect, though a serious one, is common to the Lea water and to the supplies drawn from the Thames; it is, in fact, an evil which cannot be avoided so long as we are content to obtain from rivers the water which we use for domestic purposes; but my remark applies to the retention of the means of supplying un-

* This fact is not incompatible with the theory that choleraic and similar poisons are the germs of organisms, for it is well known that certain organic germs can develop into life after being boiled in water for a short time.

filtered and impure water at Old Ford station, and especially to the position of the covered storage reservoir at the same station from which the chief part of the daily supply is now drawn. I was astonished to find that the water after being carefully brought down from Tottenham Mills in a special canal, purified by a most elaborate and efficient system of filtration at Lea Bridge, and then, to secure it from atmospheric impurities, conveyed in an iron main down to Old Ford, is stored in a reservoir sunk to the depth of some 16 feet beneath the low ground, which is here only just above the level of spring tides, and that when the reservoir is full the level of the surface of the water in it only reaches that of Trinity high-water mark. This reservoir, as I was informed, is excavated in clay, but the side next to the navigation branch of the foul river Lea is of gravel. No doubt this is well puddled, and the brickwork sides executed in the best possible manner, nevertheless, the position of this reservoir, with its 2½ acres of floor 16 feet below the surface of a badly drained district is fraught with much peril during the prevalence of epidemic disease. Whatever precautions may have been taken, soakage, to some extent, must take place into such an excavation, and it was stated to me that when the reservoir is emptied, such soakage water, though not in large quantity, has to be removed by pumping.

Such being the conditions of storage, the application of any temporary remedy is obviously surrounded with formidable difficulties. I satisfied myself that filtration through coarse animal charcoal could easily be applied, in the Essex and Middlesex wells at Lea Bridge, to the whole of the water supplied by the company; but there would be little use in thus purifying the water at Lea Bridge when it has afterwards to be stored in the reservoir at Old Ford. It is only by passage through animal charcoal, as the water leaves this reservoir, that the advantages of the charcoal could be secured. Owing to the construction of the works at Old Ford, I was unable myself to form an opinion as to the possibility of such a filtration being carried out there at a short notice, Mr. Maine thought it could be accomplished without difficulty; but Mr. Greaves, who is much more likely to know, was of a totally different opinion, and thought that such a filtration could not be effectively carried out at Old Ford without the construction of new apparatus, which would require too much time to render it available during the present emergency. It is to be hoped, however, that means may be taken without delay, either to alter the place of storage, or to render practicable filtration through animal charcoal immediately before the water is supplied to consumers.

I have, &c.

The Registrar General. E. FRANKLAND.

The following letter is from MR. BEARDMORE, C.E., the Engineer of the River Lea Trust. It is in answer to queries the nature of which will be sufficiently evident :—

30, *Great George Street, Westminster,*
August 6th, 1866.

Sir,

In reply to the queries accompanying your letter of the 3d instant, I beg to say,—

1st. "The River Lea Water Act, 1855," defines the quantities of water and priority of rights. By this Act *practically* the whole surplus waters of the Lea, excepting a *comparatively* small quantity for the navigation, was divided between the New River and East London Water companies, and their power of supply was generally improved. They can also call on the trustees to execute any further works for amelioration on tendering the cost; the New River company have exercised this power since last summer.

The companies can each take 23,000,000 gallons per diem, and beyond that quantity as much additional water as they can, gallon for gallon. Under the powers and with the proper use of reservoirs, the resources of the Lea are unlimited for a liberal and pure supply of the eastern metropolis.

Under the Act of 1855 the trustees and the companies have greatly improved the depths and character of the water, and have made cuts so as to divide the

navigation from the river. The reservoirs constructed by the East London Water company within the past four years are very large and complete, but they have no connexion with the navigation.

As to your 2d question.—The river Lea is divided into two portions, both as to its purity and its character as a water bearing district. Above the parallel of Tottenham and Walthamstow the valley is full of springs, and practically no sewage reaches the river, provided the New River company work their purifying establishment at Hertford efficiently.

Although the New River takes a great portion of the Lea above Ware, yet it is so largely supplemented by boiling springs *below Ware* as to have greater volume by the time it arrives at Broxbourne than it had before the New River share was taken out.

On the whole, although there may be two or three small points worthy of amendment, as to drainage above the reservoirs of the East London Water company at Walthamstow, I believe that there are few town supplies so pure as that of the East London company. Above Walthamstow from one third to one fourth of the river must have boiled out of the earth as pure spring water within 18 miles distance.

My connexion with waterworks and examination of springs and rivers have been extensive for 30 years past, and I have seen few sources for which I should like to exchange either the Thames or the Lea. The carbonate of lime renders these waters somewhat hard, but is a wonderful safeguard against solution of impurity.

Below Tottenham sewage passes into the river in a tangible form, and the scandalous proceedings of the Tottenham Local Board must be stopped.

It is at Old Ford about five miles below Tottenham that the river Lea has become offensive at times, within the last few years, owing to the increase of buildings and factories within the Metropolitan area; it also has the disadvantage of being tidal below Old Ford, and therefore liable to the inflow of impurity from the Thames, and from the sewage of Stratford and West Ham, which is turned into the Bow Creek arm of the Lea without deodorization.

The trustees have found great difficulty in dealing with wrongdoers below Old Ford, for it has been evident that nothing effective could be done until the low level main drainage passing under the river Lea (near Bow) had come into operation. This Mr. Bazalgette proposes to effect by temporarily pumping from the low level into the high level at Abbey mills, and then into the Thames at Barking.

The District Boards in the East of London must now improve and alter their sewers, for the new main drainage will operate as if the entire area had been suddenly lifted about 20 feet with a distant outfall.

Incidentally I may remark that overcrowding, deficiency of drainage, and inferior articles of food are more likely to have promoted cholera than impurity or deficiency of water.

This district is populated by dock labourers, sailors, mechanics in the new factores, and great numbers of laundresses.

In answer to your 3d question.—The volume of the Lea during the past six months has been unusually abundant. We had good floods during the winter, which are beneficial in sweeping off decayed matter. I have never seen the river in better condition than during the past four months. The volume flowing down towards Walthamstow is now more than double that of the corresponding period of last year, and after the companies have taken all their supplies there is a large surplus quantity still passing down the tidal channels into the Thames.

As to your 4th question.—The number of passages made by barges from Walthamstow upwards during the past six months would be about 2,500 against about three times that number in the lower portion of the river, chiefly grain, malt, bricks, &c. (manure has been prohibited for 12 months past).

But these barges pass up a canal, and do not enter any water taken by the East London until five miles above Walthamstow, and then again only for two miles out of the next six miles.

Nothing more occurs to me for your information, but I will call and personally tender my assistance, adding my own impression that if people drank more of the companies' water in London they would be the better for it.

I suspect that pumps are still common in the Bow and Poplar district, because of the fine vein of water in the sandy strata that overlies the London clay there.

I am, &c.

The Registrar-General. NATH. BEARDMORE.

The following extracts are from the 2d Report of the *Lancet* Commission on the Outbreak of Cholera in East London. (*Lancet, August 25th*, 1866, *p.* 218):—

"Passing along the river Lea from Hoddesdon, we come to the important towns of Ware, about five miles up, and Hertford two miles above this. The sewage of Hertford flows through the town to a place called the 'filtering bed,' in which it is professed to be deodorised by the New River Company. From this place it runs in an open cutting about twelve feet wide to discharge itself a little above Ware. This sewage, when it passes into the river, is highly offensive, and causes much complaint from the inhabitants of Ware. The offensiveness of the river can be appreciated by any one standing on Ware bridge. The sewage of Ware itself is conveyed by three sewers to the river near the bridge. Below Ware the Lea receives the sewage from St. Margaret's and Stanstead Abbots.

"Below Hertford the river Rib flows into the Lea. This river runs for some miles through Hertfordshire in a southerly direction to Hertford, receiving in its course the river Quin. These streams bring the drainage from Buntingford, and the main towns and villages in this part of Hertfordshire. Just above Hertford the Beane and Mimram flow into the Lea. The former flows to the Lea in a southerly direction; the latter in a south-easterly direction. The Lea itself rises in Bedfordshire, south-east of the Chiltern hills; and, passing through Luton, runs in a south-easterly direction through Hertfordshire till it approaches Hatfield in this county, when it pursues an easterly course to Hertford. It receives the drainage of Luton, Wheathampstead (and its paper-mill), and, we believe, Hatfield in Hertfordshire, and with the Beane and Mimram, that of a number of villages. The Lea is navigable by means of a system of locks as far up as the Mill-bridge in the town of Hertford. Barges pass up the Lea and the Stort, carrying manure, bricks, timber, &c., into Essex and Hertfordshire, returning with malt, corn, wool, &c."

"At Waltham Abbey, the Cobbin pours into the Lea the sewage of this town and of Epping, in its most offensive state, but three miles above Ponder's-end; and then, when there are added to these sources of pollution of the stream, the mills out of number along its banks, and the barges passing up and down the navigable river by a system of locks, which go far to give the character of a canal to the river, and to cause comparative stagnation of its waters, we have sufficient cause to wonder that the inhabitants of East London do not generally suffer more in health."

"Cobbin's Brook, which takes its rise in the country about Epping, is in parts but a narrow stream at present, while in other places it forms half stagnant pools. It receives the drainage of Epping, and about fifty yards from its outlet by an open ditch, that of the town of Waltham Abbey. The ditch from Waltham Abbey, which runs at the back of the church, and at least one house where death has been busy, is in such a condition as to occasion great complaint, and to cause it to receive in the neighbourhood the name of the 'cholera ditch.' In its present state the Cobbin is a very undesirable tributary of the Lea."

"The mention of Epping in connexion with an investigation of the influence of the river Lea upon the present cholera outbreak at once attracts our attention to the fact of the occurrence of cholera there last autumn. Whether there can be traced through the Lea and its tributary any connexion between that outbreak and the present one, we are not now prepared to say; but we believe that Theydon Bois, where the Groombridges lived, is on the other side of the watershed, and, if that be the case, its drainage must contribute, not to Cobbin's Brook, but to the Roding, which empties into the Thames direct."

The following statements from the local papers and from trustworthy witnesses are not unimportant, as they show that eels have passed through the pipes of the East London Water Company:—

From the "East End News," August 11th:—

CAN AN EEL PASS THROUGH A FILTER BED?

To the Editor of the "East End News."

"Sir,—Seeing the paragraph in your last week's impression respecting the purity of the water supplied us through the East London Waterworks that it is thoroughly filtered, I beg to contradict that statement, more particularly at this crisis, when cholera and diarrhœa are making such fearful ravages through these districts, in order that some steps may be adopted to guarantee a pure supply.

"Now, the *second week in June last* our water pipe was stopped up, and, as I am a plumber, I cut the pipe, and to my astonishment found a DEAD EEL *nine inches* in length, which must have come through the above works, and which is quite demonstrative that the water is not filtered; so if you think this hint will be the means of the company improving the filtering, you will greatly oblige me by giving this publicity, as it is acknowledged by all scientific gentlemen as well as the faculty, that it is essential to have pure water supplied.

"I am, &c.

"*Bow-lane, E. I. Road,* R. FURGUSSON, Plumber."
"*Aug. 7th,* 1866."

Mrs. Furgusson showed the cut pipe to a gentleman from the General Register Office, and stated that the eel was putrid.

To the Editor of the "East End News."

"Sir,—As small beginnings sometimes lead to great ends, so a little information may, perhaps, lead to the most beneficial improvements in the sanitary condition of some portions at least of this great metropolis; and I consider it to be the duty of every individual to furnish the authorities and the public generally with such information as he may be possessed of, as it appears to me to be the only means likely to bring about those changes so essentially necessary at any time, but more particularly so at present, when disease is carrying off so many of our fellow creatures.

"In your last impression a Mr. Furgusson speaks of an eel having got into the water pipe that supplied his dwelling. Now, strange as this may appear, I can bear testimony to a similar fact. A short time since the water supply to my residence was stopped, from what cause I could not imagine, and was without a supply five days. At length I took off the tap, and to my astonishment found an *eel fourteen inches in length.* It was in a *putrid state*, and the *stench* arising from it was most *fearful.* Since that time I have lost two of my children, who died of cholera, and my wife and other members of my family have also been suffering from that disease.

"I am, &c.

"3, *Paradise-cottages, Gray-street,* ALEXANDER RUSSELL."
"*St. Leonard's-road.*"

The eel was found at the end of the supply pipe of these cottages. It was seen by Mrs. Russell, who has just recovered from cholera. The date could not be fixed, but it was probably some months back.

EXTRACT from a LETTER of Dr. BAIN, M.D.

"I found to-day a house, No. 2., Wright's-place, Cotton-street, Poplar, where *five* in the family have had cholera, one of whom has died. I saw the mother of the family to-day, now recovered, who told me she had taken an eel from her water-butt in June last about 3 inches long, which must have come through the tap.

"I *send you a live eel* which was taken *to-day* from a tap by a Mrs. Ames, Leicester-street, opposite to where you saw a woman dying. This Mrs. Ames had cholera about three weeks ago, and her brother is ill now with it."

A plumber recollects purchasing, some years ago, an eel taken out in his presence from the main of the East London Water Company. It weighed about 2 lbs., and was alive.

Extract from the "MEDICAL TIMES AND GAZETTE," September 1st, 1866, p. 226.

"On August 15th two fire plugs opposite Regent's-place, Commercial-road, were drawn, and a very considerable quantity of small 'mussel' shells, about the size of a shilling, were discharged, at least a bushel, according to an eye-witness. This is one of the things that the East London Water Company will be called upon to explain. Where did the shells come from? for it is wholly impossible that they could have been placed from without about the plugs. No doubt they had travelled along the supply pipe some distance."

COMMUNICATION of CHOLERA by BEDDING.

Note communicated by Dr. Greenhill, M.D., Hastings:—

"A *straw bed* on which a woman had died of cholera was brought into the back room of No. 12, James-place, St. George-in-the-East, a small house which had recently been limewashed, and which was certainly by no means one of the worst in the neighbourhood.

"The father sickens (I believe) the same night, probably August 2d, and dies August 7th." (*Weekly Return of* 1866, *No.* 32, p. 335.)

"A lodger who nurses him sickens, is taken to the cholera hospital, and recovers.

"Probably on August 5th, a little daughter sickens, and dies the next day." (*W. R.*, p. 387.)

"On the same day a second little daughter sickens, lingers for six days, and dies August 12th." (*W. R.*, p. 387.)

"Then a little nephew, who was staying with the family, sickens, and dies in three days, August 11th." (*W. R.*, p. 387.)

"After a few days the daughter of the lodger sickens, and dies in three days, August 20th." (*W. R.*, p. 428.)

"And lastly, another little girl, a friend or relation who lived next door, and who helped to attend on the last-mentioned girl, sickens, and dies in 12 hours, on August 18th." (*W. R.*, p. 428.)

"The bed was probably not destroyed till August 15th or 16th."

Week ending Saturday, September 8.

The deaths registered in London during the week were 1335. It was the thirty-sixth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1245. The deaths in the present return exceed the estimated number by 90.

The weekly deaths by cholera have fallen progressively from 1053, 781, 455, 265, and 198 to 157; by cholera and diarrhœa from 1407, 1045, 649, 394, 326 to 289. In the East districts the weekly deaths by cholera have fallen from 916 to 74; in the South districts from 47 to 39; in the rest of London from 90 to 44. The rate of mortality by cholera and diarrhœa in East London is rather more than double the mortality by those diseases in the whole of the metropolis. Of the deaths in the South districts an undue proportion is still observed; last week 7 deaths by cholera, 5 by diarrhœa were registered in Deptford; 7 by cholera and 4 by diarrhœa in Woolwich, where the rector states that active precautions are taken by the Health Committee. The efficiency of the measures in both these

districts on the banks of the Thames should be closely watched. Last week the deaths by cholera in the Poplar district were 7, in Greenwich Union, including Deptford and Woolwich, 17.

Professor Frankland has related a remarkable case in which boiling did not deprive cesspool stuff of its poisonous qualities. The experiment is decisive as far as it goes; and shows the importance of the absolute exclusion of sewage from water for domestic use. Boiling the water is a useful precaution, but Professor Frankland prefers filtration through animal charcoal, or the use of the permanganate of potash.

Sporadic cases of cholera have been observed from the cause to which Professor Frankland refers; in the dead of the winter of 1838, between January 7th and February 5th, 55 persons died of cholera in the Coventry House of Industry, evidently from common polluted water, as cholera was not at the time epidemic. In the Union Workhouse of Epping cholera suddenly broke out on August 5th, 1854, and by the 14th destroyed 23 lives; "the well of the workhouse was close to the main sewer," and to this "dreadful state of drainage" the fatality of cholera was traced.* In this year epidemic cholera prevailed.

Drainage of East London.

The drainage of a part of the cholera field by the low-level sewer will not be completed until next summer; but upon the present emergency, in answer to an application, Mr. Bazalgette informed the Registrar General that he should recommend the Metropolitan Board to erect "a temporary station at Abbey Mills to lift "the sewage of this district into the northern outfall sewer."—[Letter, *ante*, p. 117.]

The pumping, it is gratifying to learn, was started on August 24th, as appears from the annexed letter. It would be an excellent arrangement, if it were practicable, to pump at least a part of the West Ham sewage into the northern outfall sewer, and thus further lessen the quantity of sewage in the Lea River.

Metropolitan Board of Works, Engineer's Department.
Spring Gardens, S.W., September 7th, 1866.

Sir,

In compliance with the request made at this office yesterday, I beg to inform you that the temporary pumping engines for diverting the discharge of sewage from the river Lea and Limehouse Cut into the northern outfall sewer, near Abbey Mills, were started on the 24th ultimo.

I am, &c.,
F. W. Maul.

The Registrar General.

The Registrar General has received the following letter from Professor Frankland:

Royal College of Chemistry, Oxford-street,
September 8th, 1866,

Sir,

In my report to you upon the water supply of the East London Company, dated August 25th, I stated that boiling will not prevent water which is contaminated with poisonous excrementitious matter from producing violent cramp and diarrhœa. The case upon which I founded this opinion is the following:—A gentleman and his wife partook of tea made with well-water which was poured boiling from the tea-kettle into the teapot. Between three and four hours after partaking of the tea, and after they had been asleep for some time, they were both awoke by violent cramps, both in the limbs and body, which were soon followed by excessive diarrhœa. The cramps lasted for several hours, and the diarrhœa until the following afternoon. Both patients were affected in exactly the same way. The well-water was suspected, and the well, which was a very shallow one in slate

* Letter of Mr. Windus, clerk to Epping Union, addressed to the Registrar General November 1st, 1865. The water is now pure.

rock, was at once opened and examined. It was soon found that a pipe from a watercloset had burst, and that some of the contents had made their way into the well; in fact, some fragments of excrementitious matter were found floating on the surface of the water. The water from this well was never again used, for the well was filled up, and another excavated at some distance, and the symptoms, which were entirely novel to the patients, never again occurred.

The attack took place in a very healthy locality in the country, and at a time when no epidemic diarrhœa or cholera prevailed. Were such an experiment tried now, the result can scarcely be doubted. I am intimately acquainted with the sufferers, and was at once informed of all the circumstances. The evidence afforded by this case is exceptionally conclusive,—first, because the parties never, under any circumstances, drank this water except in the form of tea or coffee; and, secondly, because they were at the time the only inmates of the house, being without a servant; there can, therefore, be no doubt about the water having been boiled. The case excited my special interest on account of the unexpected conclusion to which it leads; and I mentioned it because it is important, at the present juncture, that we should not place implicit reliance upon a precautionary measure founded upon the assumption that the noxious qualities of the organic matters of sewage are destroyed by boiling.

I have, &c.

The Registrar General. E. Frankland.

West Ham.

The registration district of West Ham properly belongs to London, with which it is intimately associated. Its four sub-districts are Walthamstow, Leyton, Stratford, and West Ham proper; at the north-east angle of London, it lies between Epping Forest and the Thames, the river Lea and the Roding at Barking, without touching Barking creek. It has docks as well as manufactures; and at New Stratford are the extensive works of the Great Eastern Railway. West Ham has been by error left out of London; and in consequence sends down its ample sewage by an independent channel across the northern outfall sewer of the Metropolitan Board to an arm of the river Lea, which Mr. Beardmore, C.E., says, "has the disadvantage of "being tidal below Old Ford, and is therefore liable to the inflow of impurity "from the Thames, and from the sewage of Stratford and West Ham, turned "into the Bow Creek arm of the Lea without deodorization."* By this unhappy arrangement the tide carries the sewage of West Ham up and down the river Lea, close to the reservoirs from which Stratford and West Ham proper get water.

The population of West Ham was 59,319 in 1861, and has since increased rapidly: at the rates of 1851 and 1861 it will be 81,718 in the year 1866.

Walthamstow to the north is supplied with water from a deep well, from springs, and in part from the Lea Bridge reservoirs of the East London Waterworks Company; Leyton is supplied partly in the same manner. The deaths from cholera in these two sub-districts were only eleven in the eight weeks ending September 1st.

Far otherwise was it at Stratford and West Ham proper, where the mortality in the last week of July was appalling enough; in one week 45 persons were killed in Stratford, 76 in West Ham, by cholera alone, exclusive of deaths by diarrhœa. The deaths by cholera to 10,000 living were 78 in Stratford and 49 in West Ham proper during the eight weeks ending September 1st.

Both Stratford and West Ham are detached from the metropolitan drainage system, and have a system of drainage of their own. They are both supplied with water from the Old Ford reservoirs of the East London company.

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* See the interesting letter of Mr. Beardmore, C.E., Engineer of the River Lea Trust, *ante*, p. 126.

POPULATION 1851, 1861, and 1866, and NUMBER of DEATHS by CHOLERA in the Eight Weeks ending September 1st, 1866, in each of the SUB-DISTRICTS of WEST HAM.

SUB-DISTRICTS.	POPULATION.			DEATHS registered from Cholera in the 8 Weeks ending 1st September.	NUMBER of DEATHS in the 8 Weeks to 10,000 Persons living.
	1851 enumerated.	1861 enumerated.	1866 estimated.		
WEST HAM - -	34,393	59,319	81,718	367	44·9
Walthamstow - - -	7,733	10,594	12,493	- -	—
Leyton - - - -	6,108	7,536	8,413	11	13·1
West Ham - - -	9,968	25,195	40,957	202	49·3
Stratford - - -	10,586	15,994	19,855	154	77·6

CHOLERA and DIARRHŒA in the Superintendent Registrar's District of EDMONTON during the Ten Weeks ending September 1st, 1866.

Note.—The Edmonton District is in the Lea basin immediately above the Hackney District.

The Registrar General requested the registrars of the EDMONTON Superintendent Registrar's District to supply him with information as to the number of deaths from cholera and diarrhœa registered by them during the ten weeks ending September 1st, 1866, and to state the source of the water supply.

Hornsey.—Cholera, none; diarrhœa, 7, all children, the oldest 1 year. The whole of my district is supplied with water by the New River Company.

THOMAS RICHARD GRIMES, *Registrar.*

Tottenham.—Cholera, none; diarrhœa, 10. Water supply from artesian wells and the New River Company. There are some houses in parts of the district that still use what are termed surface wells, or wells supplied from the first bed of gravel. An order has just been issued that in a portion of the district these wells should be closed, the water being found to be unfit for dietetic purposes.

September 6th, 1866. GEORGE ROSS, *Registrar.*

The following deaths have occurred since the above-named date: A male, aged 38 years, choleraic diarrhœa (14 days); and a female, aged 4 years, malignant cholera (9 hours). The latter case occurred in that part of my district where the water is considered unfit for use.

Edmonton.—Cholera, 1; diarrhœa, 3. The case of cholera was an imported one, the man being a waiter engaged to attend a cricket match on the Southgate grounds; he arrived from London in the morning, felt unwell, went to a chemist, took a draught, feeling better returned to the grounds, drank freely of beer, was seized again in the evening, and died in 18 hours. The principal water supply is the old pump system from surface wells; a few houses obtain a supply by private arrangement from the New River Company, and a small portion from an artesian well. There is no public supply of water.

JOHN JUDD, *Registrar.*

Enfield.—Cholera, 1 (this case is said to have been brought from Stratford); diarrhœa, 4. The source of water supply for this district is, as to the town of Enfield and Ponders, from the waterworks of the Board of Health, the other parts from wells on the premises of the occupiers.

JOHN PURDEY, *Registrar.*

Waltham Abbey.—Cholera, none; diarrhœa, one child died July 26th, aged 13 weeks, debility from birth, diarrhœa (5 days). Diarrhœa has been prevalent in all parts of the sub-district of Waltham Abbey, but only one death from it. The water supply is good from the river Lea, and plenty of good springs and fountains in most parts.

JOSHUA PEGRUM, *Registrar.*

Cheshunt.—Cholera, none; diarrhœa, several cases of slight diarrhœa, one severe case, but no fatal result. There is no public water supply to Cheshunt; the water consumed is mostly obtained from wells supplied by land springs on the premises of the occupiers. In some cases a supply is given by the New River Company to persons who apply and pay for the same.

ROBERT ARCHER, *Registrar*

Week ending Saturday, September 15.

The deaths registered in London during the week were 1371. It was the thirty-seventh week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1218. The deaths in the present return exceed the estimated number by 153. This number is exceeded by the deaths in the week from cholera.

The first two weeks of September have hitherto been noted in cholera epidemics; in the first week of September 1849 no less than 2026 persons died of cholera; in the first week of September 1854 the deaths by the same disease were 2050. The deaths by cholera in the second week of the same years fell to 1682 and 1549. In 1866 we have been less unfortunate; the deaths sprung up with unexampled rapidity, threatening all London with devastation, and then less suddenly, but decisively, subsided. The deaths by cholera in the two first weeks of September were 157 and 182. 132 and 110 persons died in the same weeks by diarrhœa. Of the deaths by cholera, 10 occurred in the West districts, 27 in the North, 20 in the Central, 77 in the East, and 48 in the South districts. To ensure its rapid decline, the utmost vigilance is required on the part of the people, the health officers, and the Board of Works.

It is very desirable to know what proceedings have been taken by the authorities, not only in drawing up regulations, but in seeing to their execution. The health officers of London have supplied the Registrar General with some information having an immediate practical bearing; it will be found in subsequent pages (pp. 160 to 177).

RISE AND DECLINE OF CHOLERA IN LONDON.

Cholera has been very unequally distributed over London; it has been in every district, but it is only in the field of one water company that the violence of the epidemic recalled the ravages of 1849 and 1854, when nearly the whole of the water was unfiltered, and when much of it was drawn from parts of the Thames and its tributaries polluted with sewage. The cholera matter was in those years diffused over London in large quantities, and the mortality pursued its course only checked by treatment of diarrhœa in the early stage of the malady.

The Lambeth and the Southwark companies in 1849 could not improve their water supply; the ground was undrained; the pumps were polluted; and the epidemic pursued its natural course. It first appeared in the autumn of 1848, subsided partially to break out again in the summer of 1849, when week after week it grew more fatal, until in the first week of September it killed, reckoning diarrhœa, 2,298 persons. The Lambeth water was drawn in 1853–4 from a purer source, and the mortality by cholera was immediately shown to have declined in the districts it supplied*; but no great change was made in the character of the water during the course of the epidemic, which was less fatal, and pursued its usual course, culminating in September.

Nearly the same general law of development in 1866 was observed in the districts of the south, the centre, the north, and the west of London, with this exception, that in none of these districts did the mortality approach the dimensions of previous epidemics. There it justified the anticipations that had been indulged. In the midst of this calm the whole of London was startled in the three successive weeks of July by 346, 904, and 1,053 deaths from cholera; and it was found that the great majority of deaths happened in the houses supplied from the reservoirs at Old Ford belonging to one company.

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* See Supplement to Weekly Return, November 19th, 1853; also Weekly Return, October 14th, 1854.

To make this investigation more exact, the deaths happening on each day in each of the fields of water supply have been taken out. Three deaths from cholera happened on Wednesday July 11th, 6 on the 12th, 12, 11, 12 on the three following days in the districts supplied by the East London company, including West Ham on the east side of the Lea. On Monday and the six days following the deaths ran up to 31, 54, 59, 83, 91, 104, 104. On July 23d there was again an increase; the deaths were 130 on Monday, 144 on Tuesday, 166 on Wednesday, when there was a slight subsidence; but on Monday, July 30th, the deaths were 141, on Tuesday 171, and on Wednesday, August 1st, 170.

It appeared then right to call attention at once to the complete coincidence of the cholera field with the field of supply of the East London Water Company, in the hope that the state of its water might be immediately looked to. The weekly report was published on Wednesday morning, August 1st; on that day the engineer of the company called at the General Register Office; and on the day following he published a letter in the daily journals showing that he fully appreciated the importance of the crisis. The supply might have been changed on Wednesday morning, but on that day no result appears; the deaths were 170; on Thursday the deaths fell to 155, on Friday to 114, on Saturday to 112, on Sunday to 119, on Monday, August 6th, to 115, on Monday, August 13th, to 44, on Monday, August 20th, to 31, on Monday, August 27th, to 21, on Saturday, September 1st, to 8.

This coincidence between the intervention of Mr. Greaves and the decisive declension of the cholera in the week following deserves to be noted. It strengthens the circumstantial inference that a part of the supply between July 8th and August 1st was drawn from the uncovered reservoirs; but the unclean matter might of course have entered the water through other unknown channels.

No corresponding rise or fall was observed on the same days in the other fields of water-supply.

The covered reservoir at Old Ford, said to be $2\frac{1}{2}$ acres* in area, and $10\frac{1}{2}$ feet deep, will not hold more than about 7,126,100 gallons of water; and the company supplies 90,174 houses with $20\frac{1}{2}$ million gallons daily. The uncovered reservoirs it is said cover nine acres; they are seen from the Great Eastern Railway, but are not depicted either in Mr. Milne's map, or in that of the Government engineers.

The depth of the uncovered reservoirs is unknown; but they contain perhaps three times as much water as the covered reservoir.

The system of the company consists of the water in the reservoirs, in the mains, in the multitudinous pipes, and in the butts of the consumers' houses; through these channels the matter must have been distributed irregularly; and it will be shown subsequently how slowly any zymotic matter once introduced is eliminated from the water or from the population. (See problem, p. 136.)

The only sure method is to let all the water run off simultaneously, and to let the fresh supply be scrupulously pure. This, with complete drainage, gets rid of the zymotic stuff most expeditiously.

Now the epidemic has partly subsided in the East, and the company's water, as far as we can judge of its effects, is returning to the normal state, it is desirable that Mr. Greaves, who is deservedly held to be one of the best practical hydraulic engineers of the day, and whose truthfulness, in questions of science, no one would question, should be permitted by the company to publish all the facts of the case.

The difficulties of supplying 21 million gallons of pure water daily from the Lea, with only one small reservoir, holding a third part of the day's supply, below, and in close juxtaposition to the tidal portion of that river full of foul sewage, in all seasons of the year, are immense; and, in the conditions given, casualties, which no skill can entirely avoid, are almost inevitable.

In reply to a circular from the Registrar-General the London Medical Officers of Health furnished the Department with information relative to the water supply and causes of cholera mortality in their districts. (See pp. 160–177.)

* The area of the covered reservoir is 2·5 × 43560 sq. feet; which, multiplied by 10·5 feet deep, gives 1,143,450 cubic feet, or 6·2321 × 1,143,450 = 7,126,100 gallons. For area and depth, see Professor Frankland's Report (*ante*, p. 124).

PROBLEM.

A full vessel contains x gallons of *pure water*: a *gallon* is poured out and is replaced by *a gallon of impure water*, which is mixed completely with the pure water; this operation is repeated m times: then the operation is reversed and the liquor drawn off is every time replaced by a *gallon of pure water* for n times, how much *impure water* and how much *pure water* remain at the end of the $(m + n)$ operation?

Taking a as 1 or any proper fraction let ax be the quantity of pure water remaining after the first operation, then a^2x will remain after the second operation, and a^mx after the m^{th}; as the vessel is still full the quantity of impure water is $x - a^mx = (1 - a^m)\,x$. In the reverse operation the impure water is continually diminished in the constant ratio a, and after the first change becomes $a\,(1 - a^m)\,x$, after the second $a^2\,(1 - a^m)\,x$ . . . . after the n^{th} change, that is the $(m + n)^{th}$ operation, the quantity of impure water is $a^n\,(1 - a^m)\,x = (a^n - a^{m+n})\,x$. As in the reverse operation the impure water is replaced by pure water, the quantity of pure water is found by subtraction to be—

$$= (1 - a^n + a^{m+n})\,x$$

If, instead of replacing the gallons of water withdrawn in the first m operations with impure water, a solution of arsenic is substituted, or a solution of a given quantity of any substance, then if the proportional part of the arsenic or other matter in 1 measure of water is expressed by q, then $q\,a^n\,(1 - a^m)$ will give the proportion of that substance in every unit of the solution, and the total in x such units of the solution by weight will be $q\,a^n.(1 - a^m)\,x$, and the weight of pure water will be—

$$\left\{1 - q\,a^n\,(1 - a^m)\right\}\,x$$

Putting $x=1$ and $a=\cdot9$, and assuming the unit of water at first to be pure, the quantities of pure water will fall respectively at every operation from 1·000 to ·900, to ·810, to ·729 at the third operation; when the impure water will from 0 become ·100; ·190; ·271; now reversing the operation, after three repetitions the impure water will become ·2439; ·21951; and ·197559. Assume that of the impure water ·01 by weight is arsenic, then the quantity of arsenic in 1000 lbs. of the liquor will in three operations increase from zero to 1·00 lb., 1·90 lbs., 2·71 lbs. and after repeating the reverse operation three times fall to 2·439 lbs., 2·195 lbs., 1·976 lbs.

For arsenic substitute cholera matter, say for shortness *cholrine*,* and the result will be the same.

But *cholrine** is unlike arsenic in this respect; it has the power of multiplying itself in the bodies of men, varies in strength, and undergoes changes in its activity.

It will be observed, that the quantity of poison increases faster than it decreases; and that the velocity of both changes increases as a decreases in value. A similar law is observed in the rise and decline of cholera.

When $a=0$ this implies that the whole of the liquor is changed at one operation; and when $a=1$ this implies that the original liquor is unchanged.

Week ending Saturday, September 22.

The deaths registered in London during the week were 1350. It was the thirty-eighth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1206. The deaths in the present

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* *Cholerine* is not now used in England for a mild form of cholera, as in that sense it is useless; but to prevent any possible ambiguity *cholrine* may be used as the name of the matter producing cholera.

return exceed the estimated number by 144. This number is exceeded by the deaths in the week from cholera.

The deaths returned in the four last weeks from cholera were 198, 157, 182, and 150; from diarrhœa in the same periods 128, 132, 110, and 98. The deaths from cholera are less by 32 than the deaths from that disease in the previous week. Of the deaths registered last week from cholera and diarrhœa, 14 persons died from cholera, and 11 from diarrhœa in the West districts; 28 from cholera, and 19 from diarrhœa in the North districts; 19 from cholera, and 17 from diarrhœa in the Central districts; 56 from cholera, and 24 from diarrhœa in the East districts; 33 from cholera, and 27 from diarrhœa in the South districts.

Fifty-three young persons under 20 years of age died from cholera, and 81 from diarrhœa; at the age of 20 and upwards, 97 deaths occurred from cholera, and 17 from diarrhœa.

Woolwich, unlike the other parts of the metropolis, had no Medical Health Officer at the time of the outbreak of cholera. But the Board of Works, on the appearance of the first case of cholera in London, appointed a committee, who made the two Union Officers Health Officers for the time being, and took other active steps to combat the threatening epidemic. In the case of Brewer-place, where 6 deaths from cholera occurred, it is admitted that there was some delay in the application of proper measures. Four deaths from cholera occurred last week in Woolwich, 10 in Deptford.

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ending Saturday, September 29.

The deaths registered in London during the week were 1418. It was the thirty-ninth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1239. The deaths in the present return exceed the estimated number by 179.

177 deaths from cholera, and 67 from diarrhœa were registered during the week. Of these, 12 deaths from cholera, and 9 from diarrhœa occurred in the West; 36 from cholera, and 11 from diarrhœa in the North; 28 from cholera, and 17 from diarrhœa in the Central; 55 from cholera, and 18 from diarrhœa in the East; 46 from cholera, and 12 from diarrhœa in the South districts. During the last 13 weeks, 4714 persons have fallen victims to cholera, and 2298 deaths were caused by diarrhœa.

The cholera matter is now diffused very equally all over London; and as the waters of the upper Thames, of the Lea, and of the wells become infected, the utmost exertions of the authorities will be required to ensure its decline. Each Health Officer should consider that the safety not only of the people of his own district, but of three millions of people depends on his activity. It is to be regretted that these inadequately paid officers cannot devote the whole of their time to the duties of their important office.

Cobbin's Brook.

The following note occurred in the Supplement to the Weekly Return of August 1st, in reference to a statement by Mr. Radcliffe, who reported to the Privy Council officially on the Epping cases of cholera:—"The Cobbin, which flows "into the Lea through Waltham Abbey, drains Epping, where the late small "outbreak of cholera was observed. That stream is said to be dry."*

This note has given rise to some controversy. Mr. Beardmore, the engineer of the Lea River Trust, said the brook was "dry." The *Lancet* Commissioner, after personal inspection, stated that Cobbin's Brook, which takes its rise in the country about Epping, is in parts but "a narrow stream at present, while in other places "it forms half stagnant pools. It receives the drainage of Epping, and about fifty "yards from its outlet by an open ditch, that of the town of Waltham Abbey."†

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* See p. 115.

† See p. 128.

Mr. J. Fowell Buxton writes to the editor of the *Times*:—

COBBIN'S BROOK.

To the Editor of the "Times."

"Sir,—Since it is of the utmost importance that all the facts relating to the origin and spread of choleraic infection should be stated with the greatest attainable accuracy, I venture to occupy, with your permission, a few lines in which to correct an error that, originating with the Registrar-General, has been frequently repeated in your columns.

"It is said that the choleraic poison may have been brought by the Lea and its branch, Cobbin's Brook, from Epping, where occurred the cases that attracted so much attention last autumn. For two reasons this is impossible. In the first place, the Cobbin, throughout the six or seven miles of its bed, from near Epping to Waltham, never flows at all unless it be after an excessive and long-continued rainfall.

"But, supposing that the contents of the pools of last year are by this time filling the pipes of the East London Water Company, there is still no need for alarm; for, secondly, the outbreak of cholera occurred, not in Epping, but in Theydon parish, which lies entirely within the basin of the Roding,—so that if water is the vehicle of choleraic infection, it will have to be discovered by the dwellers near Barking Creek.

"Warlies, Waltham Abbey, I am, &c.
"September 12th. J. Fowell Buxton."

Mr. Radcliffe, on this, explains:

"Three of the fatal cases in the outbreak of cholera at Theydon Bois last autumn occurred to the north of the spot marked Epping Mill in the ordnance map of the district, just beyond the crest of the hill northwards, and overlooking the slope from the eastern extremity of which springs one of the principal branches of the Cobbin's brook."

Mr. Radcliffe called attention to the brook as deserving notice, at a time when the cause of the great outbreak of cholera in East London was unknown. Cobbin's brook contributed slightly to the usual impurities of the Lea; and did nothing more. The evil had its origin at the Old Ford reservoir.

Elevation and Water Supply.

It was shown in the Report to the Registrar General on Cholera in 1849 (pp. lxi–lxvi), and in the Appendix to his Seventeenth Annual Report (pp. 88–90), that the mortality of the several districts of London from cholera diminished in the several districts supplied from the same sources in proportion to the elevation of the soil on which the houses were built.

This seemed to imply necessarily that the cholera matter (*cholrine*) was not in solution but in suspension in water, and comported itself very much like the well-known rice water when mixed in water.

The same law has hitherto been observed in this third epidemic. The mortality in the lowest sub-district (2 feet), St. John (St. George-in-the-East) was 193 deaths in 10,000 inhabitants; while it was 3 or 4 per 10,000 in Stamford Hill (76 feet), which is said to be supplied from a reservoir about 96 feet above Trinity high-water mark filled at intervals from Old Ford.

k ending Saturday, October 6.

The deaths registered in London during the week were 1344. It was the fortieth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1235. The deaths in the present return exceed the estimated amount by 109.

One hundred and eighty-two deaths from cholera and 69 from diarrhœa were registered during the week. 16 deaths from cholera and 8 from diarrhœa occurred in the West; 37 from cholera and 8 from diarrhœa in the North; 31 from cholera and 18 from diarrhœa in the Central; 50 from cholera and 17 from diarrhœa in the East; and 48 from cholera and 18 from diarrhœa in the South districts.

Eighty-six young persons under 20 years of age died from cholera and 49 from diarrhœa; at the age of 20 years and upwards 96 deaths occurred from cholera and 20 from diarrhœa.

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k ending Saturday, October 13.

The deaths registered in London during the week were 1353. It was the forty-first week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1222. The actual number exceeds the estimated number by 131.

207 deaths from cholera, and 47 from diarrhœa, making 254 deaths from the two forms, were registered during the week; 38 in the West districts, 41 in the North, 44 in the Central, 82 in the East, and 49 in the South districts. The mortality is lowest, taking population into account, in the South and North, highest in the Central and in the East districts. Many of the deaths occur in the various hospitals. The places in which the patients were attacked are printed in the notes when registered, with the particulars of each death, either by cholera or by diarrhœa.

The mortality of epidemic cholera and diarrhœa has only yet attained high proportions in the East London water field from known causes; and in the last six weeks the deaths all over London have been 289, 292, 248, 244, 251, 254. In the epidemic of the year 1854 the deaths by cholera and diarrhœa in the corresponding weeks were 2326, 1781, 1474, 919, 509, and 351. The deaths since the first week in September 1866 have been 1578; in the corresponding *six weeks* of 1854, the deaths from cholera and diarrhœa were 7360. At the cholera rates of 1854, the deaths in the last six weeks, corrected for increase of population, would have been 8929; the deaths have been 1578. Here are 7351 lives saved.

This is encouraging. Incessant attention should be given to the disinfection of the sewage of towns on the Thames and the Lea above the intake of the London water companies; and it would be exceedingly satisfactory to learn that the engineers see some way, such as Professor Frankland suggested, to the effectual filtration of the London waters.

To facilitate the extirpation of cholera the Daily Return of Deaths will be continued, and if the health officers will report what proceedings are taken in each case, the weekly summary will show the vigilance of the local authorities, and the use they make of the information placed at their disposal.

Experience proves that destruction of the cholera poison is rarely ever effected in bad districts unless it is carried out under the eyes of medical visitors; and in the same way premonitory diarrhœa is neglected. The danger of the whole metropolis is thus indefinitely protracted.

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k ending Saturday, October 20.

The deaths registered in London during the week were 1464. It was the forty-second week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1227. The present return exhibits an

excess of 237 deaths above the computed number. The increase of the total deaths is partly due to bronchitis.

One hundred and forty-four deaths were registered from cholera, and 55 from diarrhœa, making 199 in the aggregate. The deaths from cholera and diarrhœa in the last six weeks were 292, 248, 244, 251, 254, 199.

The health of London depends very much upon the inflow of pure water, and the outflow of impure sewage. The nine water companies have, according to their returns, supplied 100,864,971 gallons daily on an average in the London area during the month of September.

South London received from its three water companies 30,186,829 gallons daily during the month; and Mr. Bazalgette has, upon being applied to, supplied a return of the sewage discharged daily in September at the southern outfall works, Crossness; it amounted to 46,229,675 gallons, including the yield of the streams of land drainage, which necessarily varies from week to week. The sewage discharged daily was 43,976,300, 37,443,771, and 43,319,041 gallons in the three weeks ending October 20th.

If instead of gallon, the more convenient cubic metre of French engineers, or metric ton, agreeing closely with our ton weight, is substituted, we have these results.* London was supplied with 458,276 metric tons of water daily during September, or at the rate of 318 tons per minute, $5\frac{1}{3}$ metric tons per second. On the south side the water supply was 95 metric tons, the sewage discharged at Crossness 149 metric tons *per minute*.

The northern outfall sewer does not yet carry down to Barking Creek the sewage of the low level region north of the Thames; and Mr. Bazalgette fears that "it "will be quite a year and a half before we shall get the whole of the northern "sewage discharged through the outfall sewer, because parts of the low level have "to be constructed in the line of the proposed Chelsea embankment of the Metro-"politan Railway." Such is the present state of the London sewage.

The quality of the water supply in September has been tested as usual by Professor Frankland. He gives a remarkable instance of the effects of filtration through animal charcoal of the East London company's water, supplied to the tenants of Miss Coutts in Columbia-square. The organic matter was reduced to the minutest quantity; the hardness from 20° to 7°. The filtration of the water supply for 700 people is here performed without the least difficulty.

The Medical Health officers of London have been requested to favour the Registrar General with a weekly return of what is done in their respective districts for extinguishing epidemic cholera. Dr. Ballard has fully described the measures which are employed in Islington. It is by scrupulous attention to such details, and by purifying the water, that this plague can be stayed.

(*The replies of the Health Officers are given at* pp. 178–200.)

Week ending Saturday, October 27.

The deaths registered in London during the week were 1394. It was the forty-third week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1271. The present return exhibits an excess of 123 deaths above the computed number. The excess is partly due to affections of the air passages (bronchitis).

One hundred and twelve deaths from cholera and 32 deaths from diarrhœa were registered. The deaths from both forms in the last six weeks were 248, 244, 251, 254, 199, and 144.

Of the 112 deaths last week from cholera no less than 30 extremely malignant cases occurred in the Woolwich Dockyard and the Plumstead and Charlton sub-districts near the southern outfall sewer. The Plumstead cases occurred in the marsh district where many low houses are environed by tidal ditches.

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* A cubic metre of pure water weighs a metric ton = 1000 litres = 220·1 gallons = 2201 lbs. avoirdupois, while the common ton is 2240 lbs. The specific gravity of sewage is greater than that of water.

The Medical Officers of Health have given an interesting account* of the hygienic measures now in operation, showing an amount of vigilance and efficiency in some districts for which the local authorities and their excellent health officers have not obtained due credit. The evidence of activity in other districts is by no means equally conclusive.

The health officers of Bristol and Birkenhead, as well as of London, bear ample testimony to the utility of the disinfection of the cholera dejections by chemical agents. This can only be done effectively and kindly under medical supervision. It is a difficult chemical experiment to be performed by a practised operator. To place carbolic acid or chloride of zinc, or permanganate of potash, in the hands of people who have never seen these substances, know none of their properties, and have just been terrified by the sudden loss of a father, a mother, or a child, is to do nothing. The poor people cannot be expected to know how a house is to be disinfected, and still less to perform the operation.

The decline of cholera can be accelerated, but to ensure success every part of London must do its duty; and should expense in the poor districts stand in the way, the Metropolis will no doubt be as willing to pay a cholera rate as all England was to pay a cattle rate to meet an emergency.

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k ending Saturday, November 3.

The deaths registered in London during the week were 1432. It was the forty-fourth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1316. The actual return exhibits an excess of 116 over the estimated return. Bronchitis and pneumonia have been unusually fatal.

Seventy-three deaths from cholera, 28 from diarrhœa, 101 from both forms of disease were registered. The deaths from cholera and diarrhœa in the last six weeks were 244, 251, 254, 199, 144, and 101. Of the 73 deaths from cholera, no less than 28 occurred in the two sub-districts of Woolwich Dockyard and Plumstead. The bad hygienic condition of the people is discussed in papers by Dr. Finch, Mr. Ruegg, and Mr. Grant, the assistant engineer of the Metropolitan Board.†

The disinfection of houses in which deaths by cholera have been registered is still proceeding, and if the operation is performed with skill, care, and efficiency the decline of the epidemic will go on at a still more rapid pace.

Professors of chemistry sometimes fail in their comparatively simple experiments; how much more likely is disinfection to fail in the hands of ignorant people. It should be performed by officers properly instructed, under medical supervision. Inefficient disinfection is a delusion and a snare.

The medical health officers of Bristol, Birkenhead, Liverpool, and Leeds‡ have given an account of the hygienic measures adopted, it is gratifying to add in these cases with signal success.

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k ending Saturday, November 10.

The deaths registered in London during the week were 1361. It was the forty-fifth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1378. The deaths in the present return are less by 17 than the estimated number.

Sixty-seven deaths from cholera and 33 deaths from diarrhœa were registered in the week. The deaths from the two forms of disease in the last five weeks were 254, 199, 144, 101, and 100. Seven deaths from cholera occurred last week in Whitechapel, and 13 in Greenwich, Deptford, and Woolwich.

A large number of the deaths from cholera have latterly occurred in Woolwich, and a description of the outbreak is given on the next page.

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* See pp. 178–200. † See pp. 201–205.

‡ See "Notes on Cholera" in those Districts, pp. 224, 228, and 236

In reference to the statement that cases of cholera had occurred in Charlton without any premonitory diarrhœa, Dr. Macloughlin addressed a letter to the Registrar General upholding the doctrine which he advocated so forcibly in 1854, to the effect that cholera is invariably preceded by premonitory diarrhœa. Great credit is due to him for the labour which he bestowed in inquiring into the cases of 1853, and contributing to establish the doctrine now prevalent.

Eruption of Cholera in Woolwich.

When cholera was declining in London, Woolwich showed signs of a parting outbreak in September*, and in the last three weeks 73 persons were suddenly killed in the town and its suburbs. The area is very narrow on which these people died, and the circumstances are peculiar.

Woolwich is one of the principal military stations of England. There is a large force of the artillery and of marines, and there is the garrison hospital; amounting with cadets, in the aggregate, in 1861, to more than 5,000 men.† The dockyard employs many men; the great arsenal of the empire is full of artisans in Government employ. The health of the place in time of war might be of vital importance; yet several of the sanitary arrangements are singularly unsatisfactory.

Woolwich extends from the south banks of the Thames below high-water mark up the side of a hill, and has Plumstead on its east, Charlton on its west flank. Nearly all the deaths have occurred scattered over the Woolwich Dockyard sub-district, and in the marsh region of Charlton, which with Plumstead constitutes the sub-district of that name. Few deaths occurred in the parish of Plumstead. Nearly every house in the afflicted district has the water of the Kent Company laid on by stand pipe for a short time every day; and the people often having no butts of any kind collect the supply as they best can, in vessels of various kinds, dirty or clean, as the case may be. The only resource when the water supply proves insufficient is an underground tank of rain water close to the cesspool. The waterclosets have no water laid on; the water having, it is said, in many cases been cut off because the landlords or the tenants have at some time or other neglected to pay the rate; for the landlords of much of the house property appear to entertain insuperable objections to expending anything on their property, so the tenants suffer for the landlords' as well as for their own defaults. The offices of the dwellings are in a dirty dilapidated condition.

Dr. Finch has described the outbreak in Charlton (p. 201).

Mr. Grant, C.E., engineer of the Metropolitan Board, has given a graphic description of the block of 300 small houses, on the marsh, about six feet below high-water mark; traversed here by the southern outfall sewer (p. 202).

In descending the green hills of Charlton between mounds and fine spreading trees, in the sunshine, the land around looks the healthiest that can be imagined. The ships floating in the full flood of the Thames remind you that you are near the wealthiest commercial emporium of the world.

At the bottom of the hill is one of the massive engines of the Kent Water Company, pumping its daily supply of water from the chalk well on the margin of the marsh, not far from the tidal ditch below, but inaccessible, it may be assumed, to the ditch waters. A middle-aged man coming out of one of the cottages in the row looks sad; his wife is ill, and a young lodger has just died of cholera. Crossing the railway and the turnpike gate to the right three streets of small houses are seen stretching between the lower Woolwich road and the Thames. These houses are full of artisans of all kinds and their families, with some labourers and gardeners. In front of a few houses on the left of West-street, where six or seven deaths have been registered, a crowd is collected; a man and woman are quarrelling, and the language usual on such occasions is freely interchanged; the woman marching about with a child in her bare arms, and threatening to have "the law on the slanderous ruffian;" the man reminding her that a dead child has just been carried from the house. The man is a drunkard, and disturbs his neighbours, who are

* See Weekly Returns for week ending September 1st and September 8th, where the Woolwich authorities were warned.

† See Census, vol. i., p. 219.

nearly all respectable artisans. A few doors on is a decent woman in a clean house, whose son, a young gardener, was attacked by cholera in the morning at six o'clock, and died before noon; his two boys were running about, and the mother was from home. This row of houses is on the marsh, and the water soaking from the tidal ditch is seen through the floor; the recent heavy rains have flooded the land. The market gardens towards Greenwich had been covered with the foulest manure for a week before the great outbreak; the ground was opened and 68 deep wide cesspools were emptied which diffused offensive poisons all around. The works were nearly completed on 3d November; and the mortality declined. The people of East-street and West-street and Harden's Manorway were ill in great numbers, and several had died within a few days. Some of the artisans were sick at home; the wives and children had all been ailing. Sudden deaths by cholera create inconceivable consternation; and the women, often intelligent, complained that they did not know where to get the medicines liberally offered for nothing by the Board. Some of the men earn good wages. A few of the houses in Woolwich, where the greatest number of deaths occurred from cholera, were deserted, and no information could be obtained. The people in Charlton, on the marsh, often, as Mr. Grant says, two families in a house, worked in the gardens or in the dockyard or the arsenal; they did not know what to do; they had heard that their houses had been condemned, and had on one hand the terror of cholera, on the other the dread of being driven away.

These houses were built, it appears, by speculating builders on land entirely unfit for sites; but dwellings for workmen are indispensable. And although there is land in abundance in the neighbourhood on which healthy dwellings for the artizans of Woolwich might be erected, it is not clear that it is available without the intervention of the Legislature; as much called for in such cases as in the case of railways.

The question of the sites of dwellings for the working classes is one of the most pressing, and will no doubt obtain the attention of Her Majesty's Government.

In the meantime by erecting healthy dwellings on suitable sites and letting them to their workmen at adequate rents, the Government establishments might set an excellent example which other employers would probably in the end imitate. The abject straits to which married men, sometimes earning good wages in the works, are now put in Woolwich and Charlton have been brought to light by the cholera, and it is not likely that the lesson will be altogether thrown away. The great outfall sewer has probably had little effect on the outbreak of cholera; but it is by no means clear that the contamination of the Thames by sewage will have no effect on the health of the people in the marshes. This must be looked to by the able engineers of the Metropolitan Board.

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k ending Saturday, November 17.

The deaths registered in London during the week were 1428. It was the forty-sixth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1519. The deaths in the present return are less by 91 than the estimated number. Thus the mortality has been below the average for two weeks in succession.

The eruption of cholera in October, partly due to the sanitary defects of Woolwich and Lower Charlton, is subsiding; and the small houses of Lower Charlton are now supplied with a system of drains.

Thirty-two persons died of cholera, 22 of diarrhœa in the week. The decline of the disease is decisive; and with due vigilance in London it will ere long be extinguished in the epidemic form. The deaths from cholera in the last five weeks were 144, 112, 73, 67, and 32, among more than three millions of people.

Professor Frankland has investigated some of the physical properties of cholera stuff (cholrine); he has shown that it passes through filtering paper, and that water

containing $\frac{1}{500}$th part of the matter is not entirely purified by transmission through animal charcoal. Whether the properties of the remaining molecules or organisms undergo any change in the filtering process, depriving them of their zymotic character, has not been determined. The investigation proves the importance of destroying all the dejections by disinfectants, and of drawing water from sources free from contamination.

The Registrar General has received the following communication from Professor Frankland, F.R.S., of the Royal College of Chemistry :—

November 10*th*, 1866.

On the 27th ult. I received from Dr. Farr three bottles containing the rice-water evacuations of a cholera patient collected on the previous day.* After agitation the rice-water had the appearance of thin cream, from which a small amount of flocculent matter gradually subsided after the lapse of some hours, leaving a supernatant liquid looking exactly like milk, and from which no further perceptible subsidence took place even after the lapse of several days.

One volume of this choleraic evacuation was mixed with 10 parts of distilled water, and sealed up in a long glass tube ; the flocculent matter now subsided much more readily, leaving an opalescent liquid above. One volume of the rice-water was mixed with 100 volumes of distilled water and sealed up in a similar glass tube. The flocculent precipitate now subsided still more readily.

One volume of the rice-water was mixed with 500 volumes of distilled water, and the mixture passed through filter paper. The filtered liquid was still very opalescent, proving that a process of filtration, far more perfect than any available for the filtration of water upon a large scale, fails to remove entirely the suspended matter of choleraic evacuations.

Submitted to the action of potassic permanganate, 100,000 parts of the filtered liquid just mentioned required ·0430 part of oxygen for the oxidation of the organic matter contained in it. The average amount of oxygen required to oxidise the organic matter contained in 100,000 parts of filtered Thames water as supplied to the metropolis is ·0724 part. Thus a sample of water containing $\frac{1}{500}$th of its volume of choleraic evacuation exhibits, when tested by potassic permanganate, a much greater degree of purity as regards organic matter than the water supplied to the inhabitants of the metropolis ; in fact it may be safely asserted that the addition of cholera rice-water to the water of the Thames in the proportion of 1 to 1000 would not materially affect the results of a chemical analysis of the water.

After rapidly passing the above filtered but opalescent liquid (containing $\frac{1}{500}$th of choleraic evacuation) through animal charcoal the opalescence was diminished but not entirely removed. The organic matter still remaining in 100,000 parts of it now required only ·0103 part of oxygen for its oxidation. Animal charcoal therefore fails to remove entirely, even from previously filtered water, the suspended matter of choleraic evacuations.

The foregoing experiments show first that water may become seriously contaminated with choleraic matter without the presence of the latter being indicated by chemical analysis, and secondly that water so contaminated is not completely deprived of this impurity either by filtration or passage through animal charcoal.

It still remains to be proved to what particular constituent of choleraic dejections, the propagation of the disease is due, but it is obvious that if the propagating matter be a germ or an organism it must be in suspension and not in solution.

I have, &c.

E. Frankland.

The following notes by Dr. Sutton describe the course of the disease in the patient from whom the stuff was taken. It was a well-marked and severe case of cholera :—

James F., aged 10 years, admitted October 24th, 4 P.M., into the Cholera Hospital, Commercial-street.

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* The cholera matter was supplied by Dr. Sutton, pathologist to the London Hospital.

October 24th.—On admission: face pale, skin cold, pupils dilated, pulseless, vomited just after admission.

5 P.M. to 7·30 P.M. Vomited five times fluid like rice-water, and purged twice. Evacuations rice-water.

7·30 P.M. Face, lips, and tongue cold. Eyes semi-closed; very restless; turns himself from side to side; respiration normal; temperature in the axilla 93° Fahrenheit (in collapse).

During the night purged once; rice water evacuations; extremities cold; hands cold and shrivelled; body feels clammy, and is livid; eyes semi-closed.

October 25th. From 6 A.M. until 10·15 A.M., hot; purged, and vomited once; fluid like rice-water; pulseless at the wrist, and in the bracheal artery. He died at 10·15 A.M. on October 25th, 1866.

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ending Saturday, November 24.

The deaths registered in London during the week were 1435. It was the forty-seventh week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1608. The deaths in the present return are less by 173 than the estimated number.

Eight deaths from cholera, 26 from diarrhœa, were registered during the week. For the first time since the origin of the epidemic the number of deaths by cholera is less than the number of deaths by diarrhœa. The deaths by cholera during the last seven weeks were 207, 144, 112, 73, 67, 32, and 8; while the weekly deaths by diarrhœa fell from 47 to 26 in the same time.

It must be allowed that the circumscription of the most dangerous epidemic of the year in London is very much due to the measures by which it has been combated; and the time has now come for the extension of similar measures to the extinction of other zymotic diseases, such as typhoid fever.

The Companies supplied each house with a metric ton of water daily in October.

Dr. Letheby has described the array of disinfectants which have been employed under his instructions in the City; and has laid down rules for their use at once clear, judicious, and practical (p. 199).

In reply to an inquiry, Professor Frankland makes the following observations on the effect of temperature on organic matter in water:—

With regard to the temperature at which the putrefaction and decay of organic matter in water take place, I find that the following is all that appears in the printed report of my evidence on the subject in the case "Duke of Buccleuch and others v. Alexander Cowan and others," recently tried at Edinburgh. "Where a "river becomes sluggish—as where it is pent up by a weir—the quantity of organic "matter, and also of mineral matter, increases in some cases very considerably; "but that is only the case in warm weather, and the temperature of the water "must be 55° Fahrenheit and upwards for this effect to be produced. The putre-"faction of the mud in the bed of the river ensues, and the previously insoluble "matter becomes soluble matter."

The safest and most sensitive test of putrefaction in water is the relative proportion of oxygen to nitrogen in the dissolved gases. The river North Esk, as it flowed through the Duke of Buccleuch's grounds at Dalkeith Palace in March and in June last, afforded striking evidence of this kind as to the effect of temperature upon the absorption of oxygen by the organic matter of water (it is only when the whole of the oxygen dissolved in the water is consumed, that the latter assumes a true and offensive putrefactive condition). On the 3d of March the temperature of the water in the North Esk was 38° Fahrenheit, and the proportion of oxygen to nitrogen in the dissolved gases was $O:N = 1:2{\cdot}02$. This is the normal proportion in water free from organic matter. On the 21st of June the river emitted a putrid odour, the temperature of the water was 60° Fahrenheit, and the proportion of oxygen to nitrogen was $O:N = 1:25$; thus the amount of dissolved oxygen was reduced to a mere trace, and the organic matter was in a putrescent condition.

Week ending Saturday, December 1.

The deaths registered in London during the week were 1459. It was the forty-eighth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1596. The deaths in the present return are less by 137 than the estimated number.

Three* deaths from cholera were registered during the week; and the epidemic is now virtually extinct. The 15 deaths from diarrhœa are below the average number of previous years.

The total deaths from cholera in the present epidemic have been 5548, exclusive of 2692 deaths from diarrhœa, due in part to the cholera element. In the year 1849, when the population of London was about two millions and a quarter, cholera slew 14,137 people of all ages; in 1854 not less than 10,738 out of two millions and a half; and in the present year, when the population exceeds three millions, the deaths have been 5548, of which 3909 occurred in the East London districts, and 1639 in the rest of the metropolis.

The deaths to every 10,000 of population were 62, 43, and 18 in the three epidemics all over London. In the present epidemic the West Districts lost 4, the North Districts 6, the South Districts 8, the Central Districts 9; and it was only in the East Districts where the ravages recalled the violence of former epidemics that 3909 people, that is 64 in every 10,000 of the unhappy inhabitants, perished.

Holland and Belgium have published returns down to a recent date, for which the Registrar General is indebted to M. de Baumhauer and M. Heuschling, and the facts prove that the epidemic is as fatal as it ever was under unfavourable sanitary conditions. Thus in 22 cities and towns of Belgium and Holland containing less than half the population of London, or 1,460,808 people, the deaths from cholera alone in the present year were 20,643. So the deaths were 141 in 10,000, and if the same proportion of inhabitants had perished in London the deaths, instead of five, would have exceeded forty-two thousand. In Brussels the deaths were in the proportion of 164, Utrecht 271, Amsterdam 42, in 10,000 inhabitants.

By the bulletin published monthly by the Prefect of the Seine it appears that the deaths from cholera in Paris were 6653 in 1865, that is in the proportion of 39 to 10,000 inhabitants; while by the second outbreak in the present year 1812 persons had died by the end of July, the date of the last return, when the epidemic was increasing rapidly.

In London cholera has not only been less fatal than it was in previous epidemics, but its fatality has been reduced almost to insignificance in several of the districts by the mere force of hygienic science, before which the destroyer has retreated step by step; never, however, losing an opportunity of asserting its full power wherever negligence or ignorance presented an opening, either in England or in the cities of the Continent of Europe.

Cholera obeys certain laws, and the knowledge of those laws renders its subjugation in Europe practicable, provided all the people as well as the governments will co-operate in the work. This it may be hoped will be done, and it only remains for the metropolis of this empire to hold its own, and to keep the lead.

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* Two of these deaths were not published in the Daily Returns.

ESTIMATED POPULATION in 1849, 1854, and 1866; NUMBER of DEATHS registered from CHOLERA and DIARRHŒA in 1849, 1854, and 1866, and the PROPORTIONAL NUMBER of DEATHS from CHOLERA and DIARRHŒA in the same Periods, to 10,000 Persons living, in each of the Five Groups of LONDON DISTRICTS.

	1849.							1854.							1866.						
	Estimated Population.	Deaths registered in 52 Weeks.			Proportional Number of Deaths to 10,000 Persons living.			Estimated Population.	Deaths registered in 52 Weeks.			Proportional Number of Deaths to 10,000 Persons living.			Estimated Population.	Deaths registered in 23 Weeks.			Proportional Number of Deaths to 10,000 Persons living.		
		Cholera.	Diarrhœa.	Cholera and Diarrhœa.	Cholera.	Diarrhœa.	Cholera and Diarrhœa.		Cholera.	Diarrhœa.	Cholera and Diarrhœa.	Cholera.	Diarrhœa.	Cholera and Diarrhœa.		Cholera.	Diarrhœa.	Cholera and Diarrhœa.	Cholera.	Diarrhœa.	Cholera and Diarrhœa.
LONDON - -	2,286,635	14,137	3,899	18,036	61·8	17·1	78·9	2,504,300	10,738	3,147	13,885	42·9	12·6	55·5	3,037,991	5,548	2,692	8,240	18·3	8·9	27·2
WEST DISTRICTS - -	362,278	1,223	486	1,709	33·8	13·4	47·2	403,714	2,051	439	2,490	50·8	10·9	61·7	511,258	185	366	551	3·6	7·2	10·8
NORTH DISTRICTS - -	469,011	956	675	1,631	20·4	14·4	34·8	531,002	779	508	1,287	14·7	9·6	24·3	686,021	419	548	967	6·1	8·0	14·1
CENTRAL DISTRICTS -	391,946	1,724	550	2,274	44·0	14·0	58·0	392,065	644	397	1,041	16·4	10·1	26·5	359,219	329	364	693	9·2	10·1	19·3
EAST DISTRICTS - -	469,159	3,097	882	3,979	66·0	18·8	84·8	514,860	1,509	683	2,192	29·3	13·3	42·6	607,945	3,909	825	4,734	64·3	13·6	77·9
SOUTH DISTRICTS - -	594,241	7,137	1,306	8,443	120·1	22·0	142·1	662,659	5,755	1,120	6,875	86·8	16·9	103·7	873,548	706	589	1,295	8·1	6·7	14·8

PROPORTION of DEATHS by CHOLERA to POPULATION in EUROPEAN CITIES.

CITIES.	EPIDEMIC PERIOD.	POPULATION.	DEATHS from CHOLERA.	DEATHS to 10,000 Living.
LONDON - - - - -	23 Weeks 1866	3,037,991	5,548	(*a*) 18·3
PARIS - - - - -	12 Months 1865 7 Months 1866	1,696,141	6,653 1,812	39·2 (*b*) 10·7
NAPLES - - - - -	1865	446,931	2,301	51·5
VIENNA - - - - -	11th August to 10th Nov., 1866	560,000	2,875	51·3
LIVERPOOL - - - -	20 Weeks, ending 24th November 1866 - - - -	484,337	1,754	36·2
15 DUTCH CITIES and TOWNS (including Amsterdam).	June to October 1866	826,464	8,872	107·3
AMSTERDAM - - - -	June to October 1866	262,691	1,104	42·0
7 BELGIAN TOWNS (including Brussels).	1st May to 15th October 1866	634,344	11,771	185·6
BRUSSELS - - - - -	1st May to 15th October 1866	184,932	3,028	163·7

(*a*) Epidemic ended. (*b*) Epidemic going on.

Week ending Saturday, December 8.

The deaths registered in London during the week were 1584. It was the forty-ninth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1525. The deaths in the present return exceed the estimated number by 59. The excess is amply accounted for by bronchitis, a disease of cold weather.

Only one death from cholera was registered in the seven days; it was the death of a labourer's child, aged 2½ years, at 37 Church-street, Poplar. The deaths from cholera in the last five weeks have been 67, 32, 8, 3, and 1.

The Table, 75, gives definitively the deaths by cholera in each district to every 10,000 inhabitants, and the results may be thus briefly summed up; in St. George Hanover-square 2 in 10,000 died of cholera, Chelsea 4, Westminster 6, Marylebone 3, Kensington 4, all on the north side of the Thames, and supplied with water by the Grand Junction, the Chelsea, and the West Middlesex Companies.

The following districts on the south side of the river were supplied by the Southwark and by the Lambeth Companies, and the deaths by cholera to 10,000 inhabitants were in Newington 3, St. George Southwark 7, Wandsworth 5, Camberwell 6, Rotherhithe 9, Lambeth 7, St. Olave 9, Bermondsey 6, St. Saviour 7.

The New River taking about eighty-two per cent. of its water from the River Lea supplies St. Martin-in-the-Fields, where the deaths were 4 by cholera in 10,000 inhabitants, in the City of London 5, West London, a part of the City without the Walls, 12, Strand 7, Islington 4, Holborn 6, St. Luke 16, St. Giles 10, Clerkenwell 11. In Pancras, chiefly supplied by the New River, the deaths were 6, St. James Westminster 4, Hampstead 1.

The East London Company draws all its water from the River Lea, but it has pumps at two different stations, the one at Lea Bridge, and the other two miles below at Old Ford, where it has a small covered reservoir, and two open reservoirs

in "dangerous proximity" to the Lea, at a point where that tidal river is full of foul sewage; the deaths here were at a very different rate, namely, 63 in Bethnal Green, 65 in Mile End Old Town, 93 in St. George-in-the-East, 85 in Poplar, 78 in Whitechapel, 111 in Stepney. There are two sub-districts on the east side of the Lea, also supplied by the East London Company, and the deaths were at the same rate as on the west side.

In three districts supplied partly by the New River, and partly by the East London Company, the deaths were in imtermediate proportions, namely, 13 in Shoreditch, 12 in Hackney, 16 in East London Districts, which is a part of the City of London without the Walls.

The reasons for believing that the choleraic water was only distributed by the East London Company up to a certain date were stated at the time; and probably that Company will now be willing to relate all the circumstances of that deplorable and fatal accident.

In Lewisham, including Plumstead aud Charlton, the deaths by cholera were 6 in 10,000 inhabitants, in Greenwich, Deptford, and Woolwich 20: both these districts are supplied by the Kent Company in conjunction with the Lambeth and the Southwark Companies.

A most gratifying and conclusive proof of the good effects of improved water supply is afforded by the experience of the South London Districts, which were undrained and were supplied with the foul sewage water of the Thames by the Southwark and Lambeth Companies in 1849. The Lambeth Company got purer water from the Thames above Teddington Lock before 1854, but the Southwark Company only succeeded in supplying the purer water after the year 1854. In the present year both Companies have supplied this better, if not perfectly pure water, of the Thames; while the shallow pumps have been dried up by the drains,—with the following remarkable results:—The deaths by cholera to 10,000 inhabitants of South London were 120 in the year 1849, 87 in 1854, and 8 in the year 1866. From cholera and diarrhœa the deaths out of the same numbers living were 142, and 104, and 15! As the water improved the deaths declined to this marvellous extent. Similar, if less striking, evidence of the effects of pure and impure waters is supplied by the experience of the other London Companies.

NUMBER of DEATHS REGISTERED in LONDON from CHOLERA and DIARRHŒA in corresponding Weeks of 1849, 1854, and 1866.

No. of Week -	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	CHOLERA.																														
1849 - -	(June 3.) 9	22	42	49	124	152	339	678	783	926	823	1230	1272	1663	2026	1682	839	434	288	110	41	25	11	6	8	2	1	—	1	1	—
1854 - -	(June 3.) 2	1	1	1	—	1	5	26	133	399	644	729	847	1287	2050	1549	1284	754	411	249	163	66	31	23	12	8	7	5	2	3	2
1866 - -	(June 2.) 2	3	3	1	6	14	32	346	904	1053	781	455	265	198	157	182	150	177	182	207	144	112	73	67	32	8	3	1	—	—	—
	DIARRHŒA.																														
1849 - -	(June 3.) 16	20	36	17	30	46	89	131	224	179	173	188	240	234	272	280	238	163	135	91	51	42	31	25	21	16	17	17	14	13	9
1854 - -	(June 3.) 22	31	31	38	25	32	46	58	84	142	195	192	214	243	276	232	190	165	98	102	78	46	33	35	31	21	19	19	25	20	16
1866 - -	(June 2.) 19	22	20	43	67	102	150	221	349	354	264	194	129	128	132	110	98	67	69	47	55	32	28	33	22	26	15	10	—	—	—

In the Table for the 30th week ending 28th July, published on Wednesday morning 1st August, the complete coincidence of the cholera field with the field of supply of the East London Water Company was pointed out, in the hope that the state of its water might be immediately looked to. The weekly report was published on Wednesday morning 1st August; on that day the engineer of the company called at the General Register Office, and on the day following he published a letter in the daily journals showing that he fully appreciated the importance of the crisis. The description of the works and Professor Frankland's analysis of the waters were published in the following week (31st), when the eruption in the East London field began to decline. It will be borne in mind that the deaths are registered three or four days after they occur, and that cholera matter would remain in the mains and butts some time after the supply of purer water was commenced. The actual deaths on each day are given in a Table published in the Supplement to the Weekly Return, No. 37, p. 547. In the districts supplied by the East London Company, including West Ham, they were 170 on 1st August, and 155, 114, 112, 119, 115, and 84 successively on the six following days.

Number of Week	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	—
DISTRICTS.	June 30.	July 7.	July 14.	July 21.	July 28.	Aug. 4.	Aug. 11.	Aug. 18.	Aug. 25.	Sept. 1.	Sept. 8.	Sept. 15.	Sept. 22.	Sept. 29.	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 27.	Nov. 3.	Nov. 10.	Nov. 17.	Nov. 24.	Dec. 1.	Total in the 23 Weeks.
LONDON	6	14	32	346	904	1053	781	455	265	198	157	182	150	177	182	207	144	112	73	67	32	8	3	5548
West Districts	2	3	2	11	12	12	8	7	3	6	12	10	14	12	16	30	13	8	3	1	—	—	—	185
North Districts	1	1	4	6	20	46	38	15	12	15	20	27	28	36	37	38	35	14	8	7	1	1	1	411
Central Districts	—	1	3	1	15	32	23	16	13	9	12	20	19	28	31	39	27	14	11	10	5	—	—	329
East Districts	3	5	20	308	818	916	673	369	198	122	74	77	56	55	50	65	34	26	13	16	14	3	2	3917
South Districts	—	4	3	20	39	47	39	48	39	46	39	48	33	46	48	35	35	50	38	33	12	4	—	706
1. Kensington	—	2	—	11	7	5	3	2	1	2	2	4	7	2	7	16	8	5	—	—	—	—	—	84
2. Chelsea	—	1	—	—	1	—	1	1	1	1	6	1	3	1	1	1	—	1	—	1	—	—	—	21
3. St. George Hanover-sq.	—	—	1	—	2	—	1	3	—	1	2	3	—	1	1	1	1	—	—	—	—	—	—	17
4. Westminster	—	—	1	—	1	4	1	—	—	2	2	—	3	7	4	10	3	2	2	—	—	—	—	42
5. St. Martin-in-the-Fields	—	—	—	—	1	—	—	—	—	—	—	1	1	—	3	2	—	—	1	—	—	—	—	9
6. St. James Westminster	2	—	—	—	—	3	2	1	1	—	—	1	—	1	—	—	1	—	—	—	—	—	—	12
7. Marylebone	—	—	—	2	3	1	2	1	1	6	6	3	5	3	3	7	2	1	2	4	—	—	—	52
8. Hampstead	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2
9. Pancras	—	1	2	—	10	6	6	2	2	3	1	9	10	15	24	15	17	8	4	—	1	—	—	136
10. Islington	1	—	2	—	2	19	12	6	2	3	7	7	5	13	5	15	12	3	1	3	—	—	1	119
11. Hackney	—	—	—	4	5	20	17	6	7	3	6	7	8	5	5	1	4	2	1	—	—	1	—	102
12. St. Giles	—	—	—	—	1	—	3	—	1	1	4	5	2	6	8	7	5	2	—	3	—	—	—	48
13. Strand	—	—	—	—	2	4	2	2	1	—	1	1	3	1	3	3	—	—	1	3	2	—	—	29
14. Holborn	—	—	—	—	—	—	—	1	1	2	—	1	1	2	4	4	3	—	2	—	1	—	—	22
15. Clerkenwell	—	1	2	—	2	3	—	1	—	2	3	3	3	4	4	7	6	1	3	—	—	—	—	45
16. St. Luke	—	—	—	—	2	3	1	2	1	2	1	1	3	6	4	8	3	5	1	1	2	—	—	46
17. East London	—	—	—	—	5	12	8	4	5	2	2	7	2	5	1	2	1	1	1	1	—	—	—	59
18. West London	—	—	—	1	2	8	6	3	3	—	—	2	4	4	5	6	7	4	3	2	—	—	—	60
19. London City	—	—	1	—	1	2	3	3	1	—	1	—	1	—	2	2	2	1	—	—	—	—	—	20
20. Shoreditch	—	2	2	5	7	16	19	4	12	4	7	6	6	11	6	13	3	2	4	—	3	1	—	133
21. Bethnal Green	1	1	4	43	90	166	108	69	30	24	6	14	8	12	10	8	7	6	—	—	3	—	—	610
22. Whitechapel	—	—	2	25	131	174	178	92	50	41	36	30	23	22	27	27	12	11	5	7	2	1	2	898
23. St. George-in-the-East	—	—	1	25	79	85	86	48	24	9	7	5	3	1	3	1	1	2	—	3	2	1	—	386
24*a*. Stepney	—	—	6	67	135	135	90	58	24	10	9	2	5	3	1	6	3	—	—	2	—	—	—	556
24*b*. Mile-end Old Town	—	1	1	52	122	140	68	42	20	11	2	7	5	2	1	7	6	5	3	3	3	—	—	501
25. Poplar	2	1	4	91	254	200	124	56	38	23	7	13	6	4	2	3	2	—	1	1	1	—	—	833
26. St. Saviour Southwark	—	—	—	—	1	3	7	5	2	3	—	3	4	1	1	—	1	—	1	—	—	—	—	32
27. St. Olave Southwark	—	—	—	2	1	—	—	—	2	1	—	1	—	1	—	2	2	3	—	2	—	3	—	20
28. Bermondsey	—	—	1	1	2	2	4	3	4	2	3	—	2	5	1	—	1	1	—	1	—	—	—	33
29. St. George Southwark	—	2	—	2	2	4	2	3	—	—	—	2	2	7	3	2	2	1	1	3	—	—	—	38
30. Newington	—	1	—	2	—	1	—	1	1	1	2	—	—	1	4	—	4	2	—	1	2	—	—	23
31. Lambeth	—	1	1	3	7	5	2	13	2	4	5	4	6	11	13	13	11	4	1	6	1	—	—	113
32. Wandsworth	—	—	—	—	3	3	7	1	2	4	6	4	2	2	1	—	2	—	1	2	—	—	—	40
33. Camberwell	—	—	1	7	9	3	1	1	1	5	4	4	—	2	3	1	—	—	1	2	1	—	—	46
34. Rotherhithe	—	—	—	—	4	2	3	1	2	2	1	2	1	1	2	1	2	—	—	1	—	—	—	25
35. Greenwich	—	—	—	3	10	23	12	19	22	19	17	25	14	13	17	15	7	24	20	13	7	1	—	281
36. Lewisham	—	—	—	—	—	1	1	1	1	5	1	3	2	2	3	1	3	15	13	2	1	—	—	55

Note.—The numbers in the above Table are uncorrected for Deaths by Cholera in the several hospitals. For the number of persons who have died by Cholera in hospitals not situated in the districts in which the deceased persons lived, see Table on page 158.

NUMBER of DEATHS REGISTERED from **DIARRHŒA** since the COMMENCEMENT of the EPIDEMIC, from Week ending 30th June to Week ending 1st December 1866.

Number of Week	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	—
DISTRICTS.	June 30.	July 7.	July 14.	July 21.	July 28.	Aug. 4.	Aug. 11.	Aug. 18.	Aug. 25.	Sept. 1.	Sept. 8.	Sept. 15.	Sept. 22.	Sept. 29.	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 27.	Nov. 3.	Nov. 10.	Nov. 17.	Nov. 24.	Dec. 1.	Total in the 23 Weeks.
LONDON	67	102	150	221	349	354	264	194	129	128	132	110	98	67	69	47	55	32	28	33	22	26	15	2692
WEST DISTRICTS	11	16	18	37	48	46	31	28	15	12	18	14	11	9	8	8	6	3	4	7	3	6	7	366
NORTH DISTRICTS	20	23	37	54	78	79	51	40	21	24	19	11	19	11	8	3	13	8	5	5	9	5	5	548
CENTRAL DISTRICTS	5	18	28	31	44	42	31	22	13	18	14	15	17	17	18	5	8	4	5	3	2	3	1	364
EAST DISTRICTS	14	26	37	60	123	125	101	63	41	43	44	35	24	18	17	17	11	7	7	7	3	2	—	825
SOUTH DISTRICTS	17	19	30	39	56	62	50	41	39	31	37	35	27	12	18	14	17	10	7	11	5	10	2	589
1. Kensington	6	8	9	23	29	30	21	18	11	5	10	8	6	3	2	4	3	3	1	3	2	4	1	210
2. Chelsea	1	1	2	5	6	4	5	3	1	—	2	—	—	—	1	3	1	—	2	1	—	—	1	39
3. St. George Hanover-sq.	—	3	3	4	5	5	2	3	1	1	1	2	—	2	2	—	2	—	—	1	1	1	2	41
4. Westminster	3	2	3	2	6	4	3	2	1	4	4	2	3	2	3	1	—	—	—	—	—	—	2	47
5. St. Martin-in-the-Fields	1	1	1	2	1	2	—	2	1	—	1	1	2	—	—	—	—	—	1	1	—	1	1	19
6. St. James Westminster	—	1	—	1	1	1	—	—	—	2	—	1	—	2	—	—	—	—	—	1	—	—	—	10
7. Marylebone	2	3	12	17	16	24	17	10	4	8	5	3	3	3	5	1	5	3	1	1	3	—	1	147
8. Hampstead	—	1	—	2	1	1	2	1	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	10
9. Pancras	8	12	17	16	37	23	10	11	6	7	4	1	8	4	—	1	2	2	1	1	2	3	1	177
10. Islington	7	4	5	15	17	25	15	12	7	7	4	7	6	1	1	1	4	1	2	1	1	1	3	147
11. Hackney	3	3	3	4	7	6	7	6	4	2	6	—	1	3	2	—	1	2	1	2	3	1	—	67
12. St. Giles	—	3	9	10	11	4	7	3	—	3	3	4	1	3	4	—	2	—	1	1	1	—	—	70
13. Strand	—	2	2	1	2	—	1	3	1	1	—	3	4	1	2	—	1	—	—	—	—	—	—	24
14. Holborn	1	2	5	6	7	8	3	2	2	1	2	1	1	6	4	2	1	2	—	—	—	1	—	57
15. Clerkenwell	3	3	4	7	13	15	7	6	1	6	2	2	4	2	3	1	1	2	2	—	—	1	—	85
16. St. Luke	1	4	2	3	7	6	11	4	7	2	2	3	4	3	—	2	2	—	1	2	—	1	1	68
17. East London	—	1	3	2	3	4	—	2	—	—	—	—	1	1	3	—	1	—	—	—	—	—	—	21
18. West London	—	2	2	1	1	4	1	1	1	3	2	2	2	1	1	—	—	—	—	—	1	—	—	25
19. London City	—	1	1	1	—	1	1	1	1	2	3	—	—	—	1	—	—	—	1	—	—	—	—	14
20. Shoreditch	4	2	10	7	10	17	9	7	6	5	6	3	7	3	2	6	4	2	2	1	1	1	—	115
21. Bethnal Green	4	6	6	9	23	27	21	11	10	7	9	9	3	6	4	4	2	1	2	1	—	—	—	165
22. Whitechapel	1	5	6	12	22	12	12	6	5	7	5	4	5	1	1	2	—	1	1	2	—	—	—	110
23. St. George-in-the-East	—	3	1	10	6	9	11	7	2	4	6	7	1	4	1	1	1	1	1	—	—	—	—	76
24a. Stepney	1	2	4	8	25	21	9	11	2	3	8	3	2	—	2	1	1	—	—	—	—	—	—	103
24b. Mile-end Old Town	2	3	7	4	14	15	12	7	4	4	2	4	2	3	—	1	2	1	—	1	—	—	—	88
25. Poplar	2	5	3	10	23	24	27	14	12	13	8	5	4	1	7	2	1	1	1	2	2	1	—	168
26. St. Saviour Southwark	1	2	2	2	8	3	3	2	2	—	2	2	2	1	—	1	3	—	—	—	—	1	—	37
27. St. Olave Southwark	1	—	3	1	1	1	2	—	1	—	—	2	—	2	1	1	—	1	—	—	—	—	—	17
28. Bermondsey	3	3	2	8	6	7	12	4	10	7	5	2	2	—	1	—	—	—	1	—	1	1	—	75
29. St. George Southwark	2	2	2	3	4	4	1	5	1	2	1	1	2	1	2	1	1	—	—	1	—	1	1	38
30. Newington	1	2	1	2	2	5	5	6	1	2	2	4	2	1	1	—	1	1	—	—	—	1	—	40
31. Lambeth	3	7	5	13	11	24	12	13	6	10	3	8	4	4	3	5	3	3	1	4	2	4	—	148
32. Wandsworth	2	1	3	3	4	5	6	6	4	1	4	1	1	1	2	5	3	2	—	1	—	1	—	56
33. Camberwell	2	2	4	5	9	5	1	1	5	1	4	3	2	—	2	—	—	1	1	1	—	—	—	49
34. Rotherhithe	—	—	1	—	2	1	1	1	—	1	1	1	2	—	—	—	—	—	1	—	—	—	—	12
35. Greenwich	1	—	6	2	6	4	5	3	9	6	10	8	8	—	4	—	6	2	1	2	2	—	—	85
36. Lewisham	1	—	1	—	3	3	2	—	—	1	5	3	2	2	2	1	—	—	2	2	—	1	1	32

owing the WATER COMPANIES supplying EACH DISTRICT, the AREA in ACRES, the NUMBER of INHABITED HOUSES 1, POPULATION 1851, 1861, and 1866, and DEATHS REGISTERED in Twenty-three Weeks ending 1st December 1866 from AUSES, from CHOLERA, and from DIARRHŒA.

OMPANIES furnishing the greater Part of the WATER SUPPLY.	Area in Statute Acres.	Number of inhabited Houses enumerated in 1861.	POPULATION. 1851. Enumerated.	1861. Enumerated.	1866. Estimated.	DEATHS REGISTERED in 23 Weeks ending 1st December 1866.‡ All Causes.	Cholera.	Diarrhœa.	Cholera and Diarrhœa.
LONDON	77,997	359,421	2,362,236	2,803,989	3,037,991	36,423	5,548	2,692	8,240
TRICTS supplied by the THAMES WATER OMPANIES, viz. :—									
5 (a) by Grand Junction, West Middlesex, and Chelsea	11,794	67,719	473,077	567,053	615,604	5,930	210	484	694
9 (b) by Southwark and Lambeth	22,951	84,593	482,435	579,748	638,292	6,929	371	472	843
TRICTS supplied by the LEA WATER OMPANIES, viz. :—									
9 (c) by New River, drawing its water from upper part of Lea River (82 per cent.), from Chadwell Spring, and other sources	5,217	57,904	468,819	515,401	536,576	6,247	409	509	918
6 (d) by East London from Old Ford Reservoir	5,584	58,886	376,265	441,794	471,109	9,539	3,729	710	4,439
3 (e) by New River, and by East London from Lea Bridge	4,728	34,953	212,092	253,346	271,617	3,001	348	203	551
TRICTS supplied by the GRAND JUNCTION, NEW RIVER, and WEST MIDDLESEX OMPANIES	5,132	27,838	215,348	253,220	269,537	2,664	144	197	341
TRICTS supplied mainly by the KENT OMPANY from artesian wells, and partially by SOUTHWARK and LAMBETH OMPANIES	22,591	27,528	134,200	193,427	235,256	2,113	337	117	454

mpany ing pply.	DISTRICTS.								
. C.	3. St. George Hanover-square	1,161*w*	10,437	73,230	87,771	94,315	711	15	41	56
C.	2. Chelsea	865*w*	8,314	56,538	63,439	65,957	694	23	39	62
C.	4. Westminster	917*w*	6,798	65,609	68,213	68,268	757	42	47	89
M. J.	7. Marylebone	1,509	16,357	157,696	161,680	159,871	1,728	46	147	193
WM. C.	1. Kensington	7,342*w*	25,813	120,004	185,950	227,193	2,040	84	210	294
. S.	30. Newington	624	12,740	64,816	82,220	92,680	914	24	40	64
. L.	29. St. George Southwark	282	7,238	51,824	55,510	57,498	686	40	38	78
. L.	32. Wandsworth	11,695*w*	11,186	50,764	70,403	82,979	860	41	56	97
. L.	33. Camberwell	4,342	12,098	54,667	71,488	81,818	833	48	49	97
S.	34. Rotherhithe	886*w*	3,521	17,805	24,502	28,767	287	26	12	38
. S.	31. Lambeth	4,015*w*	22,910	139,325	162,044	174,904	1,829	113	148	261
S.	27. St. Olave Southwark	169*w*	2,209	19,375	19,056	18,914	433	16	17	33
. L.	28. Bermondsey	688*w*	8,220	48,128	58,355	64,310	695	36	75	111
. L.	26. St. Saviour Southwark	250*w*	4,471	35,731	36,170	36,422	392	27	37	64
. C.	5. St. Martin-in-the-Fields	305*w*	2,240	24,640	22,689	21,370	232	9	19	28
N.	19. London City	434*w*	6,362	55,932	45,555	39,756	264	21	14	35
N.	13. Strand	172*w*	3,775	44,417	42,979	40,883	460	28	24	52
N.	10. Islington	3,127	20,704	95,329	155,341	193,648	2,182	86	147	233
N.	14. Holborn	196	4,109	46,621	44,862	42,556	537	24	57	81
N.	16. St. Luke	220	6,356	54,055	57,073	56,710	769	90	68	158
N.	12. St. Giles	245	4,690	54,214	54,076	52,226	658	50	70	120
N.	15. Clerkenwell	380	7,088	64,778	65,681	63,957	716	71	85	156
N.	18. West London	138*w*	2,580	28,833	27,145	25,470	429	30	25	55
E.†	21. Bethnal Green	760	14,731	90,193	105,101	110,289	2,140	696	165	861
E.†	24*b*. Mile-end Old Town	681	10,758	56,602	73,064	80,695	1,343	526	88	614
E.†	23. St. George-in-the-East	243	6,169	48,376	48,891	47,779	1,059	443	76	519
E.†	25. Poplar	2,918*w*	11,123	47,162	79,196	99,762	2,111	849	168	1,017
.† N.	22. Whitechapel (London Hosp.)	406*w*	8,664	79,759	78,970	76,386	1,704	592	110	702
E.†	24*a*. Stepney	576*w*	7,441	54,173	56,572	56,198	1,182	623‖	103	726
N. E.	20. Shoreditch	646	17,072	109,257	129,364	136,836	1,546	174	115	289
. E.†	11. Hackney	3,929	13,392	58,429	83,295	97,120	1,098	114	67	181
N. E.	17. East London	153	4,489	44,406	40,687	37,661	357	60	21	81
WM.	8. Hampstead	2,252	2,653	11,986	19,106	23,557	169	2	10	12
. N.	6. St. James Westminster	164	3,333	36,406	35,326	34,155	282	15	10	25
H.WM.	9. Pancras	2,716	21,852	166,956	198,788	211,825	2,213	127	177	304
K. L.	36. Lewisham	17,224*w*	9,707	34,835	65,757	90,420	605	55	32	87
K. S.	35. Greenwich	5,367*w*	17,821	99,365	127,670	144,836	1,508	282	85	367
	Stratford (*Sub-district*)	8,648*w*	2,773	10,586	15,994	19,855	—	157	21	178
	West Ham (*Sub-district*)		3,875	9,968	25,195	40,957§	—	Return not received.		

as marked thus (*w*) include water.
eral water companies are designated by letters: thus, the New River Company by N., the Grand Junction by J., Chelsea st Middlesex by WM., East London by E., Hampstead by H., Southwark by S., Lambeth by L., and Kent by K. In re a District is supplied by more than one company, the initial of the company supplying the greater part is placed here a company supplies only a small part of the district it is indicated by a small initial letter.
part of Hackney District served by the East London Company is, it is believed, supplied from Lea Bridge after filtration, Districts are supplied from the reservoirs at Old Ford.
persons have died of cholera in hospitals not situated in the districts in which they were attacked, the deaths are n the Table, not to the hospital districts, but to those districts from which the patients had been removed. A Table on ws the number of cases to which this rule has been applied.
estimate for the West Ham Sub-district has been made on the assumption that the population increased since 1861 at the as it did in the interval between the censuses of 1851 and 1861. Mr. Marsh, the Registrar for this Sub-district, estimates lation in 1866 at 35,000.
number (623) includes 46 deaths registered from cholera in the Limehouse District Cholera Hospital. The returns

ABLE showing the WATER COMPANIES supplying each DISTRICT, the ELEVATION, PERSONS to an ACRE, ANNUAL VAI HOUSES, ANNUAL VALUE of HOUSE and SHOP ROOM to each PERSON in the £, POOR RATE in the £ of HOUSE RENT, A MORTALITY in each of the Ten Years 1841-50 and 1851-60 from ALL CAUSES, and NUMBER of DEATHS in Twenty-three ending 1st December 1866 to 10,000 PERSONS living from ALL CAUSES, from CHOLERA, and from DIARRHŒA.

No. of Districts.	COMPANIES furnishing the greater Part of the WATER SUPPLY.	Elevat[n] in Ft. above Trinity High-water Mark of the Thames.	Persons to an Acre in 1866.	Annual Value of Houses, Year ending Apr. 1843.	Annual Value of House and Shop Room to each Person in £.	Poor Rate in the £ of House Rent.	ANNUAL MORTALITY from All Causes. Deaths to 1000 living. 1841-50.	1851-60.	NUMBER of DEAT 23 Weeks to 10,000 p living.‡ All Causes.	Cholera.	Diarrhœa.
				£	£	£					
	LONDON	39	39·0	40	5·589	·064	25	24	119·9	18·3	8·9
14	DISTRICTS supplied by the THAMES WATER COMPANIES, viz.:—	*	*	*	*	*	*	*			
	5 (a) by Grand Junction, West Middlesex, and Chelsea	35	73·7	58	7·131	·041	23	23	96·3	3·4	7·9
	9 (b) by Southwark and Lambeth	4	89·5	26	4·223	·086	27	25	108·6	5·8	7·4
18	DISTRICTS supplied by the LEA WATER COMPANIES, viz.:—										
	9 (c) by New River, drawing its water from upper part of Lea River (82 per cent.), from Chadwell Spring, and other sources	53	166·9	64	7·692	·051	25	24	116·4	7·6	9·5
	6 (d) by East London from Old Ford Reservoir	24	130·0	25	3·937	·081	26	26	202·5	79·2	15·1
	3 (e) by New River, and by East London from Lea Bridge	47	160·9	28	4·108	·081	24	23	110·5	12·8	7·5
(f)	DISTRICTS supplied by the GRAND JUNCTION, NEW RIVER, and WEST MIDDLESEX COMPANIES	160	98·9	70	7·781	·033	21	21	98·8	5·3	7·3
(g)	DISTRICTS supplied mainly by the KENT COMPANY from artesian wells, and partially by SOUTHWARK and LAMBETH COMPANIES	18	16·1	25	4·101	·065	22	21	89·8	14·3	5·0
	Water Company furnishing chief Supply. **DISTRICTS.**										
(a)	J. C. 3. St. George Hanover-square	34	81·2	110	13·169	·018	19	19	75·4	1·6	4·3
	C. 2. Chelsea	12	76·3	29	4·210	·067	27	26	105·2	3·5	5·9
	C. 4. Westminster	3	74·4	36	4·189	·039	27	26	110·9	6·2	6·9
	WM. J. 7. Marylebone	87	105·9	71	7·586	·043	24	24	108·1	2·9	9·2
	J. WM. C. 1. Kensington	40	30·9	43	6·503	·039	20	19	89·8	3·7	9·2
(b)	L. S. 30. Newington	−1	148·5	22	3·788	·075	26	24	98·6	2·6	4·3
	S. L. 29. St. George Southwark	0	203·9	22	3·318	·089	30	27	119·3	7·0	6·6
	S. L. 32. Wandsworth	24	7·1	29	4·839	·072	22	22	103·6	4·9	6·7
	S. L. 33. Camberwell	4	18·8	25	4·508	·038	24	23	101·8	5·9	6·0
	S. 34. Rotherhithe	0	32·5	23	4·238	·143	28	25	99·8	9·0	4·2
	L. S. 31. Lambeth	3	43·6	28	4·389	·072	25	23	104·6	6·5	8·5
	S. 27. St. Olave Southwark	4	111·9	35	4·559	·079	30	29	228·9	8·5	9·0
	S. L. 28. Bermondsey	0	93·5	18	3·077	·134	28	26	108·1	5·6	11·7
	S. L. 26. St. Saviour Southwark	3	145·7	36	5·291	·076	30	29	107·6	7·4	10·2
(c)	N. C. 5. St. Martin-in-the-Fields	38	70·1	119	11·844	·039	24	23	108·6	4·2	8·9
	N. 19. London City	31	91·6	117	17·676	·056	22	22	66·4	5·3	3·5
	N. 13. Strand	50	237·7	66	7·374	·047	24	24	112·5	6·8	5·9
	N. 10. Islington	94	61·9	35	5·494	·030	19	21	112·7	4·4	7·6
	N. 14. Holborn	53	217·1	52	5·883	·034	26	26	126·2	5·6	13·4
	N. 16. St. Luke	51	257·8	28	3·731	·081	27	27	135·6	15·9	12·0
	N. 12. St. Giles	68	213·2	60	5·635	·052	26	28	126·0	9·6	13·4
	N. 15. Clerkenwell	65	168·3	33	4·138	·057	24	23	112·0	11·1	13·3
	N. 18. West London	29	184·6	65	7·454	·067	29	25	168·4	11·8	9·8
(d)	E.† 21. Bethnal Green	38	145·1	9	1·480	·136	25	23	194·0	63·1	15·0
	E.† 24*b*. Mile End Old Town	30	118·5	20	3·319	·066	25	24	166·4	65·2	10·9
	E.† 23. St. George-in-the-East	21	196·6	32	4·753	·080	29	29	221·6	92·7	15·9
	E.† 25. Poplar	8	34·2	44	7·360	·060	22	24	211·6	85·1	16·8
	E.† N. 22. Whitechapel (London Hosp.)	32	188·1	26	3·388	·075	29	28	223·1	77·5	14·4
	E.† 24*a*. Stepney	11	97·6	20	3·319	·066	25	27	210·3	110·9§	18·3
(e)	N. E. 20. Shoreditch	48	211·8	20	3·103	·082	27	24	113·0	12·7	8·4
	N. E.† 11. Hackney	53	24·7	25	4·397	·074	19	19	113·1	11·7	6·9
	N. E. 17. East London	40	246·2	38	4·823	·088	27	27	94·8	15·9	5·6
(f)	N. WM. 8. Hampstead	350	10·5	40	5·804	..	18	17	71·7	·8	4·2
	J. N. 6. St. James Westminster	58	208·3	128	12·669	·023	22	23	82·6	4·4	2·9
	N.H.WM. 9. Pancras	73	78·0	41	4·871	·042	23	22	104·5	6·0	8·4
(g)	K. L. 36. Lewisham	28	5·2	27	4·824	·049	17	18	66·9	6·1	3·5
	K. S. 35. Greenwich	8	27·0	22	3·379	·081	27	24	104·1	19·5	5·9
	Stratford (Sub-district)	—	—	—	—	—	—	—	—	79·1	10·6
	West Ham (Sub-district)	—	—	—	—	—	—	—	—	Return not	

The several water companies are designated by letters thus, the New River Company by N., the Grand Junction by J., by C., West Middlesex by WM., East London by E., Hampstead by H., Southwark by S., Lambeth by L., and Kent by cases where a District is supplied by more than one company, the initial of the company supplying the greater part is first. Where a company supplies only a small part of the District it is indicated by a small initial letter.

* The results marked thus (*) for the *Aggregates of Districts* have been obtained by taking the mean of the several gr Districts.

† That part of Hackney District served by the East London Company is, it is believed, supplied from Lea Bridge after fi the East Districts are supplied mainly from the reservoirs at Old Ford.

‡ See note on p. 153 relating to Deaths in Hospitals.

§ Of 623 deaths from cholera registered in Stepney 46 occurred in the Limehouse District Cholera Hospital, but the

TABLE showing the NAMES of the MEDICAL HEALTH OFFICERS appointed for the several DISTRICTS of LONDON, the AVERAGE ANNUAL MORTALITY from ALL CAUSES in each of the Ten Years 1841–50 and 1851–60, the NUMBER of DEATHS registered in the 23 Weeks ending 1st December 1866 from ALL CAUSES and from CHOLERA and DIARRHŒA, and the PROPORTIONAL NUMBER to 10,000 LIVING.

Average Annual Mortality to 1000 Persons living from All Causes.		Registrars' Sub-districts.	Names of Medical Officers.	Deaths in 23 Weeks from			Deaths to 10,000 living from		
1841–50.	1851–60.			All Causes.	Cholera.	Diarrhœa.	All Causes.	Cholera.	Diarrhœa.
		WEST DISTRICTS.							
		1. KENSINGTON.							
20	19	St. Mary Paddington St. John Paddington Kensington Town Brompton St. Peter Hammersmith St. Paul Hammersmith Fulham	Dr. Sanderson F. Godrich, jun. F. J. Burge	2040	84	210	89·8	3·7	9·2
		2. CHELSEA.							
27	26	Chelsea South Chelsea North-west Chelsea North-east	Dr. Barclay	694	23	39	105·2	3·5	5·9
		3. ST. GEORGE HANOVER SQ.							
19	19	Hanover Square May Fair Belgrave	Dr. Druitt Dr. Aldis	711	15	41	75·4	1·6	4·3
		4. WESTMINSTER.							
27	26	St. John Westminster St. Margaret Westminster	B. Holt	757	42	47	110·9	6·2	6·9
		5. ST. MARTIN-IN-THE-FIELDS.							
24	23	Charing Cross Long Acre	L. J. Beale	232	9	19	108·6	4·2	8·9
		6. ST. JAMES WESTMINSTER.							
22	23	Berwick-street St. James's-square Golden-square	Dr. Lankester	282	15	10	82·6	4·4	2·9
		NORTH DISTRICTS.							
		7. MARYLEBONE.							
24	24	All Souls Marylebone Cavendish-square Rectory Marylebone St. Mary Marylebone Christchurch Marylebone St. John Marylebone	Dr. J. Whitmore	1728	46	147	108·1	2·9	9·2
		8. HAMPSTEAD.							
18	17	Hampstead	C. F. J. Lord	169	2	10	71·7	·8	4·2
		9. PANCRAS.							
23	22	Regent's Park, Pancras Tottenham-court Gray's-inn-lane Somers Town Camden Town Kentish Town	Dr. Hillier	2213	127	177	104·5	6·0	8·4
		10. ISLINGTON.							
19	21	Islington West Islington East	Dr. Ballard	2182	86	147	112·7	4·4	7·6
		11. HACKNEY.							
19	19	Stoke Newington Stamford Hill West Hackney Hackney South Hackney	Dr. Tripe	1098	114	67	113·1	11·7	6·9
		CENTRAL DISTRICTS.							
		12. ST. GILES.							
26	28	St. George Bloomsbury St. Giles South St. Giles North	Dr. Buchanan	658	50	70	126·0	9·6	13·4

Note.—When persons have died of cholera in hospitals not situated in the districts in which they were attacked, the deaths are referred in this Table, not to the hospital districts, but to those districts from which the patients had been removed. A Table on page 158 shows the number of cases to which this rule has been applied.

TABLE showing the Names of the Medical Health Officers appointed for the several Districts of London, the Average Annual Mortality from All Causes in each of the Ten Years 1841–50 and 1851–60, the Number of Deaths registered in the 23 Weeks ending 1st December 1866 from All Causes and from Cholera and Diarrhœa, and the Proportional Number to 10,000 living—*continued.*

Average Annual Mortality to 1000 Persons living from All Causes.		Registrars' Sub-districts.	Names of Medical Officers.	Deaths in 23 Weeks from			Deaths to 10,000 living from		
1841–50.	1851–60.			All Causes.	Cholera.	Diarrhœa.	All Causes.	Cholera.	Diarrhœa.
		CENTRAL DISTRICTS—*cont.*							
		13. STRAND.							
24	24	St. Anne Soho St. Mary-le-Strand St. Clement Danes	Dr. Conway Evans	460	28	24	112·5	6·8	5·9
		14. HOLBORN.							
26	26	St. George-the-Martyr St. Andrew Eastern Saffron Hill	Dr. S. Gibbon	537	24	57	126·2	5·6	13·4
		15. CLERKENWELL							
24	23	St. James Clerkenwell Amwell Clerkenwell Pentonville Goswell-street	Dr. Griffith	716	71	85	112·0	11·1	13·3
		16. ST. LUKE.							
27	27	Old-street City-road Whitecross-street Finsbury	Dr. Pavy	769	90	68	135·6	15·9	20·0
		17. EAST LONDON.							
27	27	St. Botolph Cripplegate	Dr. Letheby	357	60	21	94·8	15·9	5·6
		18. WEST LONDON.							
29	25	West London North West London South		429	30	25	168·4	11·8	9·8
		19. LONDON CITY.							
22	22	London City South-west London City North-west London City South London City South-east London City North-east		264	21	14	66·4	5·3	3·5
		EAST DISTRICTS.							
		20. SHOREDITCH.							
27	24	Holywell Shoreditch St. Leonard Shoreditch Hoxton New Town Hoxton Old Town Haggerstone West Haggerstone East	Dr. Barnes	1546	174	115	113·0	12·7	8·4
		21. BETHNAL GREEN.							
25	23	Hackney Road Green, Bethnal Green Church, Bethnal Green Town, Bethnal Green	Dr. Sarvis	2140	696	165	194·0	63·1	15·0
		22. WHITECHAPEL.							
29	28	Artillery Whitechapel Spitalfields Mile End New Town Whitechapel North Whitechapel Church Goodman's Fields Aldgate	J. Liddle	1704	592	110	223·1	77·5	14·4
		23. ST. GEORGE-IN-THE-EAST.							
29	29	St. Mary St. Geo. East St. Paul St. Geo. East St. John St. Geo. East	Dr. S. Rygate	1059	443	76	221·6	92·7	15·9
		24*a*. STEPNEY.							
25	27	Shadwell Ratcliff Limehouse	T. Orton	1182	623	103	210·3	110·9	18·3
		24*b*. MILE END OLD TOWN.							
	24	Mile End Old Town, West Mile End Old Town, East	Dr. Corner	1343	526	88	166·4	65·2	10·9

TABLE showing the Names of the Medical Health Officers appointed for the several Districts of London, the Average Annual Mortality from All Causes in each of the Ten Years 1841–50 and 1851–60, the Number of Deaths registered in the 23 Weeks ending 1st December 1866 from All Causes and from Cholera and Diarrhœa, and the Proportional Number to 10,000 living —*continued.*

Average Annual Mortality to 1000 Persons living from All Causes.		Registrars' Sub-districts.	Names of Medical Officers.	Deaths in 23 Weeks from			Deaths to 10,000 living from		
1841–50.	1851–60.			All Causes.	Cholera.	Diarrhœa.	All Causes.	Cholera.	Diarrhœa.
		EAST DISTRICTS—*cont.*							
		25. POPLAR.							
22	24	Bow Poplar	Dr. Woodforde S. K. Ellison	2111	849	168	211·6	85·1	16·8
		SOUTH DISTRICTS.							
		26. ST. SAVIOUR SOUTHWARK.							
30	29	Christchurch St. Saviour	R. Bianchi	392	27	37	107·6	7·4	10·2
		27. ST. OLAVE SOUTHWARK.							
		St. Olave St. John Horsleydown	Dr. Vinen	433	16	17	228·9	8·5	9·0
		28. BERMONDSEY.							
28	26	St. James Bermondsey St. Mary Magdalen Leather Market	W. Parker	695	36	75	108·1	5·6	11·7
		29. ST. GEORGE SOUTHWARK.							
30	27	Kent-road Borough-road London-road	Dr. Bateson	686	40	38	119·3	7·0	6·6
		30. NEWINGTON.							
26	24	Trinity Newington St. Peter Walworth St. Mary Newington	Dr. Iliff	914	24	40	98·6	2·6	4·3
		31. LAMBETH.							
25	23	Waterloo Road First Waterloo Road Second Lambeth Church First Lambeth Church Second Kennington First Kennington Second Brixton Norwood	Dr. Puckle	1829	113	148	104·6	6·5	8·5
		32. WANDSWORTH.							
22	22	Clapham Battersea Wandsworth Putney Streatham	J. M'Donogh Dr. Connor G. E. Nicholas R. H. Whiteman D. C. Noel	860	41	56	103·6	4·9	6·7
		33. CAMBERWELL.							
24	23	Dulwich Camberwell Peckham St. George Camberwell	Dr. Bristowe	833	48	49	101·8	5·9	6·0
		34. ROTHERHITHE.							
28	25	Rotherhithe	Dr. Murdock	287	26	12	99·8	9·0	4·2
		35. GREENWICH.							
27	24	St. Paul Deptford St. Nicholas Deptford Greenwich West Greenwich East Woolwich Dockyard Woolwich Arsenal	H. N. Pink No Medical Officer	1508	282	85	104·1	19·5	5·9
		36. LEWISHAM.							
17	18	Charlton and Kidbrooke Plumstead and Charlton Eltham Lee Lewisham Village Sydenham	Dr. Finch A. W. Allinson Dr. King J. S. Burton F. E. Wilkinson	605	55	32	66·9	6·1	3·5

TABLE showing the CORRECTIONS for DEATHS registered by CHOLERA in HOSPITALS in the Twenty-three Weeks ending 1st December 1866.

DISTRICT in which the Hospital is situated.	Name of Hospital.	Number of Deaths deducted belonging to other Districts.
St. George Hanover Square -	St. George's - - -	2
Marylebone - - - - -	Middlesex - - -	6
St. Olave Southwark - - -	Guy's - - - -	9
St. Saviour's Southwark - -		
Strand - - - - - -	King's College - -	2
Islington - - - - -	Fever - - - -	37
West London - - - -	St. Bartholomew's -	30
Whitechapel - - - -	London - - - -	222
	Cholera - - - -	87*
Pancras - - - - - -	Royal Free - - -	11

* In respect to 34 Deaths in the Cholera Hospital, Spitalfields, the returns failed to mention from what Districts the patients had been brought. These cases are therefore distributed according to the various proportions indicated by the complete returns.

In addition to the Deaths in the above Table, 46 Deaths by Cholera were registered in the 23 weeks in the Limehouse District Cholera Hospital, situated in Stepney District, but the returns neglected to state from what district the patients were brought.

Week ending Saturday, December 15.

The deaths registered in London during the week were 1389. It was the fiftieth week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1469. The deaths in the present return are less by 80 than the estimated number.

Two cases of cholera and 25 of diarrhœa were registered last week.

A boiler-maker, aged 18 years, died on December 9th of bronchitis after cholera, at 17 Orchard-street, Woolwich.

The son of a silk dyer, aged one year, died on December 10th of cholera (24 hours), at 17 Fleet-street, Bethnal Green.

Although the epidemic has subsided, isolated cases still demand the vigilant attention of the authorities. This is one of the lessons of the year. For while cholera raged between the Tower, the Isle of Dogs, and Victoria Park,—over the area traversed by the Blackwall Railway, and the Great Eastern Railway as far as Stratford and West Ham,—among a population in uninterrupted communication, through lines of streets, the Regent's Canal, and the Thames, with the rest of London and the surrounding districts, to which many of the infected persons living in the East of London fled, the conflagration was strictly circumscribed within well-defined bounds. The fierceness of the disease extended thus far and no further, although the movements of the people were as free as air. The futility of quarantine lines is so well known, that their establishment was never proposed in London. The supply of impure water was at once arrested; the water engineers grew careful; the sewage was now less inefficient than it ever had been before, for South London was drained; the health officers became vigilant; premonitory diarrhœa was treated; every case as it occurred was published to the world; and the cholera excreta were destroyed by carbolic acid and other disinfectants. The disease was communicated by contact with the poison in a few cases, but its general diffusion was stopped.

This is the secret of the success of London in controlling an epidemic that during the year has been so fatal in continental cities.

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ending Saturday, December 22.

The DEATHS registered in London during the week were 1377. It was the fifty-first week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1452. The deaths in the present return are less by 75 than the estimated number.

Two deaths from cholera, and 16 from diarrhœa, were registered during the week.

A coachmaker's labourer, aged 59 years, died on 17th December at 10 Shouldham-street, Marylebone, of cholera (35 hours).

The widow of a publican, aged 36 years, died on 18th December at 16 Exmouth-street, Mile-end Old Town, of choleraic diarrhœa (3 days).

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ending Saturday, December 29.

The DEATHS registered in London during the week were 1436. It was the fifty-second week of the year; and the average number of deaths for that week is, with a correction for increase of population, 1554. The deaths in the present return are less than the estimated number by 118.

The daughter of a pen merchant, aged 16 years, died on 23d December, at 3 Boar's-head-yard, Whitechapel, of cholera Asiatica (14 hours).

Fourteen deaths from diarrhœa were registered during the week.

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2. The Medical Officers of Health on the Water Supply and Causes of Cholera in their Districts.

The Medical Officers of Health, in answer to a circular of inquiry, kindly supplied the Registrar-General with remarks on the following points:—

1. On the water supply of the district since June last, and the results of any analyses which have been made.
2. If the district is supplied partly by two or more companies, has any difference in the mortality of the parts supplied by the respective companies been observed?
3. On the effects of pump, well, or spring water on disease.
4. General information as to causes of mortality from cholera in the district.

The following replies were printed in the Return, No. 37, for the Week ending September 15th.

Paddington.

1. There were in Paddington, at the commencement of the present epidemic, six spring wells accessible to the public, although on private property. Most of these wells were used by considerable numbers of persons for drinking; one of them in particular was, and is still, much esteemed for the excellence of its water by the inhabitants of Westbourne-terrace and the neighbourhood. Water from each of these wells has been subjected to analysis by Dr. Vogt.

In most cases it appeared sufficient to determine the amount of readily oxydizable organic matter contained in each water by the well-known process of Dr. Angus Smith. A standard solution of permanganate of potash was used for the purpose containing one grain of the salt in 5,000 grains of water. In every case the water was first acidulated with sulphuric acid (20 drops to a litre) before the addition of the permanganate, and it was ascertained how much it was necessary to add in order that the liquid should retain a red tinge after the lapse of five minutes. The amounts of oxygen required for the oxydation of organic matter in each water were as follows:

Pump in Burwood-mews	- - -	0·0290	grains in 100,000 grains.
,,	Frederick-mews - -	0·0390	,,
,,	Omnibus Company's stables, Market-street - -	0·0350	,,
,,	Other premises belonging to the company in the same street - - - -	0·0224	,,
,,	Cab-yard, Irongate Wharf-road - - - -	0·0114	,,
,,	Cab-yard, Charles-mews -	0·0090	,,

The total quantity of oxydizable matter in each water is no doubt greater than that indicated by these numbers. Thus 100,000 grains of water from Burwood-mews (which contained no less than 122·17 grains of solid matter, of which 30·4 grains consisted of organic and other volatile matter), when left in contact with an excess of permanganate of potash solution for 24 hours, had at the end of that period reduced an amount corresponding to 0·15 grains of oxygen, so that it decolorized nearly five times as much in 24 hours as in five minutes.

The quantity of chloride of sodium or common salt is regarded by Dr. Smith and others as of great value, as affording indication of the impregnation of water with sewage; a determination of chlorine was therefore made in all excepting one of the waters. The results show that the waters differed from each other extremely in this respect. Thus the two wells on the premises of the General Omnibus Company contained, respectively, 20·76 and 16·68 grains of chloride of sodium in 100,000. The water from Burwood-mews, already referred to, contained 17·74; whereas that of the wells in Frederick-mews and Charles-mews contained only 2·27 and 2·17. These differences clearly indicate that, so far as regards direct contamination with sewage, these wells were comparatively pure.

In all cases the presence of nitrites was investigated, as recommended by Dr. Angus Smith, by the addition of iodide of potassium and starch. The indications of their presence were very distinct in all of the waters, excepting that from Charles-mews. A bluish colour appeared almost immediately after the addition of the iodide of potassium and starch, which rapidly increased in intensity.

2. The district is supplied by the West Middlesex and Grand Junction Water Companies.

3. The only fatal case, not imported, which had occurred in the parish up to the end of August, was that of a boy who resided at No. 2, Irongate-wharf, and drank habitually water from a contaminated well.

I would add that, in accordance with my advice, the Public Health Committee have taken effectual measures for closing those of the wells above referred to which were found to be contaminated.

September 8, 1866. J. B. Sanderson, M. D., F.R.C.P.

Kensington.

The water supply given by the three companies to this parish has been much more ample since June. Water is supplied twice daily to the poorer localities and once on Sunday. There certainly is a difference between the mortality of the parts supplied by the three companies, but I do not attribute this at all to the water, but rather to the drainage, crowding, and more especially the clay soil of the northern part. We have had only one case of Cholera; I therefore can give no information on that point.

September 7, 1866. F. Godrich.

Fulham.

1. The Fulham district is partly supplied by wells, and to a considerable extent also by the "West Middlesex," the "Grand Junction," and the "Chelsea" Water Companies. The water of the London Companies is regularly submitted to analysis monthly by Dr. Letheby on behalf of the Metropolitan Association of Officers of Health, that of the West Middlesex company being furnished to him by me for the purpose.

The results are published in the Medical journals.

I have from time to time, though not very recently, made many examinations of the water of the surface wells of the district, and find them to abound in organic impurity, the total impurity ranging from 60 to 100 grs. per gallon, and the organic from 5 to 12 or 14 grs.

2. The districts supplied by the various companies are all more or less supplied by wells also; but I have no special facts relating to either company in connection with disease in consequence.

3. I believe the use of impure well water in this district to have been the cause of frequent diarrhœa amongst persons using it, as also of scrofulous disease.

4. This district has not suffered materially in its mortality from cholera during the present epidemic. In July a case of cholera arose, and death, from the use of water which had been pent up in a cistern for a month during the time the house was untenanted, and from the incoming tenant incautiously allowing her family to drink thereof. The few other deaths from cholera I have had no reason to associate with the use of impure water.

It may not be out of place, probably, here to express my opinion that the water supplied by the various companies to London is not derived from proper sources, neither do I think the present mode of filtration effective in removing its impurities. I believe, however, that much of the odium thrown on the water supply is also due to the very defective manner in which, as a rule, *it is stored* for domestic service by the consumer, and I would suggest to the water companies generally the propriety of employing *water-tank inspectors*, so as to ensure and enforce the *periodical cleansing* and repair of these receptacles in private houses,—a plan which I think would materially diminish the present frequent bad results from drinking impure water, and to a great extent protect those bodies from complaints which frequently lie at the consumers' own doors.

August 5, 1866. Frederick J. Burge.

Chelsea.

1. A Sunday supply of water has been obtained from the company. No analysis of the water has been made.

2. Chelsea is supplied wholly by one company.

3. The pumps have been, so far as possible, closed since the appearance of cholera. In one house which, with half a dozen others, drew their supply from the Thames direct, the water having been condemned as unfit for drinking purposes, the landlord threw obstacles in the way of obtaining a better supply. Before legal proceedings could be taken a case of choleraic diarrhœa occurred, which proved fatal. The patient, however, only slept in the house, and no other individual is known to have suffered from diarrhœa in consequence of using that water. All in the house professed to be quite well.

4. Chelsea has as yet suffered so little from cholera that I can give no information as to the causes of isolated cases.

August 24, 1866. A. W. Barclay, M.D.

Hanover-square and May Fair.

1. The Grand Junction Water Company supply the Hanover and May-fair sub-districts, and the Chelsea the Belgrave sub-district. These waters have during the last year been analysed for my colleague, Dr. Aldis, and myself, by Dr. Letheby, the results of whose analyses are published every month. The general character of the water has been good since last April, when there were great complaints of turbidity.

2. The difference in mortality between the Hanover and May-fair and the Belgrave sub-districts does not appear connected with their water supply.

3. There are three pumps in Mount Street and its vicinity, which are still used by the owners and the neighbours, although the evidence of their contamination by sewage is complete. Remonstrances urged in person have been vain. No case of disease, however, has been traced to the use of this well water.

4. There has not hitherto been a case of cholera in the Hanover and May-fair sub-districts. The chief causes of diarrhœa appear to be the use of beer with the adults, and of milk with the children.

August 29, 1866. R. Druitt, M.D.

Belgrave.

1. I have lately received complaints of no water supply in two streets in South Belgravia on Sundays. Generally the water supply is very good, the water being distributed among the poorer classes twice daily and once on Sundays. It will be supplied in future throughout the Belgrave sub-district on Sundays.

An analysis of the Chelsea water, taken from the main at No. 1 Chester-terrace, Chester-square, June 4th, 1866, contained—total solid matter 17·73 grs., lost by ignition 0·74 grs., oxydizable organic matter 0·48 grs.

On July 9th, 1866, the following results were obtained :—

Total solid matter - - - -	16·60 grs.
Lost by ignition - - - -	0·68 „
Oxydizable organic matter - - -	0·60 „

2. The sub district is supplied by one company.

3. I send my general report containing analyses of these waters several years ago.

4. The first patient died of cholera at 74 Cumberland-street. He appears to have been infected with the disease at Stratford, whence he had come, suffering from diarrhœa, the day before his death. He was much alarmed, as several persons whom he knew had died of the complaint at Stratford.

Three persons, two of whom died, were admitted into St. George's Hospital suffering from cholera. One, a man, was in a very exhausted state after walking up to London from Norwich. A policeman found him in Hyde-park and took him to the hospital. Another, a youth, had left his mother's residence in Manor-gardens, Manor-street, Chelsea, in perfect health, but was taken ill at Bow a day or two after, when he was taken to the hospital,

The third, a man, resided at No. 5 Apothecary-row, Wandsworth, but worked at Stanley-bridge, Fulham.

On September 5th Dr. Aldis forwarded the particulars of two fatal cases of cholera. The deaths took place in St. George's Hospital.

1. Mary Anne Johnson, aged 38, residing at No. 16 Walton-street, Chelsea, which is a private nurses' institution, was admitted in the hospital on Saturday, September 1st, and died on the same day at 3·15 P.M. It is remarkable that she nursed the gentleman who died of cholera at 25 Arlington-street. She suffered from diarrhœa the week before attending upon this patient, who had recently come from Ghent. We may question the propriety of allowing a nurse to attend a cholera patient under such circumstances.

2. Thomas Good was taken to the hospital, September 2d, at 1 A.M., and died at 9·30 A.M. The patient was found by a policeman in Commercial-road, Pimlico, and had been unloading a vessel called "The Gratitude" in the Grosvenor Canal. The vessel belongs to Goole, but sailed last from Portland. It was generally clean, but the forecastle was filthy and swarmed with bugs. I went on board and inspected the vessel. There is no proper ventilation in the forecastle, where the food is cooked. I recommended sulphur to be burnt in the place, and carbolic acid to be used for disinfection. Both the men who slept in the forecastle were drunkards, but the deceased was sober on the day of his death, and had *been drinking the water of the canal*, which is almost liquid sewage, while cleaning the outside of the vessel, although there was plenty of good water on board.

September 5, 1866. C. J. B. Aldis, M.D.

Westminster.

Water, which is good, is supplied by the Chelsea Water Company. Every pump in the district, so far as I know, is closed, and there have only been four deaths from cholera, in neither of which was there any apparent cause for the outbreak.

August 30, 1866. Barnard Holt.

St. Martin-in-the-Fields.

1. Our poorer people have suffered much from want of water on Sundays, but the New River Company have very lately been induced to give a supply on that day. The Chelsea Company have always furnished a supply on Sundays.

2. There is a difference in the mortality of the two districts of our parish, the Charing-cross and the Long-acre; Charing-cross is partly supplied with water by the Chelsea Company, but I doubt whether the water used has any influence. I have always imputed it to the difference of the classes of society in the two districts. Long-acre district contains a larger proportion of poor dwellings. In my annual reports I have always pointed out the difference in the mortality as a result from the greater attention to the laws of health among the inhabitants of the Charing-cross district than in the more densely inhabited Long-acre district.

3. I have never observed any ill effects of pump or spring water on health. Our spring water contains about 50 grains of solid matter per gallon, of which 6 to 7 grains is destroyed by combustion. We have only two public pumps of spring water, both of which have, for the present at least, had the handles removed. There are many private pumps, the water of which is consumed by private families. The water of three which I have examined is very similar to that of the public pumps. I have never heard of any evil to have resulted from the use of it. I have myself drank the water of the pump in Covent-garden Market for 40 years, and never less than a pint daily. I know many who have done the same, and never heard of the slightest ill effect. I am averse to contend against the authority of the late Dr. Dundas Thomson, of Dr. Letheby, and of nearly the whole of my colleagues the medical officers of health, but I cannot yet feel convinced that the water of our superficial wells is injurious to health. I know of no proofs against any but those of Broad-street and West Ham, and in both these instances sewage matter was traced direct into the wells. Seeing that our London water is good enough for all purposes but those of drinking and cooking, I think our wells should not *all* be condemned without further inquiry. For example, if there were wells in the centre of our large squares,—say, for example, Lincoln's Inn Fields, and half a dozen pumps in the circumference just outside the railings,—might not the water so obtained be fit for drinking and cooking purposes? Chemistry is certainly opposed to the use of London pump water, but the anticipated results are not confirmed by practical experience.

4. The present outbreak of cholera has not produced one single case in our parish. The only death occurred at Charing-cross Hospital, and the patient was brought from a house in West-street, Soho. In the outbreak of 1854 we had very few cases of cholera, although very many of diarrhœa. Then, as now, we had four stations for the gratuitous administration of advice and medicine; and I cannot but connect our immunity, then as now, with the facilities given for the early treatment of diarrhœa, and we are not free from several closely built and densely inhabited courts.

August 31, 1866. Lionel J. Beale.

St. James Westminster.

1. I have examined a large number of specimens of water from the cisterns in the parish of St. James Westminster, and I find the water is not overcharged with organic matter. In some instances, when the cisterns or waterbutts have not been cleansed, the water has indicated by the permanganate test a considerable quantity of organic matter. In such cases the cleaning of the cistern or butt has invariably corrected the evil.

2. The district of St. James Westminster is supplied from three sources: 1, the Grand Junction Water Company; 2, the New River Water Company; 3, surface wells. I cannot attribute any cases of diarrhœa directly to the water supply.

3. Since the latter end of July the pumps of the parish have been closed, and I have no evidence to show that any cases of cholera or diarrhœa have been dependent on the water supply.

Two cases of fatal diarrhœa in children occurred in this parish at the latter end of June. Both children drank copiously of water in a cistern which was exposed to the emanations of a watercloset.

4. We have had seven decided cases of cholera; of these four had been in communication with cholera districts in the east. The other three cases were not traced to any particular locality. One case was very remarkable: a boy came from Poplar to stay with his uncle at 5 Little Pulteney-street on the 7th of August; he died on the 9th; and his uncle went to his funeral on the 11th, and came back and died on the 13th.

September 6, 1866. Edwin Lankester, M.D.

Marylebone.

1. As regards water supply, the parish of St. Marylebone, which contains about 22,000 houses, is supplied by two water companies, viz., the West Middlesex and the Grand Junction; the former supplies by far the largest portion of the parish, the latter some few streets on the southern boundary abutting upon Oxford-street.

I analyse these waters every month, and for the last five or six months there has been a gradual improvement in the quality of both of them; the result of my analysis for July will be seen in my monthly report.

The average supply to each person is about 30 gallons. I know of no houses without water supply; in some few small courts and places, to the extent probably of about 100 houses, there are

water tanks, in which one tank furnishes a supply for all the houses in the court or place; but these tanks are generally sufficiently capacious, and tolerably clean; in these cases there is a separate water tank for the closets. All other houses in the parish have a separate supply, the water receptacles in many of the small houses being altogether unsuited to the purpose, and improperly placed. Every week-day a fresh supply is given to every house, and during the last three or four weeks, at the request of the vestry, the West Middlesex Company have given an additional supply on Sunday mornings to the poorer districts.

2. I have observed no difference in the mortality of the parts supplied by the two companies; each derives its water supply from the same source, and in point of purity they are much alike.

3. Since the prevalence of the present epidemic I have had no opportunity of forming an opinion of the effect of pump, well, or spring water on disease, because immediately on the first outbreak of cholera I recommended the vestry to close all the public pumps in the parish, and that recommendation was at once carried into effect.

4. Fortunately up to the present time there have been but very few cases of cholera in this parish; not more than four or five. I have inquired into the history of these cases, and cannot trace the origin of either of them to any local or other cause. Two occurred in highly respectable families, where the sanitary condition of the house and its surroundings were apparently excellent; and two in the workhouse, where especial attention is and for some time past has been paid to sanitary precautions.

In the district of Christ Church (Lisson-grove) diarrhœa has been most prevalent; here the most wretched portion of the population of the parish live; it is here also that house-to-house inspection has for some months past been going on, and a very great deal of sanitary work has been done. The diarrhœa has been chiefly amongst children, and I attribute it to their bad diet and the quantity of decayed and unripe fruit which they had been permitted to eat.

Since the 4th of the present month six dispensaries have been opened in the parish for the gratuitous supply of diarrhœa medicine, and up to Saturday last, the 25th instant, 3,555 cases had been treated, and in almost every case relieved.

August 31, 1866. J. WHITMORE, M.D.

HAMPSTEAD.

There has not been any need to make a special analysis of the water supply to this parish "since June last." No case of cholera has arisen here, and diarrhœa has been rather below than above the average. No appreciable difference has arisen from the supply of water, which has been given to different districts of the parish by the New River and West Middlesex companies; the health and death rate have been equal in each case.

There are still some deep wells in use; the water is good. In one case a public well has been closed, because an old drain and suspected escape of sewage is running near. The numerous surface wells have not been used for years past.

August 27, 1866. CHARLES F. J. LORD.

PANCRAS.

1. I have not made any analysis of the water in my district lately.

2. My district is supplied partly by the New River and partly by the West Middlesex Company, but I cannot say that I have detected any difference in the mortality of the parts supplied by the two companies.

3. All the public surface wells in my district have been disused on my recommendation for some time past. In the workhouse there is a deep well. There has been there this year remarkably little diarrhœa and no cholera.

4. As to the causes of cholera in St. Pancras. In 11 cases I have traced cholera to importation from the east. In one case a woman had nursed her daughter at Stepney, who was suffering from cholera, and washed the linen; she died, and in a short time afterwards two children of another family in the same house contracted the disease and died. This house was in a bad sanitary condition. The grandmother of these children visited them frequently during their illness. She lived in an adjoining street, contracted the disease, and died. Her son, who waited upon her, and occupied the same room, died two days after her.

Another set of cases occurred thus: two children came from a house in Mile End, where their brother had died from cholera; they too died, and communicated the disease to their grandfather, who lived in the house to which they came.

Another man working at the Isle of Dogs came home to Camden Town suffering with diarrhœa; his wife, who had not been away, waited on him, sickened with cholera, and died; and in a day or two later the husband died.

One gentleman died in a house in which there were cesspools of old standing, and a gravelly soil, with many cesspools around.

A man and son died on the same day at the upper part of Kentish Town; the cause of their illness was not made out. Their house was a new one, not very dry; the water supply was from the New River Company; there was no defect in the receptacle, except that it was uncovered, situated on the leads.

In this house two other cases occurred, the children of another family.

Two deaths from cholera have occurred at the Royal Free Hospital from Holborn district.

August 31, 1866. THOS. HILLIER, M.D.

Islington.

1. Our supply of water in Islington is derived from the New River Company. Several private houses, however, in the older parts of the parish, have superficial wells upon their premises, which the occupants prize as furnishing a more agreeable water for drinking purposes.

2. I have not observed the occurrence of cholera at any houses thus using their superficial wells.

3. The general quality of the New River supply is excellent. What I complain of is, that it is damaged by storage after delivery from the company's mains. This damage arises from the use of old and rotten butts, from the improper places where butts, and cisterns more especially, are commonly fixed, and from the gross neglect of householders to cleanse these receptacles.

The storage of *butts* is mostly limited to old tenement houses occupied by the lower classes, and in making an inspection of such premises it is the rule to find the butts decaying and leaky, from the neglect of painting outside and of proper pitching inside. It is the rule throughout the district to find the cistern placed over the watercloset, with an *untrapped* waste-pipe communicating with the house-drains. The houses are very few indeed where the house and closet supplies are separated. In mews I generally find the butt or cistern placed *in the stable*, where the water is most likely to gather vaporous and other impurities, in addition to what comes from the drains through the waste pipe. In some small houses I have found them placed in some corner, where they regularly receive the drippings from the roof or leaky gutters of the house, or else side by side with the dust-bin and privy. Any odd corner, if convenient, seems to be considered fit for the placing of the cistern. Sometimes it is so placed (as *under the flooring of a sleeping-room* or over the portico of the house) as to be out of reach of cleansing, except at the cost of removing boards or obtaining a ladder to reach it from outside. The neglect of cleansing is almost universal. In small tenement houses the children amuse themselves by casting filth and rubbish of all kinds into the butt. I have myself taken filthy cloths, old hats, &c. out of a common cistern in a court. Even in most respectable houses, where the cistern is uncovered, the neglect of cleansing is often observed. Years are sometimes permitted to pass without any attention being paid to the cistern, and I have known bucketsful of filth removed when an outbreak of disease has at last opened the eyes of the occupants of a house. Unfortunately, although the law enables local authorities to enforce a supply of water to every house, no control is given over the mode of storage. I firmly believe that no remedy for this sad state of affairs exists but the total abolition of the intermittent system of supply, and the adoption of a constant supply at high pressure universally.

4. I do not know that the cases of cholera which have been met with here were dependent upon the condition of the water. The butts and cisterns in the several houses were no worse than in others where cholera did not occur, so far as could be discovered by ordinary inspection. Still it may be that something was present in the former that was not present in the latter. I am disposed to think this, because I have seen attacks of typhoid fever, and symptoms resembling those of irritant poisoning, arise *most distinctly* from the use of water taken from uncleansed cisterns—cisterns with more or less organic deposit—and yet the deposit has in such cases not been greater or perhaps so great in amount as where no such attacks of disease have resulted. I can, however, say this, that while I have seen typhoid fever arise where the cistern has been kept scrupulously clean, and while I have seen symptoms like irritant poisoning arise from other causes than bad water, I have not met with an instance this season where cholera has occurred in a house in which the cistern or butt was not neglected.

5. An arrangement is now in force here with the New River Company for a constant supply to stand-posts in some of our poorest neighbourhoods—to last for three months. The stand-posts are provided with a simple form of self-closing tap.

6. As to the apparent causes of cholera here: our first case was derived from the East of London; the next occurrence was four days later, and then, within two days, 10 cases (9 fatal) occurred in two parts of the parish more than half a mile distant from the initial case. Until I can review the circumstances of all my cases together I should not like to commit myself to an opinion upon their causes. This, however, I may say, that in many instances the cause has appeared to be attached to the house, several inmates of different families, and occupying different floors, being attacked in succession—not together; members of families in these houses who have escaped fully developed cholera have very commonly suffered from choleraic diarrhœa. At other times persons in the same house and family have escaped, although living apparently under the same conditions and using the same water, only one case occurring, and then there being an end to it. Two instances at least of apparent personal communication of cholera (contagion?) have occurred; one was of an old nurse at the Fever Hospital, who, after spending three nights in the cholera ward, was attacked and died. The other case is a remarkable one. There is a court here called Hope-place West. On 1st August an old woman was attacked with cholera, and speedily died; the room was disinfected with carbolic acid, the drains and privies throughout the court also, the bedding and clothing were destroyed after a similar disinfection, and the body quickly removed and buried. No one else in the house suffered; this was at No. 9. At No. 7, on the opposite side of the court, and some ten or twelve yards distant, lived a man, his grown-up daughter and two children. A son of this man and his wife resided more than a mile distant in Anglers-gardens, and both were attacked with cholera, the husband on 27th July, and the wife on 30th July. The wife died at home on 1st August, and the husband then being removed to the hospital, died on 3rd August. The bedding and clothing were disinfected and all destroyed. During the conjoined illness at home of this man's wife the sister from 7 Hope-place West came to and fro to nurse them. On 4th August one of the children mentioned as living at this house, a little brother of the man and his sister, was attacked with cholera and died in ten hours, and the other child had choleraic diarrhœa; the young woman who went to and fro to nurse did not suffer at all. Neither of the children had been to Anglers-gardens, and none of the clothes had been

brought to Hope-place West. The court contains several houses, but no cholera occurred (after the case at No. 9) in any other inmate of the court. On questioning the young woman, it appeared that, although exposed to having her dress and person soiled with the discharges, she had continued to wear the same dress while doing what was necessary for the children at home, and ridiculed the suggestion that it would have been well to have washed it. Knowing, as all do, the common practice of women in her rank of life of using the cotton dress for all kinds of purposes, such as wiping hands upon, or even children's faces, it is quite possible that this dress may have been a medium of communicating the disease. It is more likely also that the disease was derived from the young woman than from the case of the old woman four days previously.

I cannot help thinking (to return to the general question) that all the house cleansing and drainage works that can be carried out will have little result so long as the bedding of the inhabitants remains uncleansed. Its horribly filthy condition in the houses of the lowest classes, and in many where cholera has happened, affords a fit nidus for any such virus as that of cholera to fructify in. It would be one of the best works a charitable society could expend its funds upon to make a wholesale destruction of such filthy bedding, supplying new in its place.

August 24, 1866. EDWARD BALLARD, M.D.

HACKNEY.

1. The water supply was less than usual until a deputation waited on the directors of the East London Company, and the Board wrote to the New River Company. No analysis.

2. Partly by East London, partly by New River. Cholera has spread in Tingay's-buildings, Matthias-place, and 19 Robinson's-row, supplied by New River Company, as readily as in Silk-mill-row, Balls-buildings, and other places supplied by East London Company. No difference perceptible.

3. I have no remarks to offer on the effects of pump, well, or spring water on disease.

4. The earliest cases of cholera were imported from other districts. The disease has been most fatal in houses which have not any back ventilation. I have ordered a small opening to be made through the staircase wall, so as to allow of a thorough draught of air. Nearly all our cases have occurred amongst the poorest and dirtiest of the population.

September 4, 1866. JOHN W. TRIPE, M.D.

ST. GILES.

1. The water supply of this district is in the main from the New River Company. In quality that supply remains, as far as I know, unchanged. In quantity it has somewhat improved, especially in the particular of Sunday supply, during the present month, in consequence of representations that have been addressed to the company by this Board. A second source of supply is from surface wells. In so far as these wells are public, this Board has wholly put a stop to the use of their water throughout the year for any other purpose than watering the streets. But many such wells are in private houses, and water from them is probably still used for drinking by the inhabitants, mostly of the better class, on whose premises they exist. A third source of water is a very limited and almost private one :—a deep artesian well in Russell-square, from which water has been supplied in the usual way throughout the year. I have no analyses, of my own, of any of the waters for the present year. Former analyses have shown the surface well water to be extremely impure, the artesian well water to be perfectly good and wholesome, and the New River water to be what the Registrar-General knows it is.

2. No remarks under the head of your second question arise in respect of this district.

3. The preventive measures of closing pumps connected with shallow wells have reduced the opportunities of getting information in answer to the third question, and I have nothing from my own knowledge to communicate.

4. In certain instances out of the few cholera cases that have occurred in St. Giles', I have traced the disease to direct intercourse with infected districts at the East end of London. In other instances I have thought that proximity to the Strand district (with probable personal intercourse with infected neighbourhoods therein) might have determined the occurrence of cholera. But in one or two instances I have no notion of the cause of its occurrence. And the number of cases in St. Giles' having been very limited my opportunities for answering this question are also few.

August 24, 1866. GEORGE BUCHANAN, M.D.

STRAND.

1 and 2. The only company by which the Strand district is supplied with water is the "*New River Company*," but of their water (as delivered in the district) I have no recent analysis.

Note as to water supply.—The objection to the present mode of water-supply is mainly one of quantity, or, more correctly, of deficiency, and of impurity by reason of the small capacity and character of the water receptacles (cisterns or butts) in many of the more densely peopled parts of the district, and of the absence of a supply on Sundays.

In respect of the Sunday supply, however, it is only right to state that the New River Company has expressed willingness to afford this in the poorer courts and alleys of the district, and during the past few weeks in several of these localities this has been done.

In regard of the question of the capacity of water receptacles, the Board of Works of this district has resolved that every house shall have a water receptacle capable of holding at least *ten gallons* per day for each of its inmates (children and adults).

The consideration of the whole question of the water supply of London is one which cannot with safety to the public be much longer postponed, for, speaking generally, the quality of the water is not what it should be, and there cannot be two opinions as to the expediency of getting rid of water receptacles altogether, and having a continuous supply, The water companies, the New River Company at least, express both their readiness and willingness to afford a constant supply (as indeed they are under certain circumstances compelled by their Acts to do), provided such means be adopted by the owners and occupiers of houses as shall prevent all *unreasonable waste* of the water; but these means, it is affirmed, (and all persons practically acquainted with the subject concur, I believe, in greater or less degree, in the accuracy of this statement,) do not at present exist. From considerable experience, the conclusion at which I have long ago arrived in this matter is, that the entire system of water supply must in a *financial* point of view be completely altered, that water receptacles must be wholly abolished, and that the mains and service pipes must be continuously charged; but that in order to effect these objects successfully *water must be paid for, just as gas is paid for, namely, in accordance with the quantity consumed.* No one hears of a gas company complaining of the waste of *gas* by the consumer; nor would any similar complaint ever be made of the waste of *water* if the latter were paid for by the landlord or tenant at so much per hundred or thousand gallons.

The present mode in which water is paid for is both unsatisfactory and unjust, the water rate being a charge of six or seven per cent. upon the rental of the house supplied; and the effect of this arrangement is practically to compel the tenant of a large house, in which from a variety of circumstances but little water is consumed, to pay for the great quantity of water wasted in less costly and poorer localities. It may be right that the richer neighbourhoods should be taxed more highly than they already are for the support and maintenance of the poorer; but it cannot be right that they should be obliged in this indirect, and in many instances unsuspected manner, to provide in a great measure the more lowly rated localities with water. Good and pure water is a necessity of existence, and its supply ought to be the duty and property of the municipality, and not those of any private companies whatever.

3. The Strand district contains a few public and also a few private pumps. All the former I caused to be rendered incapable of being used (either by the removal or the locking up of their handles) in the early part of July. The disuse of private pumps I have no power to compel; but in the instructions I have caused to be distributed throughout the district the point upon which I have most strongly insisted is the BOILING of all water, or liquids containing unboiled water, before it is swallowed.

Partly in consequence of its being found impracticable to cause in a short space of time an efficient cleansing of the water-butts and cisterns in the poorer parts of this district, and of their small capacity, and partly in consequence of the inconvenience arising from the closure of the public pumps, the Board of Works caused (with the consent of the New River Company) several standposts (furnished with handles easily usable by any one) to be fixed at the entrance to some of our more crowded courts and alleys; and these, being charged night and day with water from the main, have placed a supply of comparatively pure water within the reach of the inhabitants of these localities, free of all cost.

4. In nearly every instance of a so-called outbreak of cholera in this district, I have succeeded, upon close investigation, in tracing the importation of the disease, either directly or indirectly, from infected localities. Once, however, carried into this district, the malady has in more than one instance spread to other inhabitants; but by the daily use of carbolic acid in large quantities, and other disinfectants, used, not merely for watering the streets and flushing the public urinals, water-closets, and sewers, but also regularly and daily applied, under competent medical supervision, in every house in which cholera or diarrhœa has occurred, anything like an extensive spread of the disease has been completely arrested.

September 10, 1866. CONWAY EVANS, M.D.

HOLBORN.

1. This district is wholly supplied by the New River Company, who, since 1862, have most liberally complied with the request of this Board to give an extra supply to all the poorer localities on Saturday evenings. The quality of their water is, I believe, excellent, but have not analyzed it since June last. An additional supply is provided by eight wells which were sunk by the local authorities about 25 years since. With one exception, viz., the well on the west side of Middle-row, Holborn, which has long been irremediably contaminated with sewage, these wells yield an abundant supply of drinkable water. I have frequently examined the water from these wells, both chemically and microscopically. Although the solid constituents are great as compared with the companies water, viz., from 40 to 100 grains per gallon, as well as the organic and volatile matters, viz., from 5 to 12 grains, and there are abundant nitrates in nearly all of them, I have failed, however, to detect any nitrites or animalcules in any of them. The quantity of ammonia found has never been great; often only a trace. The same, and even less favourable results, have been obtained in the examination of the water from private pumps, of which there are 4 in Gray's-inn, 1 in Lincoln's inn, 1 in Staple's-inn, 1 in Red Lion-square, and 1 in Queen-square. Most of these pumps are open to the public, and the water is largely drank on account of its cool and sparkling character; in two instances it is, I am told, actually sold to the public, who often send considerable distances for it. However, I have no evidence to indicate that the water from these public and private wells has caused injury to health.

At a time when cholera was prevalent I felt it my duty, in consequence of the strong presumptive evidence there is, that this disease is communicated by means of drinking water that has been

specially contaminated by the poison, to advise the Board to remove the handles from the several pumps under their control, which they did in July last.

2. Only one company supplies water.

3. Under the first question I have stated my experience of water derived from these sources. I may add, that I have found the water drawn from *underground cisterns* more dangerous to health than that from wells. On the 20th of August, just at a time when we had an unusual amount of rain, Asiatic cholera, of a severe type, attacked all the inmates of a house in Great Ormond-yard, fifteen persons in all; three fled in terror. I found that the house No. 10 was one which last spring I advised your Board to order to be improved. Your orders had been complied with, but not in so thorough and efficient manner as was desirable. Unable to trace the cholera to any palpable cause, I instituted a chemical and microscopical examination of the drinking water which is stored in a tank under the yard. To the naked eye this water had a dull opalescent appearance, and under the microscope it was seen to contain myriads of animalcules, some vegetable fibre, &c. I unhesitatingly attributed the disease to the fact of the inmates having drunk of the water of this tank, which was so imperfectly covered that the heavy rain had caused the surface water of this ill-drained and worse paved yard to flow into it, filled as this yard is with dung-heaps, stables, cow-stalls, and slaughter-houses. I need not describe the nature of that surface water. In former years, viz., in August 1856, I traced 15 attacks and 4 deaths from cholera at No. 10 Great Ormond-yard to drinking polluted water from such a cistern. In August 1858 a whitesmith, aged 30 years, died in Black Bull-yard, after 6 hours illness, from this same disease, probably induced by the same cause. Again, an ostler in Lamb-yard, Lamb's Conduit-street, in 1862, died, after a few hours illness, from the same cause. These cisterns were all situated in stable yards.

4. Very many of the cases of cholera in this district have occurred to persons who had within a week previously visited the localities in the east of London where cholera was prevalent. The three exceptions are a young woman, aged 23, who was seized after eating eels for dinner on Sunday, and died in 11 hours, and two old women who appear to have been frightened into it.

It is a noteworthy fact that out of 19 cases of cholera in this district, 9 were removed to hospital, of whom 8 died, 10 were treated on the spot by the medical visitors, of whom only 1 has died, 8 have recovered, and 1 almost convalescent from the secondary fever.

August 30, 1866. SEPTIMUS GIBBON, M.D.

CLERKENWELL.

1. No general complaints of the water-supply. Some of the inhabitants of the district derive their water-supply from underground tanks; these I consider very objectionable, and have advised that they be replaced by above-ground cisterns, which has not been done.

2. The district is supplied by the New River Company only. The well-pumps have been locked.

3. No remarks.

4. The cases have been but few. The first sufferer of four in one family apparently brought the disease from Whitechapel; this one recovered, as did two others; the mother, however, died of cholera.

August 30, 1866. J. W. GRIFFITH, M.D.

ST. LUKE, MIDDLESEX.

This parish is only supplied by the New River Company.

Only one public pump now exists, and this has been purposely rendered inoperative during the epidemic.

No epidemic outbreak of cholera can be considered to have occurred in St. Luke's, there having been only a few (under 12) sporadic cases, occurring at distant parts. In some of these cases there is direct evidence to lead to the inference that the disease was contracted in a cholera locality, and brought into the parish; for example, a policeman who died in Mitchell-street had been engaged on duty in Shoreditch; a man in Turk's Head-court had been working at the docks, and his death was assigned to drinking impure dock water; a man in White Horse-court had been working at the water-side at Billingsgate; and a woman in Garden-court had just removed from Shoreditch, and was ill when she came into the parish.

F. W. PAVY, M.D., F.R.S.

CITY OF LONDON.

Dr. LETHEBY, M.B., M.A., Ph. D., Health Officer for the City of London, (which includes the Districts of the City, East London, and West London,) has drawn up an elaborate analysis of the waters in use in the City. The following extracts are from his valuable Report.

"Altogether there are 35 pumps in the City from which the public are in the daily habit of drawing water for drinking purposes, and as you will perceive from the accompanying table the quantity of saline and organic matter in the gallon ranges from 26·63 grains to 129·73,—that of the New River during the last month being but 17·16 grains, and of the East London 18·18. Only six of the City wells yield water with less than 50 grains of solid matter in the gallon, and there are but two others with less than 70 grains. Ten of them contain from 70 to 80 grains per gallon, nine have from 80 to 90 grains, two have from 90 to 100 grains, and there are five wells in the City, namely, those in Aldgate High-street, in Bishopsgate-street, by Dunning's alley in Leadenhall-market, in Milton-street, Cripplegate, and in St. Nicholas Olave Churchyard, the water of which contains from 100 to 130 grains of solid matter per gallon.

"In most cases too the constituents are remarkably indicative of the source and nature of the pollution. The wells of the public meat markets, for example, as those of Newgate, Aldgate, and Leadenhall, are charged with the peculiar filth of those localities; indeed the water furnished by the well in Leadenhall-market contains nearly 40 grains of common salt per gallon, besides a large

quantity of nitre and organic matter, all of which is derived from the stinking serosity which runs from the hides, exposed for sale and salted upon the public way. The wells of the City churchyards and their neighbourhood are also strongly tainted with saltpetre and ammonia, the former to the extent of from 20 to nearly 30 grains in the gallon, and doubtless it is the final product of the decay of the animal matter buried in the neighbouring graveyards. Others of the public wells show the presence of the more or less oxidised products of substances which have escaped from adjoining drains and sewers; and nearly all of them are so largely impregnated with compounds which have percolated through the foul soil of the City that they are entirely unfit for domestic use. Where the soil is well protected, and the pump is away from any especial source of pollution, as is the case with the two pumps at Guildhall, the water is but moderately tainted with impurities, but even there it is dangerous to use the water for drinking purposes, for there is no saying how soon it may become foul from a neighbouring sewer or cesspool.

"I have already reported to you that as most of these waters are bright and sparkling, and have a cool and agreeable taste, they are much sought after for drinking purposes; but the coolness of the beverage, and the briskness of its appearance, are dangerous fascinations, for they are both derived from organic decay. In fact, the dead and decomposing matters accumulated in the soil are partially changed by a wonderful power of oxidation, and thus converted into carbonic acid and nitre. These give to the water the agreeable qualities which are so deceptive; and although they are so frequently drank without any apparent manifestation of injury to health, yet it cannot be that the products of such corruption can be admitted into the human body without danger of insidious mischief; and at the present time there is the still greater danger of the impurities of the soil passing unchanged into the water, and being a source of quick and certain injury."

Composition of the Waters of the Pumps and Surface Wells of the City of London.

NAMES OF PUMPS.	Carbonate of Lime and Magnesia.	Sulphate of Lime and Magnesia.	Alkaline Chloride.	Alkaline Nitrate.	Silica and Alumina.	Organic and other Volatile Matter.	Total per Gallon.
	grs.	grs.	grs.	grs.	grs.	grs.	grs.
Aldgate	23·43	15·63	13·17	19·37	0·96	4·87	77·43
Aldgate High-street	25·30	24·30	20·70	24·20	1·12	8·13	103·75
Bartholomew-lane	21·70	16·17	15·47	16·50	0·97	4·56	75·37
Basinghall-street	21·17	25·20	12·73	13·60	0·97	6·30	79·97
Bell-yard, Gracechurch-street	19·29	12·80	19·11	19·58	1·00	8·22	80·00
Bishopsgate-church	22·60	21·20	18·20	17·33	1·10	6·23	86·66
Bishopsgate-street, by Dunning's-alley	32·23	33·54	22·43	16·06	1·50	9·07	114·83
Bow Churchyard	25·80	19·13	18·47	12·87	1·00	5·43	82·70
Bowling-square	18·67	26·20	11·17	9·13	1·00	4·93	71·10
Bride-lane	14·53	23·07	25·53	24·27	0·93	6·87	95·20
Cannon-street West	14·80	13·73	10·87	25·53	1·00	5·10	71·03
Chequer-yard, Dowgate-hill	20·53	16·43	11·87	16·57	1·03	7·03	73·46
Cock and Hoop-yard, Houndsditch	19·93	17·33	13·03	21·90	1·00	5·60	77·79
Cornhill	22·13	18·20	10·70	16·23	1·20	5·37	73·83
Cree Church-lane	21·07	9·43	6·70	7·17	0·87	2·56	47·80
Fenchurch-street	21·77	20·23	14·50	21·33	0·87	7·23	85·93
Guildhall	12·90	8·65	4·30	3·05	0·95	2·90	32·75
Guildhall-buildings	13·37	4·40	3·40	2·76	0·60	2·10	26·63
Gutter-lane	16·57	15·53	7·47	10·53	0·97	5·33	56·40
Great St. Helen's	15·47	10·83	6·50	12·27	0·76	3·50	49·33
Half Moon-passage	16·40	13·00	17·23	15·00	0·87	3·50	66·00
Herald's College-yard	14·57	21·90	15·87	30·50	0·93	5·86	89·63
Honey Lane-market	16·10	10·50	9·23	6·63	1·10	3·27	46·83
Idol-lane	15·70	19·50	15·73	22·63	1·30	5·44	80·30
Ironmonger-lane	19·27	30·60	13·57	15·07	1·26	6·90	86·67
Leadenhall-market	16·63	23·97	38·60	29·13	1·07	5·53	114·93
Little Britain	25·27	29·93	13·83	6·42	1·43	8·27	85·17
Minories	21·93	21·70	15·46	29·00	1·23	6·63	95·97
Milton-street, Cripplegate	33·63	37·84	22·93	23·50	1·33	8·34	127·57
Mitre-square	17·23	10·33	7·27	6·03	0·97	4·37	46·20
Newgate-market	19·73	14·14	13·70	14·70	1·30	6·83	70·40
Old Jewry	18·50	15·20	7·70	13·33	0·94	4·93	60·27
St. Mary-Axe	23·47	19·93	12·57	20·74	1·13	5·53	83·37
St. Nicholas Olave Churchyard	21·03	29·17	31·87	38·36	1·20	8·10	129·73
St. Paul's Churchyard	20·60	15·20	9·47	20·80	1·10	4·10	71·27
East London Water Company	12·00	2·42	1·32	1·52	0·50	0·40	18·16
New River Water Company	11·49	1·94	1·06	2·05	0·42	0·20	17·16

Shoreditch.

1. I have made no special analysis of the New River or East London water.

2. I have long taken pains to suppress pumps and wells; and believe that companies' water is now almost exclusively used.

3. At first it appeared that the epidemic was chiefly prevalent within the area of the East London, but latterly not so, at least to the same extent.

4. I attribute most of our cases to direct importation from the infected bordering districts. A resident in Shoreditch has been in contact with cholera patients in Bethnal Green, Whitechapel, &c., and has come back to be speedily attacked. Then, this fact is common,—a second, rarely a third, case follows in the same house as the first. There has been nothing in the nature of spreading beyond this. Dotted or isolated cases have appeared in various and distant parts of the district, but these have not become foci of radiation. The active means adopted, in burning infected bedding, free use of carbolic acid, a wonderful anti-zymotic in my opinion, and the removal wherever possible of the sick have, I am convinced, together with the steady house-to-house visitation, been very effectual in meeting the epidemic step by step.

There is nothing in these very unstatistical notions that is worthy of publication, nothing that militates against the almost irresistible conclusion that the disease has been propagated through the East London water supply.

Let me take the opportunity of calling your attention to one point.

There is no practical sanitary work more important than the prompt removal of the dead from an inhabited house. Until the corpse is removed, cleansing and disinfection of the house cannot be done, and in the meantime a second or third case happens, and in some cases I know of, cholera has been propagated to other houses. Now removal cannot always be effected with sufficient promptitude unless provision is made for the temporary reception of the corpse in a public mortuary. I have had such a mortuary erected—in every way as I think suitable for the emergency; but owing to the prejudice of the people living near to it, I am not allowed to use it; and the vestry, although disposed to support me, seem hardly prepared to run counter to the feeling. Strange to say, there seems no such feeling against the established practice amongst undertakers of depositing bodies for an unknown time, in unknown places, cellars, stables, &c., in close proximity to dwellings; no care being taken—undertakers despising it—to disinfect them.

September 5, 1866. Robert Barnes, M.D.

Bethnal Green.

The following reply from Dr. Sarvis appeared in the Return, No. 45, *for the Week ending November* 10*th.*

1. There has been no special analysis of water in this district lately. The whole of Bethnal Green is supplied by the East London Waterworks from the Old Ford reservoir. For a long time prior to the outbreak of cholera the water supply has been very scanty; it not having been turned on long enough or with sufficient force to fill the receptacles provided; the poorer localities have often been without water, especially on Sunday. Since the outbreak a larger supply has been given, but even now it is not sufficient for the wants of the inhabitants. I believe the storage of water to be bad even under the most favourable conditions, and a constant, instead of an intermittent supply, for the whole of London, greatly needed.

2. Only one company supplies water to this district.

3. There are no public pumps in my district, and I have not been able to trace any case of cholera directly to drinking impure water, although there is every reason to believe that the present epidemic arose from that source. The first well-marked case of cholera occurred in this district close to the Old Ford reservoir.

Thomas Sarvis, M.D.,
Medical Officer of Health.

September 29*th*, 1866.

Whitechapel.

1. The mode of water supply has not varied since June; there are now about 20 courts in this district which are supplied with water direct from the main without the intervention of cisterns or butts. The houses in these courts thus supplied contain about 2,000 persons. I have not made an analysis of the water.

2. The district is supplied by the water companies, viz., the East London and the New River. The entire district contains about 8,664 houses, and the East London supplies about 7,914 of them, and the New River about 750, or nearly one twelfth of the total number.

The sub-districts which are in part supplied by the New River Company are Aldgate, Whitechapel North, and Artillery, the mains running along a portion of Upper East Smithfield and along the centre of Petticoat lane.

The total deaths in this district from cholera, in the four weeks terminating on Saturday the 25th August, have been 494, including the deaths in the London Hospital and those in the Cholera Hospital in Commercial-street, both of which institutions receive patients from all the neighbouring parishes.

The mortality from cholera during the same weeks in the houses in the three sub-districts which are supplied with water by the New River Company has only been 19.

3. I have had no experience as to the effects upon health by the use of pump water, but I may state that the water from two of the pumps recently became so foul that it was deemed advisable to prevent the further use of it. But, notwithstanding this, the inhabitants in Norton Folgate memorialized the Board to cleanse the well, and to allow the public to continue to use the water. At present the Board has not complied with the request; and it is to be hoped that, for the safety of the public, not only will these two pumps be kept closed, but that all the pumps in the district will be removed.

4. The extreme poverty of the inhabitants in many parts of the district, owing to their precarious employment, and their consequent inability to procure a sufficient quantity of good wholesome food, and from their crowding together in ill-ventilated rooms, thereby diminishing their physical powers, so that they are unable to resist the poison of epidemic diseases.

We have been left a fearful legacy by our forefathers in their having permitted houses to have been built without the least regard having been paid to sanitary arrangements. Everybody has been permitted to do what he liked with his own. Unless these supposed "vested rights" of property are vigorously attacked by Parliament, and prevented from being used to the detriment of the public health, the present evil will be perpetuated.

August 30, 1866. JOHN LIDDLE.

ST. GEORGE-IN-THE-EAST.

No replies were received from the Medical Officer of Health.

LIMEHOUSE.

The water supply is grossly defective, and demands immediate change. The complaints among the poor on this head are incessant; it is seldom let on for more than 10 minutes, and then there is often a contention for this limited quantity with the inmates of a dwelling. I have made no analysis of the water.

2. This district is wholly supplied by the East London Waterworks, excepting 15 houses in Green-yard, and four in Brown Bear-alley, Wapping, which have their supply from the New River Company. In this limited exception the difference rather tells against the New River Company comparatively in that neighbourhood, as one death has occurred at No. 6, Brown Bear-alley, and one at No. 4, having died in hospital. Three recoveries from diarrhœa happened at Nos. 4 and 9.

3. There are no public pumps or wells in the district in use.

4. Intemperance in food or drink, feebleness of habits from previous disease or otherwise, fatigue, anxiety, and scantiness of food have been amongst the markedly predisposing causes of cholera. The streets selected have very generally been wretchedly built, both as regards materials and especially the foundations of the houses. I could number houses of this character where deaths have been remarkable, and whole groups of streets, not old but new streets, not in this alone, but other districts, where cholera has found victims, while the same class of houses of another structure have comparatively escaped. Then again, I believe, the Lea Cut and the Regent's Canal, two bodies of water little better than cesspools in June under the high temperature, probably 80°, are comparatively stagnant canals, gave rise to poisonous gases and vapours, and these, favoured by the immediate change of the wind from the north-east, after several days of excessive heat, as in other cases on record, largely diffused its virulence in the direction of the recent fatal attacks.

September 1, 1866. THOMAS ORTON.

MILE END OLD TOWN.

No replies were received from the Medical Officer of Health.

BOW.

1. The water supply in the older parts of my district is in most cases a daily supply into cisterns, too often old and ill kept; but in the more recently built streets, and especially in North Bow, nearly all the houses have a constant supply from the mains of the East London Waterworks Company. I am most anxious to see this system universally enforced through the entire district.

2. The East London Company supply the whole district.

3. We have neither pumps, wells, nor springs in use throughout the district for the supply of drinking water.

4. I am not able to ascribe the rapid spread of the epidemic amongst us to any single cause. At the beginning of the outbreak the larger number of cases occurred among persons residing near the River Lea and the Limehouse cut, this being, however, the poorest and most densely populated portion of the district; subsequently the disease attacked persons of all ranks, and residing in the healthiest parts of the neighbourhood, many cases occurring among those who were not water-drinkers, and in whom, therefore, the choleraic poison could not thus have found an entrance into the system.

September 8, 1866. W. P. G. WOODFORDE, M.D.

Poplar.

1. The water is supplied to every house for about 15 minutes every day, except Sundays.
2. My district is supplied by one company, the East London. I have not observed any difference in the mortality in any particular part of my district.
3. There are not any pumps or wells in my district.
4. I am at a loss to know the causes of mortality from cholera in my district, but I would suggest that every house ought to have the water on the constant supply.

August 31, 1866. Saml. K. Ellison.

St. Saviour.

1. The St. Saviour's district is supplied with water by two companies, viz., the Lambeth, and Southwark and Vauxhall.
2. I have not observed any difference in the mortality of the parts of the district supplied by the respective companies; nor is it possible I should, as the water is derived from the same locality by both companies.
3. I have advised that all surface-wells in this district should be closed, or not used for drinking purposes. This advice has been acted upon.
4. The locality where cholera has proved fatal in this district is very crowded, and is adjacent to Reddin's dust yard. At No. 6, Farnham-place, Gravel-lane, a man was attacked with cholera and died. His son, a boy 10 years old, also died. A boy who went to the house was seized the next day, and died in Knight's-court, Bear-lane. Since, a young man has died at No. 7, Farnham-place, and from the 17th August to this date no other case has occurred. I have caused all the houses to be thoroughly limewashed, scrubbed with carbolic acid, the waterclosets thoroughly cleansed, and have had all the bedding, wearing apparel, &c., of those who died destroyed.

August 25, 1866. Robt. Bianchi.

St. Olave.

1. I have not made any analysis of the water supplied to my district since June last. Numerous complaints have been made within the last few weeks of a deficiency in quantity.
2. My district is supplied by the Southwark and Vauxhall Company only.
3. I have no opportunity of forming any opinion on the effect of pump, well, or spring water on disease. The only pump within my district was removed some weeks since through the agency of the Board of Works, in consequence of my report that the water was unfit for drinking purposes.
4. Nine cases of cholera have occurred within my district during the present summer. Six proved fatal; five if not six of the cases appeared to have been imported from other districts.

August 29, 1866. J. Northcote Vinen, M.D.

Bermondsey.

The water is supplied to Bermondsey by the Southwark and Vauxhall and the Lambeth Water Companies. The former supplies the greater part of this parish. Since June last the quality has been good, and more carefully filtered than in times gone by; but the quantity has been seriously deficient. In every part of this company's district there is a general complaint of scarcity of water. The officers of the vestry are in constant correspondence with the company, the result of which is an occasional squabble about fittings with the landlords; the company's officers most inconsistently showing their ability to give the necessary supply by flooding the yards of the complainants in my presence. It would seem that the supply is systematically withheld on account of the waste caused by the objectionable fittings and receptacles. The question of water supply to the parish is becoming a very serious one indeed.

The Lambeth Company supplies a very small part of Bermondsey. The complaints are so few that I only happen to know officially that they do supply this very small district, in which there has not been any cholera and no more diarrhœa than elsewhere. I cannot fairly attempt a comparison between the waters of the two companies, as nothing important has taken place in the part of the parish supplied by them conjointly. The mains of the Lambeth Company do not go near the part of Bermondsey where cholera has as yet prevailed.

I have not performed any analysis lately, having adopted that of the late Dr. Dundas Thompson and that published by the Registrar-General, with the exception of having used permanganate of potash occasionally on account of having great reason to find fault with the storage of water in cisterns, butts, tubs, jars, &c. &c. I have found the humble jug or jar of the poor more wholesome than the dirty open butts or more pretentious cistern. The former, often rotten, standing over the drain, and seldom cleaned out; the latter too often ventilating the sewer or closet by means of an open waste pipe. The purest water in England would be poisoned by the present system of storage. I have long been an advocate for a constant supply.

To the third question I have only to say that I have not known the water of any pump to have been used lately for drinking purposes. The vestry pumps have been chained and locked, at my suggestion, and are only used to water the streets.

Eighteen deaths from cholera have occurred in Bermondsey between July 8th and August 25th. The first victim was a sailor trading to Hamburg, where the disease prevailed; house clean and

free from sanitary defects. The next was an aged woman, who lived next door to the above, but without the least communication with him or his family. This was attributed to fear; house clean as the former; both houses continue free from cholera. Brickfield a great nuisance. Third case in a spot inhabited by poor Irish labourers who work by the water-side or whose wives are employed at cinder-sifting, rag-sorting, or in glue yards. They are dirty, given to overcrowding, and every sanitary effort fails to keep their dwellings free from fever. Here six deaths have taken place in three small streets. Efforts are being made to arrest the disease by the free use of disinfectants. Three other deaths occurred in places of a similar description in another part of the parish; two of these in one street. The first was the daughter of a man who carts ice to the London Hospital, and the second had been in communication with her during her illness. Four deaths occurred in one house in the Rouel-road, a new street of well-drained houses, with only one fault, the storage of water in cisterns with objectionable waste pipes. The first of them was an idiot child, which had been left a few days before its death sitting in a swing in a shower of rain for three hours or more. It was neglected, and allowed to practise the filthy habits of idiocy. The mother and another child followed, and the father died in Guy's Hospital. The three last were cut off in 36 hours; the husband and wife were both intemperate. Here, without doubt, the cholera was invited by drunkenness and dirt. No more cases have occurred in the Rouel-road, though the inhabitants are suffering much from the nuisance of an adjoining glue factory.

September 1, 1866. WILLIAM PARKER, M.D.

ST. GEORGE, SOUTHWARK.

1. I have not made any analysis, and I have not observed any matter worthy of notice.
2. This district is supplied by two companies, the Lambeth and Southwark. The mortality has been so small that no inferences can be drawn. Two of the fatal cases of cholera which occurred were imported from Stratford. In all cases the water receptacles were filthy; in two cases they were filled with weeds like a stagnant or slow running ditch.
3. All our pumps have been closed for some time; that is, the public ones. There are many private pumps; one situated in the centre of a catgut manufactory in Green-street, and from which the water is fetched far and near, owing to its coolness and deliciousness. The family use it. The well is about 17 feet deep.
4. I have no information to give.

August 25, 1866. H. BATESON.

NEWINGTON.

Our parish is supplied by two companies, the Lambeth and the Southwark and Vauxhall, and we have had so little cholera that no comparison can be drawn between the two with respect to mortality; the latter company's arrangements as regards sufficiency of supply are defective, and scarcely a week has passed for a long period without complaints being received; the water supplied is not thoroughly filtered, and at times there is a great deal of earthy (?) matter diffused through it, and I have detected by the microscope living organisms as well. We have not received one complaint for a long time against the Lambeth Company.

I have in former years, on more than one occasion, traced the occurrence of diarrhœa to the use of well-water for drinking purposes, and have found, in one instance that I can well remember, that it was contaminated by connexion with a drain, and on this being prevented the diarrhœa ceased.

September 6, 1866. W. TIFFIN ILIFF, M.D.

LAMBETH.

The parish of Lambeth is served by two companies drawing their supply from the River Thames, viz., the Southwark and Vauxhall and the Lambeth Water Companies, and some houses are supplied from wells only.

The condition of the waters since June has been as good as usual, but some complaints have been made of an insufficient quantity in the poorer localities, especially on Sundays. The two water companies have recently undertaken to furnish water in poor neighbourhoods on Sunday.

There have been very few cases of cholera in Lambeth, and these have been distributed, and not confined to any one water company's district. The number of cases have been insufficient to form any satisfactory data; a considerable proportion were imported into the parish from infected districts, or arose after great irregularity of living, or occurred in young children.

September 5, 1866. GEORGE PUCKLE, M.D.

CLAPHAM.

This district is supplied by the Southwark and Vauxhall Water Company, and the supply since June last has been good. I examined the waters of several pumps, &c., and found them unfit for drinking purposes, and gave directions to close them.

In this district there is but little cholera; there is a great deal of diarrhœa.

The health of this district has been very good during the last three or four weeks; the mortality light.

August 29, 1866. JOHN MACDONOGH.

Battersea.

1. Water supply is good ; no analysis has been made lately.
2. By one company, the Southwark and Vauxhall.
3. None has been observed.
4. The localities where cholera has occurred are generally unhealthy, from pig-keeping, defective drainage, overcrowding, and dirty habits. The first case of cholera that occurred was imported by a man who had worked at Bow Common; he died after three days' illness; his daughter was attacked the day after his seizure, and died in 11 hours.

August 27, 1866. Wm. Connor.

Wandsworth.

1. I have made no analysis of the water supplied to this sub-district since 1856.
2. Tables have been lately furnished to the inspectors of nuisances for the purpose of gaining this information.
3. Much conjecture, but no direct evidence of actual disease having resulted from the use of these waters.
4. Five cases of cholera have come under my care during the present epidemic. Three of men and two of women; the latter wives of two of the men. The men were attacked first, then their wives. Two of the men were employed on the sewer works, and the third digging mud out of the Wandle, and previously in the manufacture of artificial manure.

The only etiological deductions which I can extract from these cases are, that the kind of employment of the men presupposes exposure to malarious influence, or at least to noxious gases; and the fact of the women having been attacked subsequently to the men would appear to indicate a contagious transfer of the disease.

September 3, 1866. G. E. Nicholas.

Putney.

Eighteen years ago, in "An Address on the Moral and Physical Evils resulting from a Neglect of Sanitary Measures," I made the following remarks in reference to the supply of water :—

"Let us turn now to another part of our subject, the water supply of the district. I have a very strong opinion, indeed, from the liability of the water in many of the localities in which the poor reside to become contaminated by the numerous cesspools in the vicinity of the wells, that the use of such fluid filth for drinking and cooking purposes is a fruitful source of disease; and it is a very great question with me whether it will not one day or other be demonstrated that the drinking of such impure water gives rise to cholera in too many instances, and possibly to many other diseases of which we at present know not the origin. I anxiously look forward to the day when these contaminated wells shall be closed altogether, and when good and wholesome water shall be supplied to the poor, in an unlimited quantity, by a water company having mains running directly through the district."

Within the last six weeks I have examined nearly all the remaining well waters in the parish, and, with very few exceptions, find them to contain dangerous amounts of organic impurity. Even some water taken from a well on Putney Heath, always considered to be of excellent quality, gave, in a recent analysis—

	Grains per gallon.		Grains per gallon.
Total impurities	- 56·0	Organic matter	- 17·5

Other well waters within the town have also been lately examined, and found to be equally impure. In one instance, where percolation from a neighbouring privy was but too evident, the water under the microscope was found to abound in infusorial life.

Those portions of the parish in which surface wells have been abolished are all supplied by one company, the Southwark and Vauxhall; but even this water, though the purest (if it could always be drawn directly from the mains) obtainable in the poorer portions of the parish, has often been found to contain much too great an amount of organic matter to be safely used for drinking without being previously boiled or filtered.

Contamination of the company's water in passing through unclean water-butts, cisterns, and tanks is a great evil throughout the district, as is also the want of water for closet flushing, and the Sunday's supply, especially to the houses inhabited by the working classes.

Numberless closets exist without any supply of water whatever; and even where it is laid on, it is, in many cases, in such small quantities as to be all but useless to float away fæcal matter from drains into the main sewer; hence the worst nuisances are continually arising.

The Board of Works of the Wandsworth District have been urged by the medical staff to employ all their influence to obtain a constant supply of the company's water, and if this cannot be accomplished, to adopt, during the continuance of the present epidemic, the stand-pipe system wherever practicable.

August 27, 1866. R. Harland Whiteman, M.D., L.R.C.P.E.

Streatham.

1. This district is supplied with water by the Lambeth Waterworks Company. I have analysed the water from several wells, but have found only the minutest quantity of organic matter, and have not thought it necessary to close any pumps as yet.

2. The district is supplied by one company.

3. The spring, artesian, and well water of this district is very "hard," containing a great deal of lime, and is unsuited for some forms of dyspepsia and for constipated habits of system.

4. There has not been a case of cholera.

Diarrhœa has not been very severe, and the only fatal case (in a child) that came under my observation may be attributed to a misplaced dose of castor oil, given without medical advice.

August 31, 1866. D. C. Noel.

Camberwell.

1. The water supplied to Camberwell has been analysed monthly for some time past by Dr. Bernays of St. Thomas's Hospital, and the result of these analyses have accorded, as nearly as possible, with those published monthly by the Registrar General, so that there is no need to quote them. Complaints, I need scarcely say, are common with regard to insufficient supply; in many cases these turn out to be due to the want of a Sunday supply; in some cases to smallness of water receptacles, and in some cases to purely accidental causes. Complaints too are occasionally made as to impurity of water; the impurity, on investigation, turns out to be frequently due to uncleanly condition of water receptacles, sometimes to local conditions connected with the pipes, and now and then I believe to imperfect filtration on the part of the companies. No special complaints have arisen since June last.

2. Camberwell is supplied by three water companies, the Lambeth, the Southwark and Vauxhall, and the Kent. I have never observed special unhealthiness or mortality to arise amongst any one of the three sections of the population furnished by these several companies. The Kent Company supplies a comparatively small portion of the parish only, that, namely, abutting on Deptford.

3. There is still a good deal of well and pump water used throughout the parish, though of late years the number of wells and pumps has greatly diminished. I have no facts showing the ill effect on health of these waters.

4. Cholera has not prevailed largely in the parish, and although in the beginning of the epidemic more cases occurred in Camberwell than in any of the other southern districts, the cases had something of a sporadic character, that is to say, the affected houses were scattered irregularly over the parish, and the disease did not spread from them to their neighbourhood. Some of these cases (one or two) were distinctly imported cases, and some occurred in respectable houses where there was no apparent sanitary defect. There has, however, during the last week been a distinct outbreak of the disease in a place called Stockwell-street (Old Kent-road). Since yesterday week there have been there 9 or 10 cases of cholera, and 6 or 7 deaths. The houses in this street are occupied for the most part by low Irish, are generally overcrowded and in bad sanitary condition, yet they have water laid on, and are for the most part more or less perfectly drained. The first death (that of a gardener) took place yesterday week in a house occupied in tenements. One of the families at once removed to another house two or three doors off; one of this family, the mother, with a baby at the breast, died of the same disease within the next two or three days. Since then another death has taken place in the first-named house, and another (not fatal) case in the second-named one. Since then two other cases and other deaths have occurred in two or three neighbouring houses on both sides of the street.

The water which the people drink is supplied by the Kent Company, but it should be added that this water is also drunk by poor people in neighbouring streets and by the inhabitants of the neighbourhood generally, and that there has been no suspicion of cholera in any part of the district but this street.

I may point out that this street very closely adjoins Deptford, that part of South London (Deptford, Greenwich, and Rotherhithe,) in which, if anywhere in the south, the disease seems to have been prevailing epidemically. Most of this part is no doubt supplied by the Kent Company, but it is also largely connected with shipping interests, and included in the port of London.

September 1, 1866. J. S. Bristowe.

Rotherhithe.

1. Rotherhithe is supplied with water by two companies; the upper or western district, by far the most populous, by the Southwark and Vauxhall Company. The water is generally of good quality, but the supply is scanty, and since June last many complaints have been made of this deficiency. During the present epidemic these complaints have been most numerous in the humblest and poorest parts of this parish.

The lower or eastern district receives its water from the Kent Waterworks. The quantity and quality is everything that can be desired.

2. There have not been above 25 deaths from cholera and diarrhœa in this parish since the beginning of the present epidemic, and they have been scattered in different localities.

3. I have a few remarks to make on this subject, being fully persuaded and satisfied that in large cities supplies from pumps, wells, springs, &c. do occasion disease of the very worst kind.

In the year 1849 all the lower or eastern portion of Rotherhithe had no water supply from any company.

The inhabitants either dipped their water from the muddy Thames, from dirty tidal wells, or procured it from pumps connected with springs, many of which contained salts of lime and iron in solution, and were strongly impregnated with organic matter. There was at that time no drainage in the district, except a few superficial channels, which carried the surface water into the Thames.

The cholera came (1849), and about 200 persons died in a locality certainly not containing 3,000 souls; whole streets were decimated by the disease,—to wit, Silver-street, Charlotte-row, Ramalley, &c. No place in London of the same size and same amount of population was so unhealthy.

The authorities, alarmed at the frightful mortality, caused a sewer to be constructed, and good water to be supplied from the Kent Water Company.

The results were as follows :—

When the cholera revisited us (1854) the lower part of Rotherhithe remained almost entirely free from the disease; not five deaths took place in it, and it became and still remains one of the healthiest localities in London, and during this present epidemic has scarcely suffered at all.

4. I believe that bad drainage and bad water are the most powerful agents in propagating cholera. They do not generate cholera, whose remote cause is quite hidden from human inquiry, but render those persons sojourning in places undrained and unwatered more ready recipients for the disease than they otherwise would be.

September 6, 1866. W. Murdock, M.D.

Greenwich.

1. The water supplied to the whole of my district is taken from the artesian well at Lewisham, an analysis of which is published in the Registrar General's Reports.

2. The whole of my district is supplied by the Kent Waterworks alone. In this district it does not appear that the water has been influential in the production of disease.

3. I am not aware of any pumps or wells at present in use for domestic purposes throughout the district.

4. The chief causes from which the mortality in the present epidemic would appear to have arisen are the want of sewers throughout the greater part of the district, and consequent defective drainage of houses, privies, streets, gutters, and surface generally, and the filthy habits of that portion of the population amongst whom cholera, choleraic diarrhœa, and diarrhœa have chiefly prevailed.

The present epidemic has mainly existed in all such parts of my district as are contiguous to the river Thames. The nearer the river the more cases of cholera, and the greater the severity of attacks generally, the disease gradually decreasing in virulence and numbers as the distance increases from the river.

Many cases of cholera have broken out in this district amongst persons who have been working or staying in the eastern districts of the metropolis, or who have been working on board ships in the river.

August 27, 1866. Henry N. Pink.

Charlton and Kidbrooke.

1. The whole of this district is supplied by the Kent Waterworks. There is a good and abundant supply, and the water is very free indeed from organic impurity, but contains large quantities of carbonate of lime.

2. The whole district is supplied by one company.

3. There are few pumps or wells in our district supply water, as almost every house is supplied by the Kent Company.

4. Up to this date only two cases of cholera have occurred in my district; the first on 22d of August, an imported case from Blackwall, and the second on the 30th of August. We have little or no diarrhœa; only one death from diarrhœa in several weeks. The whole neighbourhood very healthy.

September 5, 1866. Robert Finch, M.D.

Plumstead.

1. The water supplied is very good.
2. One company supplies the district.
3. Pump and well water *bad*, but the springs have no effect on disease.
4. No cholera.

August 27, 1866. Augustus W. Allinson.

Eltham.

1. The only difference in the water supply of the Eltham district since June last is, that a few private houses have had water supplied by the Kent Water Company instead of by pumps. Most probably in a short time this Company will supply with water almost the entire district.

The following analyses of the water of three wells were made some time previous to June.

Foreign Matters present.	Pump Water in Well Hall-lane.	Pump Water at the corner of the Courtyard.	Mr. Jackson's Well, top of Town, 250 feet deep.
	grains.	grains.	grains.
Organic matter - - per gallon	7·78	6·48	4·72
Inorganic matter - - „	59·82	61·38	27·04
Total of Impurities - per gallon	67·60	67·86	31·76

2. The Kent Water Company is the only one which supplies water in this district.

3. I have not observed any influence on diseases from the use of pump, well, or spring water, as diseases of the zymotic class are very few in this district.

4. There have been no cases of cholera in this district, and the number of cases of diarrhœa have been very few.

August 27, 1866. David King, M.D.

Lee and Kidbrooke.

I beg to state that the district of Lee and Kidbrooke is supplied only by the Kent Waterworks, and that there have been no deaths from cholera at all, and that only one death from diarrhœa has occurred since June, and that in an infant seven weeks old.

September 6, 1866. Joseph S. Burton.

Lewisham and Sydenham.

A portion of Blackheath and the village of Lewisham are supplied with water by the Kent Waterworks Company, who did obtain their water from the Ravensbourne, but since the wholesale contamination of that small stream by sewage have given up that source of supply, and I am positively assured solely use water from artesian wells, which appear to me to give a very abundant supply. Sydenham and Penge are supplied with water by the Lambeth Company.

The water as supplied seems a very fair sample. But in many houses even of the better class little attention is paid to the cleansing of cisterns; and amongst the poor it would be an exceptional matter to find a clean cistern; again, the water pipes from some of the cisterns have been found to communicate *directly* with the sewer, and sometimes without traps.

Lewisham Village is also supplied by pump wells, but the village is now well drained, and I think that these wells are quite free from contamination, as far as I have been able to ascertain.

Diarrhœa is prevalent, but not generally of a very severe character; but two cases of cholera are reported to me this day in West Kent part, usually one of the worst localities in the district, but *not* from any difference in the source of water supply.

August 26, 1866. F. E. Wilkinson.

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3. The Medical Officers of Health on the Preventive and other Measures adopted in their Districts.

The Registrar-General addressed the annexed circular to the London Medical Officers of Health on October 20th :—

The Medical Health Officers of London will receive daily the Return of Deaths from Cholera and Diarrhœa in their several districts.

The Registrar-General will feel obliged if they will, for the public information, furnish brief replies to the annexed inquiries.

The Registrar-General will be glad to receive their replies as early as 10 o'clock, by post (unpaid), on Monday morning for publication ; and he will be further obliged if they will forward similar returns for publication on every successive Monday morning so long as they receive the daily returns.

This will satisfy the public mind that no exertions are spared by the respective local authorities to stay an epidemic which keeps the whole of the metropolis in a state of alarm.

1. What is the number of medical visitors and nuisance inspectors employed in your district ? Are they under your control ?
2. What steps are taken to secure the early treatment of diarrhœa ?
3. What measures are employed to disinfect or destroy chemically the dejections of cholera patients ?
4. Is every house in which a cholera patient is attacked visited, and is the disinfection of beds, linen, &c. carried out under inspection so as to secure its efficiency ?
5. Are the linen and beds destroyed immediately replaced by the authorities ?
6. Have you anything to remark generally in connexion with the hygienic state of the houses in which deaths from cholera were registered last week ?

The following replies were printed in the Return, No. 42, for the Week ending October 20th.

Islington.

October 17th, 1866.

We have had here, independently of the cases of "choleraic diarrhœa," amounting to 266 cases (reported to me), 105 cases of fully developed cholera, of which 62 have died up to the present time. Nine of the cases returned to me as "choleraic diarrhœa" were fatal. Our first case of cholera happened on July 23d, and on the 27th there was an outburst of 5 cases, 5 more occurred on the 28th, 3 on the 29th, 5 between this date and the 1st of August, 8 cases on the 1st of August, and 9 more between then and the 5th of August. Since then the cases have numbered from 10 to 4 per week. At first, when the disease appeared in limited localities, three medical visitors and an assistant were employed, and two stations established by the vestry for relief of diarrhœa cases. We have now, with my concurrence, only one medical visitor, but the ordinary sanitary staff has been increased to eight inspectors and six men, whom I occupy in disinfection and other works about dwellings, burning bedding, &c. I have hitherto received tolerably early information of any case of cholera and of many of the cases of choleraic diarrhœa that have occurred, so that the instances are very few in which I have received my first intimation from the daily returns of deaths.

My practice has been to visit personally every case of cholera or severe choleraic diarrhœa immediately on hearing of it, and, if the case be a fit one to remove, I have endeavoured to persuade the patient to go to one of our hospitals, either to the cholera ward of the London Fever Hospital or to the Great Northern Hospital; until this be done, or if the case be one it would be unsafe to move, I see that it is properly in charge either of one of my visitors or of some medical man. If the family are destitute I am empowered to order relief, either in the way of food or blankets, &c., and to engage a nurse where none of the family can undertake that office. I watch the case either until death or recovery. When death takes place I see that the body is coffined as soon as possible with some MacDougal's powder, and removed to our deadhouse where the friends do not object. So long as a patient remains at home I have been unable to persuade the friends to vacate the apartment. The result in many instances has been the occurrence of several cases in the same family or house. On the removal or death of a cholera patient I direct the closing of the room until the room and its contents have been satisfactorily disinfected and cleansed. In some instances where

several cases have occurred in the same house I have closed the house altogether, and then, having no house of refuge provided, have found lodgings for the family or families as best I could, and made arrangements for providing them with an ample diet. I have hitherto met with no instance in which the disease has spread to the houses into which the families have been removed, although I cannot but regard the arrangement as not free from danger. It has been considered, however, by our Diseases Prevention Committee, that the cases at present could be sufficiently provided for in this way.

As regards disinfection, &c., my practice is this: On occurrence of a case of cholera or choleraic diarrhœa I send a man at once to pour carbolic acid into the privy and inlets of house drains in the invaded and adjoining houses, and take care that carbolic acid is also supplied for use in the utensils, or else Burnett's fluid, which is preferred by patients on account of its freedom from smell. This disinfection is repeated day by day for three or four days, and the whole adjoining streets similarly treated. Notice is given to owners of houses of any sanitary requirements discovered by our inspector, and especially for the cleansing of water receptacles. Dust accumulations are disinfected with MacDougal's powder, and then ordered for removal, and MacDougal's powder is scattered about the floors and staircases of the house and about the yard. When death takes place and the body is removed, or when a patient is removed to a hospital, the key is turned and brought to me, and I again visit the house and examine the bedding and articles in the room and condition of floors, walls, &c. In nearly all instances I have ordered the bedding to be destroyed, seeing it first soaked with carbolic acid; any filthy clothes or rags or dirty pieces of carpet are similarly treated. Other things which appear worth preserving or are not much stained, such as sheets, blankets, or articles of clothing, I see put into a solution of Burnett's fluid or a weak solution of carbolic acid. The carbolic acid is apt to damage such articles unless tenderly used. I have not felt myself at liberty to leave the most disagreeable task to the discretion of assistants. I hold that while it is the most unpleasant it is the most important duty laid upon the medical superintendent by the Privy Council order. No house or family is safe so long as a particle of the virus is left undestroyed. The floors in all cases, and if dirty the walls and ceilings of the room and sometimes of the entire house, are then smeared or washed over with carbolic acid and water, and a notice given to the owners to cleanse and limewhite under the Sanitary Act. The owners of articles of clothing which have been disinfected are then permitted to wash them. I have met with no instance where the washer has suffered if the clothes have been thus treated previously, but I have met with a case where choleraic diarrhœa followed upon the washing of clothes not disinfected, and where the person had not waited for my orders upon the subject. After disinfection of a room or house I have all the windows thrown open, and keep the house or room empty for at least a week, until it is fit to be reoccupied. In addition to this, certain general precautions are taken. I send my medical visitor from house to house daily for some days in the invaded street and other suspicious streets in the vicinity, and he distributes handbills to each family, such as that which I enclose. The streets and courts where cholera is likely to occur, and especially those adjoining upon parishes where it prevails much at the time, are visited every few days, and the privies and drains disinfected with carbolic acid. The main sewers throughout the parish have been twice disinfected with carbolic acid thrown in at all the gully openings, and an active general inspection of the low streets in the parish is being carried out.

It is to be understood that in all the houses where deaths have hitherto been recorded by you in my parish the above steps have been taken wherever necessary, and also in many other cases wher death has not occurred.

When deaths are recorded by you I shall be happy to inform you, as you desire, as to the steps taken under my orders to prevent the spread of the disease.

EDWARD BALLARD, M.D.,
Medical Officer of Health.

Measures adopted in regard to recent Cholera Cases in Islington. Deaths recorded in Supplement to Weekly Return, No. 41.

A wood turner, 23 years, cholera, died October 6th, at 8 Charles-street, Islington-green.—A case of cholera. Death had occurred two doors off, and on same line of house drains, about a fortnight previously. Roadway neglected by contractor; heaps of mud and offensive matter in the street, which were immediately covered with MacDougal's powder and removed; body coffined and pt. into a separate room; bedding good, and not at all soiled, directed to be freely exposed to the air out of doors; water receptacle clean; closets in the house and all other houses in the neighbourhood daily disinfected with carbolic acid; house-to-house visitation. A second case in the same family at time of death; using Burnett's fluid in utensils; recovered. No other case happened in the street or neighbourhood.

A boy, 12 years, cholera, died October 5th, at 8 Providence-place, Islington-green.—This boy was taken ill on September 26th, and was immediately removed to hospital, where he died on October 5th; bedding not soiled, but some very filthy; flock bed destroyed; horsehair mattress disinfected with sulphate of iron, and ordered to be emptied and washed; bedclothes disinfected and washed; privies at this house and all neighbouring houses disinfected with carbolic acid; house-to-house visitation. No new case in the neighbourhood.

Wife of a labourer, 28 years, cholera, pregnant, died October 12th, at 17, Henry-place, Islington. —The first case in my parish happened in this house on July 23d; the patient was removed to the workhouse and died. No fresh case happened until this one; woman taken ill on October 10th, was immediately removed to hospital; an Irish colony in the street; rubbish commonly laid at the blind

extremity opposite this the end house in Henry place; had rubbish removed, being the second outbreak in this house; immediately cleared the house of inhabitants, finding them accommodation and support elsewhere; all clothing left in the house, bedding, &c. (except cholera bed) disinfected with Burnett's fluid; cholera bed, soiled sheets, &c. soaked with carbolic acid and then burned; a choked up drain in narrow backyard; cleared drain and closet of this and all houses in this and adjoining streets (similarly occupied); disinfected daily with carbolic acid; walls, ceilings, and floors everywhere wetted with carbolic acid and water, and windows all thrown open for several days; limewhiting throughout; other work, and cleansing of water-cistern, yet to be done; house-to-house medical visitation daily for a week. No fresh case, except that the woman who attended to the patient before removal to hospital has had an attack of choleraic diarrhœa.

Wife of a van driver, 46 years, choleraic diarrhœa (3 days), died October 14th, at 26 Sydney-street, York-road.—Patient was a cleaner at the London Fever Hospital, and is supposed to have acquired the disease there, cholera patients being received into a special ward; the house generally dirty; area undrained; drains in yard not trapped; waterbutt not covered, and situated in a wash-house close to the privy, which is also in the wash-house; a pony has been also, till just recently, kept in a shed at the side, so that the water had abundant opportunities for gaseous and other defilement; butt cleansed by my own officers and disinfected with quicklime, ordered to be removed into a better situation, and covered, and cleansing of house and trapping of drains, &c. to be carried out forthwith; bedding and sheets, which were much soiled, soaked with carbolic acid and burned; floor of room saturated with carbolic acid, and walls ordered to be stripped of paper and limewhited; room in the meanwhile closed.

A death from cholera having occurred in Cock and Castle-lane in Hackney, immediately adjoining upon a part of Islington occupied by a low population, I have had all the privies and house drains in that neighbourhood disinfected with carbolic acid.

Female, 28 years, cholera uræmia, died October 14th, at 1 Brand-street.—This street suffered most severely in former epidemics; this was the first case in the street from cholera this year. Removed the patient in an early stage to London Fever Hospital, where she died, uræmic; no predisposing conditions discoverable in the house (a two-roomed lean-to) or premises. Rooms had been repaired and whitewashed during the year under notice from our office. Removed the healthy members of the family into lodgings, and cleared the house; saturated walls and floors of infected room with carbolic acid and water, and put windows of both rooms wide open for aeration for several days; soaked bedding with carbolic acid, and then burned it; bedclothes, &c. and bed furniture disinfected with Burnett's fluid; house now being limewhited and cleansed by owner under Sanitary Act.

Wife of a labourer, 47 years, Asiatic cholera, 36 hours, died 14th October, at 3 Queen's-road.—Saw the patient soon after seizure, but being cold and pulseless dared not remove her; set a nurse to attend to her, and keep away the people whom I found flocking into the room; on occurrence of death had the body removed speedily to dead-house. Room let furnished; landlord willing to do all that is necessary; house had recently been repaired under notice from our office. Cistern over privy had been cleansed some weeks previously, but being old, out of repair, and lined with zinc, speedily reacquired impurities; new cistern ordered to be put up; bedding, sheets, and pieces of old carpets and rags soaked with carbolic acid and burned; articles of clothing upon the bed, blankets, and coverlet and bed furniture disinfected with Burnett's fluid and left to be washed; floor smeared with carbolic acid and water, and window thrown open for aeration; landlord has stripped paper off the walls, and limewhited with limewash containing a cup full of carbolic acid to the pail of wash. Queen's-road and Brand-street lie together in a very low neighbourhood, which was put at once under medical house-to-house visitation, and privies and drains throughout the district disinfected daily for some days with carbolic acid.

Fulham.

October 20th, 1866.

1. There are six medical visitors and four inspectors of nuisances, and they are all under my control.
2. Prompt treatment by medical visitors.
3. The free use of Condy's fluid, chloride of lime, and carbolic acid.
4. The house is visited, and disinfection carried out.
5. Linen and beds destroyed are replaced by authorities.
6. A death registered to-day occurred in a house immediately adjoining a large open creek in the centre of the town of Hammersmith. Two other deaths occurred in August adjoining this creek, which is always in an offensive state. It is a tributary of the Thames, and is under the jurisdiction of the Metropolitan Board of Works. A considerable quantity of sewage flows into it.

I may state, that although the existence of this creek in a sanitary point of view is excessively objectionable, I am of opinion that the existence of cholera in the Fulham district depends more on atmospheric than on local conditions. Whilst expressing this opinion, I also believe that the spread of the disease has in each locality affected received a palpable and evident check from the sanitary regime now in operation here.

Frederick J. Burge,
Medical Officer of Health.

St. George Hanover-square.

October 20*th*, 1866.

1. No additional medical visitors have been appointed at present, but Dr. W. Bloxam, one of the parochial surgeons, attends the patients taken to the special Cholera Hospital provided at No. 8 Hereford-street, Park-lane, where only 3 cases have been received. Upon the admission of a patient he immediately communicates with the medical officers of health, who cause a sanitary inspection of the patient's residence to be made. Six nuisance inspectors (now reduced to four) have been appointed, and are under our control.

2. A house-to-house visitation has just been completed throughout the parish, and bills, one of which I enclose, have been distributed by order of the local authority, cautioning the inhabitants as to the best measures to be adopted when any person is attacked with diarrhœa. Two wards are appropriated at St. George's Hospital for the reception of cholera patients, and diarrhœa medicines are administered to out-patients on application. These are also given to applicants at the St. George's and St. James's Dispensary situate in the in-wards, at the Royal Pimlico and the St. Paul and St. Barnabas Dispensaries, both in the out-wards. These precautionary measures were adopted, but the number of patients has hitherto been so limited that nothing further is needed at the present time. I may add that the vestry clerk, Mr. Chappell, has addressed circular letters to all legally qualified medical practitioners in the parish, requesting information as to the presence of cholera or unusual amount or severity of diarrhœa; and that the four parochial medical officers, Drs. Symes and W. Bloxam in the in-wards, and Drs. Griffith and Webb in the out-wards, attend without orders all cases of cholera or diarrhœa that are brought before their notice.

3. Carbolic acid and Condy's fluid are used as disinfectants.

4. Every house in which a cholera patient is attacked is visited, and disinfection is properly carried out.

5. No application has been made to the authorities.

6. The only death registered last week was that of Amelia King, aged 11, a school girl residing at No. 3 St. George's-row, Pimlico, who was admitted into St. George's Hospital suffering from cholera at 3 P.M. on 9th October, and died at 4·45 P.M. On Monday the 8th October she purchased a quarter of a peck of apples and ate them all; cholera supervened. The house was clean.

C. J. B. Aldis, M.D., M.A., F.R.C.P.,
Medical Officer of Health.

St. Martin-in-the-Fields.

October 20*th*, 1866.

1. Two medical visitors have been appointed, but have not been called into action, the cases of cholera not having been in number sufficient to render it necessary. I have one medical inspector and one sanitary inspector both under my control.

2. Three dispensaries are established in different parts of the parish for the gratuitous administration of medicine in cases of diarrhœa. 1330 cases of diarrhœa have been treated, besides a very large number at the Charing Cross Hospital.

3. Chloride of lime and carbolic acid, liquid and powder, have been freely used, and supplied gratuitously wherever disinfectants have been required.

4. Every house in which cholera has occurred has been visited, and the disinfecting of beds, &c. has been efficient, since there has been no instance of the spread of the disease to any attendant or resident in the house beyond those who were originally attacked.

5. Beds and linen and clothes have been burned in the three instances where the disease has occurred, and have been replaced with new ones by the authorities.

6. We had no death from cholera last week. Of parishioners we have had altogether four deaths, and all since the middle of September.

Lionel J. Beale,
Medical Officer of Health.

St. Giles.

October 21*st*, 1866.

In this district a very effectual house-to-house visitation was established, and dispensaries were open day and night for the detection and treatment of cases of diarrhœa. Latterly, however, diarrhœa has almost disappeared from St. Giles's, and these arrangements have accordingly been given up.

In every case of cholera or choleraic diarrhœa, disinfectants, with a paper of instructions for their use, are liberally supplied; and at the Cholera Hospital every discharge from a cholera patient is instantly disinfected.

Every house in which a cholera case occurs is visited by the medical officers and sanitary inspectors of this Board. Every room in which a cholera patient has lain is thoroughly cleansed and disinfected by the servants of the Board, and the privies, drains, and dust-bins are similarly dealt with. All articles of bedding or clothing soiled by cholera discharges are destroyed, and only in exceptional instances disinfected; and all this action is efficiently done.

Linen and beds destroyed are immediately paid for, or in some few cases replaced by the authorities.

The great majority of cholera cases occurring in this district have been removed to the Shelton Hospital near St. Giles's Church.

Upon recent inquiry, it appeared that out of twenty instances, where the first cholera case had been so removed, cholera had attacked a second person in the same house once only; whereas in some fourteen instances where the first patient was not so removed, it had happened seven times that a second or a third person was attacked in the house, in spite of all the disinfection that could be done by the authorities.

GEORGE BUCHANAN,
Medical Officer of Health.

WHITECHAPEL.

October 19th, 1866.

The information contained in the daily returns of deaths from cholera is attended with this beneficial result, viz., that it enables me to send a qualified medical practitioner, Dr. Duke, to visit the house where a death is recorded, and to destroy the clothes and bedding of the deceased, and to inquire into the sanitary condition of the house and locality, and to ascertain the existence or otherwise of diarrhœa in the neighbourhood.

JOHN LIDDLE,
Medical Officer of Health.

NEWINGTON.

October 20th, 1866.

1. The *extra* out-door staff consists of five non-medical sub-inspectors (4 employed in daily house-to-house visitation, and one whose duty it is to ascertain how far the sanitary orders have been carried out); also one water-butt cleaner.

They were all engaged by me, and are entirely under my control.

2. 10,000 bills were distributed throughout the parish informing the inhabitants that medicine for diarrhœa and chloride of lime could be procured at any hour, day and night, at the dispensary by the workhouse, and at the residence of each of the four parish surgeons. Medicine was also supplied to all the public schools wherein the children of the poor were taught.

3. Disinfectants are freely supplied.

4. Every house in which a cholera patient is attacked is visited by myself as soon as possible after I receive information. I endeavour to make the inmates understand the object and method of disinfecting, and from time to time inquire as to how it has been carried out. The cases in Newington have been but few.

5. Linen and beds destroyed are replaced by authorities.

6. No deaths occurred in the week ending October 30th from cholera.

WM. TIFFIN ILIFF, M.D.,
Medical Officer of Health.

The following replies from Health Officers were printed in the Return, No. 43, for the Week ending October 27th.

KENSINGTON.

25th October 1866.

1. The number of medical visitors for the past ten weeks has been three, with two qualified medical gentlemen to act under them, and not living in the houses of the medical visitors. Notting Hill Dispensary and Kensington Dispensary have also agreed to attend diarrhœa and cholera patients both day and night, for which they receive remuneration by the vestry; they are under my control.

2. In addition to this, several chemists' shops have been open where medicine can always be procured gratuitously both by day and by night, the whole medical staff being also in constant attendance.

3. Very large quantities of carbolic acid, both in liquid and in powder, are freely distributed at all the stations, where any one who applies can have it gratuitously. These measures are fully carried out by the sanitary staff.

4. Every house is visited as soon as a case is reported, and all the beds and linen disinfected and the place thoroughly cleansed and limewhited.

5. There has been no occasion to have the linen or beds destroyed, but the vestry have given me full power to do so if found necessary, and they will immediately replace them.

6. The mortality from cholera and diarrhœa has been low. In the few cases that happened, the houses were cleansed. No case of cholera was registered last week. I may add that all nuisances

requiring immediate removal have been executed at the expense of the authorities, that every mews has been by their direction regularly flushed, quantities of perchloride of iron thrown down the sewers, and chloride of lime down the gulleys.

FRANCIS GODRICH,
Medical Officer of Health.

CHELSEA.

As soon as the prevalence of diarrhœa and the occurrence of one or two decided cases of cholera indicated the presence of the epidemic in the parish, a staff of medical visitors, which had been previously organized under my direction, was set in motion to prosecute a daily house-to-house visitation. It seemed to me that the disease would be more effectually brought under control and more quickly checked by a large number of persons acting in concert and searching out its haunts, than by a smaller number occupied during a longer period and only visiting places known to be infected. Five superintending visitors and ten assistants were therefore employed, and worked under my direction so long as cases of cholera occurred.

At the same time nine dispensary stations were opened, and were placed in direct communication with the medical visitors.

After cholera had ceased in the district, the dispensaries were still kept open some weeks longer, and an engagement was entered into with the parochial medical officers to undertake any case sent to them from the dispensary stations, at the expense of the vestry.

Prior to the appointment of the visitors a staff of workmen was engaged, who were employed daily in cleansing privies, water butts, yards, and cellars, and, when necessary, limewashing both the outside and inside of the houses of the poor.

Three of these acted as foremen or sub-inspectors, one of whom had special charge of the cleansing of dustbins, a daily report on this subject being made separately by him to the sanitary committee. The latter officer and a gang of three men with their foreman are still employed.

In addition to their daily work a portion of this gang was employed, whenever a case of cholera occurred, to disinfect the whole interior of the house; and by them all bedding and clothing likely to be infected by the discharges was destroyed, under the orders of the medical visitors and the superintendence of the chief inspector. The articles destroyed, or their value in money, was in every case made good by the vestry.

I believe that the effect of these precautionary measures has been fully appreciated in the parish, and it is gratifying to be able to report that we are at this date entirely free from the epidemic.

The two chief rules adopted, which differed I believe from those practised in many other parts of the metropolis, were: 1. That the assistants should make inquiries as to the presence of diarrhœa in every one of a list of streets, courts, and alleys furnished to them by me, once daily. 2. That the dispensers should give only one dose of an astringent to patients personally applying, and then send them on to the visitor, furnishing him also with a list of the names for further inquiry.

A. W. BARCLAY, M.D.,
Medical Officer of Health.

ST. GEORGE HANOVER-SQUARE.

October 27th, 1866.

The fruit hawker, whose death at St. George's Hospital from cholera was registered 30th September, came from 31 Dudley-street, Soho; he was taken ill in Piccadilly in the afternoon.

During four weeks, ending 20th October, only five deaths occurred from diarrhœa in the parish of St. George Hanover-square, the same number as in the corresponding period of last year.

C. J. B. ALDIS, M.D., M.A., F.R.C.P.,
Medical Officer of Health.

WESTMINSTER.

October 26th, 1866.

1. There are three medical visitors and three inspectors of nuisances in my district under my control.

2. Notices are issued all over the parishes that medicines and attendance are furnished gratuitously by the medical visitors' dispensary and hospital.

3. The free use of Condy's disinfectant and carbolic acid.

4. Every house is immediately visited, and the disinfection, &c. is carried out by the district inspector under medical supervision.

5. The linen and beds are either immediately replaced with others or are paid for by the Diseases Prevention Committee.

B. HOLT,
Medical Officer of Health.

Marylebone.

October 22*d*, 1866.

1. Eight medical visitors have been appointed by the health committee to take charge of cholera cases in this parish, but from the paucity of cases their services have not yet been called into active requisition ; most of them, however, have attended cases of diarrhœa.

Such cholera cases as have occurred have been attended—1stly, by private practitioners; 2dly, by the parochial medical officers, of whom there are five ; 3dly, in the iron cholera hospital in Capland-street ; and, 4thly, at the Middlesex Hospital.

There are four inspectors of nuisances, two of whom are only temporarily employed. These officers are under my control.

2. In each of the six districts of the parish a dispensary for the gratuitous treatment of diarrhœa cases was appointed. These remained in operation from the 4th of August to the 6th of the present month, when, in consequence of the great decline of the disease, they were closed by order of the health committee. Upwards of 7000 cases of diarrhœa were treated in this way, and in one instance only, as far as I was able to ascertain, did the disease run on to cholera.

3. The dejections of cholera patients are disinfected by carbolic acid, which is gratuitously supplied to and freely used in all houses where cholera is known to exist.

4. Every house in which it is known that there is or has been a patient suffering from cholera is visited, and its sanitary condition carefully inspected. All the walls, ceilings, &c. are thoroughly cleansed and whitewashed by parish workmen, in accordance with my recommendations, and under the personal superintendence of one of the inspectors of nuisances. All linen, &c. is disinfected by being immersed first in boiling water, and afterwards in a solution of carbolic acid or chloride of lime ; beds, bolsters, and woollen fabrics are destroyed by fire.

5. All linen, bedding, &c. destroyed by my order is either replaced or paid for at its full value by the vestry.

6. Two deaths occurred last week in the front kitchen of a house No. 14, Suffolk-place, Lissongrove, in which a man, his wife, and three young children lived. The place was filthy dirty, and too small for the number of inmates. Suffolk-place forms part of a densely populated district inhabited by the poorest and most destitute classes in the parish. The habits of a large proportion of them are very dirty and depraved, and it requires the most unceasing vigilance to keep their rooms, closets, yards. &c. in anything like a proper sanitary state.

J. Whitmore, M.D.,
Medical Officer of Health.

Pancras.

October 23*d*, 1866.

1. There are six medical visitors and four nuisance inspectors in St. Pancras, all acting under my direction.

2. A number of dispensaries have been opened, 24 in number, where persons suffering from diarrhœa can at once obtain medicine, or an order to see one of the medical visitors.

3. Where cholera or choleraic diarrhœa is known to exist, the friends of the patients are supplied with M'Dougal's powder, and instructions how to use it. A man is employed to disinfect and flush the closets and sinks, and to clean out the water butts when necessary. The main sewer of any street or place in which cholera prevails is specially flushed and disinfected with carbolic acid.

4. Every house in which a cholera patient is attacked is visited, and the disinfection of beds and linen is carried out by my directions, under inspections of one of the sanitary officers. When beds are soiled, they are burnt by one of the inspectors of nuisances.

5. The linen and beds destroyed are replaced by the Vestry, so soon as it is safe to do so without the risk of fresh infection.

6. Of the deaths that occurred in St. Pancras last week, 3 were from badly drained houses, and one was from a kitchen unfit for occupation. In every case the drainage will be set to rights as soon as it is prudent to disturb the old drains ; in the meantime the drains will be daily disinfected with materials supplied by the Vestry. Owing to the extreme difficulty in finding lodgings for the poor, it is impossible to enforce all the requirements of the sanitary Acts as regards underground kitchens and overcrowding. So far as practicable, the requirements are enforced. Many of the cases of cholera have been brought on by intemperance, and a considerable number by unwholesome food.

Thomas Hillier, M.D.,
Medical Officer of Health.

Hampstead.

October 20*th*, 1866.

1. Two additional inspectors of nuisances have been appointed in this parish, but no medical visitor, as no cholera has arisen in this parish.

2. Placards have been issued, stating where any suffering from diarrhœa may promptly apply. This facility is in addition to the ordinary aid given by parish and club doctors and by the dispensary.

3. Carbolic acid, M'Dougal's disinfecting powder, and Condy's solution.

4. Only three cases of cholera appear to have ended fatally in the parish; they were all imported. In each instance disinfectants, and burning contaminated bedding and linen, were properly adopted.

5. See above for this parish.

6. Hitherto no case has occurred among a class of society requiring such aid; but should it arise, the authorities in Hampstead will fully meet the demand. Those who have hitherto had the epidemic cholera have resided in very healthy situations, and been surrounded with all the supplies which hygienic care could desire.

CHARLES F. J. LORD,
Medical Officer of Health.

ISLINGTON.

Measures adopted in regard to recent Cholera cases.

12. Alma-terrace. Woman taken ill on October 15th; visited the same evening by medical visitor who induced her to go to hospital, and used M'Dougal's powder about room and premises, and closed the room. On the next morning, bedding and soiled carpet disinfected with carbolic acid, and burned; other articles on and about bed soaked in Burnett's fluid, and left to be washed. House clean and tidy. Floor of room soaked with carbolic acid. Privy and drains of this and adjoining houses disinfected with carbolic acid. Water receptacle cleansed by our own men, and disinfected with lime. [This death was recorded in Supplement to Weekly Return, No. 42.] House-to-house visitation daily for some days. No fresh case.

16. Albert-terrace, Queen's-road. Case discovered by our medical visitor on October 15th. He sent patient to hospital, and brought me the key of room. Visited house the same day, and saw soiled flock bed damaged with carbolic acid, and it was burned in the evening. Other articles disinfected with Burnett's fluid. House had recently been cleansed and repaired under directions from our office. Privies of this and adjoining houses disinfected with carbolic acid. House-to-house visitation. No fresh case.

EDWARD BALLARD, M.D.,
Medical Officer of Health.

HACKNEY.

October 22d, 1866.

1. There are five medical visitors, to be reduced to three this day. There are also one chief sanitary inspector, partly under my control, and four sub-inspectors entirely under my control. One sub-inspector is chiefly employed in disinfecting the clothing and bedding of cholera patients, and the houses in which they lived; attending to their removal to hospitals, and burning the beds, pillows, and mattrasses.

2. Medicines and attendance can be had gratuitously at several surgeons' houses; and the localities in which cholera has appeared are frequently inspected by inspectors and members of cholera committees.

3. The use of Burnett's fluid. Bottles of Burnett's fluid are supplied gratuitously to the poor for this purpose.

4. Every house in which a cholera case occurs is inspected immediately a return is made to me; the house is thoroughly disinfected with the London Sanitary Company's disinfecting powder; Condy's fluid used in the sick room; the linen and other clothes disinfected by the district officer, and the beds and pillows burned. The closets and drains of the adjacent houses are also generally disinfected with carbolic acid.

5. The value of the property destroyed is paid to the owners at the time. The property is valued, and the valuation ticket brought to me, and I pay the amount out of money which the sanitary committee have placed at my disposal for that purpose. New beds can therefore be bought by the owners without delay.

6. Two deaths occurred in one house in Castle-street, which was about to be closed, and in which the occupier had some stinking rabbit skins.

JOHN W. TRIPE, M.D.,
Medical Officer of Health.

HOLBORN.

October 22d, 1866.

1. We have had four medical visitors and three inspectors at work in this district, but some three weeks since reduced the number to two medical visitors and two inspectors. They act under me.

2. In addition to the dispensaries of the four medical visitors, the Board of Guardians instructed their four medical officers to dispense diarrhœa medicine to all applicants.

3. Carbolic acid, in powder and solution, is supplied gratuitously at all the dispensaries, with directions for use.

4. Every house is at once visited, and no one is allowed access to the chamber in which a death or removal from cholera has taken place until every article of bedding, clothing, &c. has been immersed in a mixture of boiling water and carbolic acid, by men in the employ of the Board, under my

personal supervision. I attach the greatest importance to this measure, and I may say we have never had a second case in the same house.

5. The beds, if made of flock or straw, are subsequently burnt, the loss being recouped to the owner. Linen and feathers are washed and purified, and restored to the owners.

6. As to Vine-street, where many cases of cholera have occurred, I wrote as follows to my Board last week:—"Fortunately the disease has been pretty much confined to Vine-street, which is a "wretched 'cul de sac,' having several populous courts, as Lucy's-buildings, Cotterell-place, "Munday's-yard, Omer-place, and Bedford-court, communicating with it. In order to stay the "disease your committee caused, at my suggestion, a stand-pipe, connected with the New River "Company's main, to be erected, so that the inhabitants could supply themselves with uncon-"taminated water, whilst the old water receptacles were cleansed or disinfected, or replaced by new "ones."

At the house 15 Cross-street, Hatton-garden, where the wife of a wood carver, aged 27 years, died of cholera (30 hours), the water-butt was old and without cover, but the woman was in very needy circumstances, having an invalid husband and two children to support, and went daily to an infected part of Clerkenwell. She was seized whilst washing, but I have no proof that the clothing was infected.

35, Baldwin's-gardens, where a death occurred on 14th October, is, with exception of dirt, in good state. Patient seized after a Saturday night supper off mussels and gin; kept a shell-fish stall in Great Ormond-street.

SEPTIMUS GIBBON, M.D.,
Medical Officer of Health.

CLERKENWELL.

October 22d, 1866.

1. Four medical visitors, besides myself, with the full power acquired by the Orders in Council dated 21st July 1866. Two nuisance inspectors, partly engaged in superintending the scavengering and watering of the roads. They are subject to my control.

2. The appointment of five stations, where remedies may be obtained at any hour of the day or night.

3. The gratuitous supply of disinfectants by the medical visitors, the inspectors, and at the vestry hall.

4. The disinfection of beds, &c. is not carried out under inspection; the destruction by burning is so. The houses where deaths have occurred are visited repeatedly until sanitary defects are remedied, and until all sickness has disappeared.

5. The commoner articles of bedding, &c. are at once supplied, being kept in stock; the more expensive ones are supplied with as little delay as possible, within a day or two.

J. W. GRIFFITH, M.D.,
Medical Officer of Health.

BETHNAL GREEN.

October 22d, 1866.

1. We have now only one medical visitor, and three nuisance inspectors. They are all under my control.

2. We have closed our open dispensaries, and patients are referred to the district medical officers.

3. We have ceased to employ a staff of disinfectors; but where cholera is known to exist disinfectants and directions are given for the chemical destruction of dejections, &c.

4. All houses where the disease has shown itself are visited; and beds, linen, &c. are disinfected under inspection.

5. Beds and linen destroyed are replaced by the authorities.

THOMAS SARVIS, M.D.,
Medical Officer of Health.

WHITECHAPEL.

October 21st, 1866.

We have now only one medical visitor and four inspectors of nuisances. They are entirely under my control.

Not only are the houses where cholera deaths have occurred visited, but every house in which fever cases are reported by the medical officers of the union to exist are likewise visited, and in every instance notice is served upon the landlord to limewash the room if the patient die, or is removed to the workhouse or hospital.

JOHN LIDDLE,
Medical Officer of Health.

St. George-in-the-East.

October 22d, 1866.

1. At present we possess one very efficient sanitary inspector, and associated with him during the late epidemic were an assistant and four others for flushing and disinfecting sewers and gutters, and washing and limewhiting the courts and alleys. The clergy and members of their congregation undertook the visiting, and their services have been discontinued.

2. Four Poor Law medical officers attend to the medical wants of the parish.

3. Each medical visitor was furnished with chloride of zinc, and distributed by him for washing out utensils and closets.

4. Yes. The beds, bedding, and very frequently the clothing of the patient are removed by two of the parish officers, and consumed in a furnace (made for the express purpose).

5. Yes.

6. The last death that occurred was the son of a poor widow in the receipt of parish relief, and the room was very dirty. There was an insufficient supply of water to the house.

J. J. Rygate, M.B.,
Acting Medical Officer of Health.

Mile End Old Town.

October 20th, 1866.

1st. Owing to the cessation of the epidemic the medical visitors were discontinued on the 6th October.

2d. There is one permanent inspector of nuisances, and five sub-inspectors were appointed at the outbreak of cholera to make a house-to-house visitation of the hamlet, and report thereon. These officers are not under my control.

3d. Disinfectants are supplied free at all hours at the vestry hall; this fact has been freely advertised, as also recommendations and instructions for use.

4th. I personally visit every house, upon receiving information of the presence of cholera, and the necessary sanitary measures are adopted forthwith.

5th. Every infected article of bedding, linen, or wearing apparel is destroyed forthwith, under supervision of inspector of nuisances; the articles are immediately replaced or money value given by the authorities.

As early information is of importance, I think the district registrar should inform the medical officer of health of any death from cholera as soon as it comes to his knowledge, otherwise much time is lost.

M. Corner,
Acting Medical Officer of Health.

St. Olave Southwark.

October 27th, 1866.

Two medical visitors were appointed on the first appearance of cholera; but as the number of cases has been small, they have not been called upon to act. A plan was adopted for obtaining from each of the medical practitioners in the district a daily return of every case of cholera or diarrhœa which occurred in his practice. A very close supervision of the district is kept up by myself and the inspector.

Three places were appointed where medicine might be obtained day and night for the treatment of diarrhœa; and although it has almost disappeared from the district the arrangement still continues in force.

Every house in which a case of cholera occurs is visited; the room occupied by the patient, with the watercloset, dustbin, drain, and yard are freely treated with chloride or carbolate of lime. In case death takes place the body is removed as speedily as possible to the dead house, the coffin is filled up with sawdust well saturated with carbolic acid. In nearly every instance the infected beds and clothing have been soaked with carbolic acid, and afterwards burnt. All articles destroyed are immediately paid for by the authorities. The room in which death occurs is fumigated with chlorine; after being closed for some hours it is well ventilated, and thoroughly cleansed and lime-washed.

The general measures adopted throughout the district consist of flushing the sewers, and washing all the courts twice or three times a week with water mixed with some disinfectant, emptying the public dustbins, and sweeping the poorer streets every other day, lime-washing the courts and alleys, watering the streets with water to which carbolic acid is added, cleansing and disinfecting all the urinals and gulleys daily. Extra men are employed whose whole duty is to visit regularly every house in the poorer localities, to supply disinfectants for use, and to apply some to the waterclosets, drains, and dustbins. Especial attention is also given to the condition of all water receptacles. These measures still continue to be carried on.

During the week ending to-day three deaths from cholera have occurred in one family; they were amongst the children of a labourer living at No. 47 Fair-street. They were aged 4, 7, and 11 years respectively, and died within a few hours of each other at periods varying from 6 to 14 hours after seizure. The family consisted of a man, wife, and six children, and occupied one room at the top of the house, which on visiting I found tolerably clean, without any furniture

except two chairs and a table ; no bed or bedding of any kind. I understand the parents are of very drunken habits, the children were nearly half starved, pale, thin, and stunted in growth. On examining the waterbutts, which are in the yard close to the dustbin, I found two clean and a third dirty, with a number of maggots at the bottom. I was informed by some of the lodgers that the two butts then clean also contained a quantity of maggots the day before, but had just been cleansed. Two dogs were kept in the yard, and it appeared that some of their food had been thrown into the dustbin, where the maggots were generated, and had then found their way into the butts from which water was taken for drinking purposes.

J. Northcote Vinen, M.D.,
Medical Officer of Health.

Bermondsey.

The medical Officer of Health was prevented by illness from replying to the Registrar General's inquiries.

St. George Southwark.

1. Three qualified medical men were appointed as house-to-house visitors ; they were not in practice, hence their whole time was devoted to the work. It was their duty to give in daily returns of the number and sanitary state of the houses visited, the condition of the occupants, and to administer medicines to such as were suffering from diarrhœa, &c. They were under my control.

2. A dispensary was established in the centre of the district, which was kept open day and night ; any one who applied had suitable medicines given them ; also chloride of lime and carbolic acid for disinfecting purposes. This place was closed on the 12th inst. ; the number of applicants having so far decreased, it was considered not advisable to keep it open longer. Should, however, the necessity arise, the whole machinery can be set in operation immediately. The vestry are now trusting to their own inspectors, an additional one having been appointed previous to the breaking out of the cholera. I may perhaps be allowed to add here, that a committee was appointed, pursuant to the order of Her Majesty's Privy Council, to carry into execution, &c., to which the full powers of the vestry were given, so that upon any emergency they could meet and act. This committee still continues.

3. Disinfectants and directions were given to "disinfect or destroy the dejections of cholera patients."

4. Every house was visited and disinfected, under the inspectors' and my own supervision.

5. "The linen and beds destroyed" are replaced as soon as the room or rooms have been thoroughly cleansed.

6. The disease has attacked houses where the sanitary conditions have been good, and where they have been bad ; where the occupants have been healthy or ailing, well-fed or ill-fed ; where great care has been taken, and where no care has been taken. The only imperfection invariably met with has been in reference to the water, as regards either its supply or receptacle. Nevertheless, I do not wish the inference to be made that I think this is the sole cause of the attack.

Henry Bateson, M.D.,
Medical Officer of Health.

Putney and Roehampton.

1 and 2. One sanitary inspector, in addition to the ordinary staff, has been appointed for a short period, to assist in discovering and reporting on nuisances, but no special arrangements at present exist to secure the early treatment of diarrhœa, the services of the medical visitors having been for some weeks past dispensed with by the local authorities.

3 and 4. Under my personal superintendence, disinfectants have been freely employed in all cases of choleraic disease requiring the same, and all affected localities have been constantly visited and supervised by myself and the very active and intelligent inspector.

5. In the single case of cholera that has occurred in this parish, the linen and bedding destroyed after the death of the patient by my directions was replaced by the authorities, or their value allowed.

6. The only general remark I desire to make is, that the removal of admitted nuisances is here, as I believe it is in most parishes throughout the metropolis, much too slow a process to meet the requirements of either the Order in Council or the Sanitary Act of 1866. What appears to be required is, more security that nuisances prejudicial to health, and calculated to engender and propagate disease, shall not recur through a too careless and incomplete fulfilment of the object sought to be obtained. A make-shift measure of sanitation is much oftener an aggravant of the evil complained of than a remedy for that evil, and this, I believe, is the experience of every health officer in the kingdom.

The thorough inspection which the sub-district is undergoing cannot fail to be productive of the greatest good. The authorities, I am pleased to add, have been liberal in both their supply

of disinfectants, &c. to the poor and in meeting the expenses consequent upon the exertions of their officers.

The public health of the parish continues favourable, and diarrhœa has almost ceased in the neighbourhood.

R. Harland Whiteman,
Medical Officer of Health.

Camberwell.

October 19*th*, 1866.

1. We had had up to the time of the outbreak of cholera two inspectors of nuisances. At the time of the outbreak two men were appointed; we have now therefore four. It has recently been determined that the services of the 4 inspectors shall be retained for at least another twelve months.

We have not at the present time any medical visitation going on. As soon as possible after the receipt of the Order in Council we nominated 9 medical men to act, in case of need, as medical visitors. But we only have had (subsequently to their nomination) one epidemic appearance of cholera in the parish; this was in Stockwell Street. Immediately on the appearance of the disease the medical visitor of the district in which Stockwell Street is was instructed to assume active duties, and an assistant medical visitor was associated with him. Thirteen deaths from cholera occurred in this district, and rather more than a fortnight after the last deaths the medical visitor's services were suspended. All nuisance-inspectors, &c. are under my control.

2. Nine dispensaries (with one exception, the surgeries of the gentlemen nominated as medical visitors,) have been open for the gratuitous supply of medicines. Bills have been distributed about the parish both to inform parishioners of this fact, and to suggest precautions against cholera.

3. Carbolic acid and chloride of lime are supplied gratuitously at the dispensaries; and in all cases when cholera is known to be in existence disinfectants are at once provided by one of the inspectors.

4. Every house in which a cholera patient is attacked is visited; and in nearly every case the bedding has been destroyed. Disinfection of bedding and destruction of bedding is done by or under the eye of the inspector.

5. Everything thus destroyed has been at once replaced by the authorities.

6. There was only one death from cholera registered in the week ending Saturday October 12th. The street in which the death occurred was only sewered about three months ago, and but few of the houses are yet connected with it. The house in which the fatal case occurred was not sewered. Water is supplied by one of the companies. I believe there have been no deaths from cholera during the week ending this day (Saturday 19th).

J. S. Bristowe, M.D.,
Medical Officer of Health.

Charlton.

(*See also* pp. 201–205.) *October* 24*th*, 1866.

1. A medical visitor and an active inspector are appointed, both under my supervision.

2. A handbill has been printed, and circulated freely throughout the parish, advising the inhabitants as to the precautionary measures to be employed in warding off an attack of diarrhœa, and giving instructions as to the best measures to be adopted in arresting the first symptoms should diarrhœa occur. Depôts of medicine, suitable for diarrhœa, have been established in different parts of the parish, with a placard where it may be obtained. A letter has been addressed by the Clerk of the Board, Mr. C. A. Smith, to all the medical practitioners in the district, requesting them to give the earliest intimation of the existence of cholera or unusual diarrhœa.

3. The disinfectants which I have chiefly employed have been carbolic acid for drains, sewers, &c., and chloride of lime for articles of clothing, bedding, &c., which have been supplied gratuitously, and freely used by the inspector wherever occasion requires.

4. Up to this date the few cases which have occurred in our parish have been promptly treated. The houses have been immediately visited and effectually disinfected, and the bedding, if soiled, has been immediately burnt by the inspector.

5. All articles that have been destroyed by the authorities have been immediately replaced.

6. No deaths from diarrhœa or cholera have occurred in this parish since October 5th.

Robert Finch, M.D.,
Medical Officer of Health.

Lewisham and Sydenham.

October 21*st*, 1866.

Upon the first appearance of diarrhœa in this district six medical visitors were appointed to hold office for two months; one for so much of Blackheath as is contained in Lewisham parish, one for Lewisham village, one for Forest hill, one for Upper Sydenham, one for Lower Sydenham and the village of Southend, one for the hamlet of Penge.

During this period all the houses in the district inhabited by the poorer classes were inspected (in some instances several times), and a moiety of them reported upon daily to the medical officer of health, who gave written directions upon each item contained in these reports. Between 2,000 and 3,000 houses were thus visited, and orders made relative to them.

The two nuisance inspectors were (and are now) engaged in seeing these orders attended to. An additional clerk was also appointed to assist in tabulating these reports, and take any necessary action upon them. The medical officers appointments have now lapsed for the past fortnight, power, however, being given to the medical officer to reappoint any or all of hem, without previous application to the Board, in case of necessity.

The shops of all the chemists in the district (who would accept the appointments) were thrown open to the public for the gratuitous supply of medicines and disinfectants, each one being supplied with formulæ by the medical officer of health.

Any case of cholera or diarrhœa was immediately attended to by the medical visitor, whose prescriptions were dispensed at the chemists' establishments.

In all cases of epidemic disease the directions given were, that a vessel containing Burnett's Disinfecting Fluid mixed with water should be placed in readiness outside the house into which all infected articles of clothing should be placed, immediately after removal from the patient.

Carbolate of lime was supplied to be placed in the vessels used for the reception of the dejections of patients suffering from disease.

Infected articles of wearing apparel, beds, &c. were burnt under the inspection of the inspectors of nuisances. A small kiln was erected upon a piece of land adjoining the cemetery for that purpose.

The Board of Works hold themselves responsible for articles of wearing apparel thus destroyed, the few cases of cholera not having been deemed sufficient to warrant the expense required for erection of works for disinfecting linen, &c.

One death from choleraic diarrhœa was reported last week; this occurred in an isolated house which was in a bad hygienic condition, and to which the only supply of water easily obtainable was from a pond.

F. E. Wilkinson, M.D., L.R.C.P., and M.R.C.S., &c.,
Medical Officer of Health.

The following replies from Health Officers were printed in the Return, No. 44, for the Week ending November 3d.

St. George Hanover-square.

November 3d, 1866.

In answer to circular of the 20th October, I beg to state that the reply given by Dr. Aldis continues applicable to the present time, so far as the first five questions are concerned. I may add, however, that the additional nuisance inspectors are employed, in *all* cases of zymotic disease, to disinfect the sinks, closets, &c., and to supply the inmates with carbolic acid for destroying the dejections of the sick. For if this measure be useful in cholera, it may be useful also in whooping-cough, scarlet fever, and typhoid, and the vapour of carbolic acid may have some destructive force over these miasms.

In answer to question 6, I beg to give the following particulars as to a case of cholera reported in Weekly Return No. 42. as follows:—

St. George Hanover-square; *Hanover-square.* — 8 Hereford-street, Park-lane, 15th October, charwoman, about 56 years, Asiatic cholera.

This woman was brought to the Workhouse, Mount-street, late in the evening of the 13th by a chemist, who had been in attendance, and who came beforehand, and assured the master that she had a *fit*, and had not cholera nor any other contagious disease. So soon as she arrived, Dr. W. Bloxam was sent for, and found her deep in the collapse of cholera. The street cab in which she had been brought was therefore well drenched with carbolic acid, and the poor woman removed to the cholera hospital, where she lingered till the 15th. The house in Old Bond-street, whence she was brought, was found to have a very filthy and dilapidated watercloset in the back kitchen, the stench of which, in the opinion of the inspector of nuisances, was enough to poison any one.

This house, like every other, had been visited by one of the inspectors; but as their instructions were, not to enter any apartment unless invited by the householder, this nuisance had not been discovered.

In this parish there is some difficulty in getting intelligence of cases of cholera, if the patient be not driven by necessity to seek parochial aid.

R. Druitt.

Hackney.

1. There are three medical visitors, four nuisance inspectors entirely under my control, and one partially so.
2. Persons attacked with diarrhœa can have medicines and attendance at any hour on application to the medical officers appointed by the Board of Works.
3. Burnett's fluid is given to the friends of persons suffering from cholera, to disinfect the dejections.
4. Every house in which a cholera case occurs is visited immediately, and disinfectants freely used by the inspector; the premises ventilated, if the ventilation is bad, and all means deemed advisable for preventing the spread of the disease. This plan has been adopted from the first with the best results, and one inspector devotes his whole time, or nearly so, to these duties.
5. The linen and beds destroyed are paid for by the authorities on the day they are destroyed.
6. Nothing special to remark as to the hygienic state of the houses in which cholera occurred last week.

John W. Tripe, M.D.,
Medical Officer of Health.

Holborn.

Measures adopted in regard to recent cholera cases.

The daughter of a cigar-maker (a Belgian), 9 yrs., "cholera (21 hours)," died 1st November at 10 Green-street. This girl was seized whilst at school, where the sanitary arrangements are not good; but there had been no previous case of cholera. It was the national school belonging to Trinity district parish. The girl was sent home at 11 A.M., 31st October. The parochial surgeon saw her at once, and was unremitting in his attendance up to the time of her death, at 8 A.M. the following morning.

Her twin brother, 9 years, was seized in the same school at 4 o'clock P.M. same day, and died at 10 Green-street the same night at 11 o'clock.

The house where these children resided is in clean and fair sanitary condition, but there is an old and partly disused sewer running close at the back of it, in the rear of Great James street, which the sanitary authority is unable to destroy, because three houses in Green-street claim a right to drain into it.

The water cistern (leaden) is placed at the side of the closet, and is imperfectly covered by tiles, so that the droppings of several pigeons, which this Belgian family kept, could find their way into it.

The only clue to the infection of these children which I can attach any credit to is the father's illness. He, occupied as a cigar-maker in Cannon-street, has been confined to the house for 8 days with "obstinate vomiting" and "partial obstruction of the bowels." He was of intemperate habits, and the medical attendant attributed these symptoms to "gastritis." Enemata, both nutritive and purgative, were frequently given, and *no disinfectants were used.* In the absence of any other source of infection I am inclined to assume that this man's illness was of a choleraic nature, or that the children actually drank from some vessel contaminated with (may be decomposing) fæcal matter. The man at present has all the symptoms of the fever which follows on attack of cholera.

The room, bedding, clothing, &c. in which these children died were at once disinfected with carbolic acid. The corpses were removed for interment, after disinfection, within 12 hours after death. After immersion in a solution of boiling water and carbolic acid, the sheets, blankets, &c. were sent to be washed and the beds to be burned. The sick father was removed into an adjoining room, and his evacuations were directed to be disinfected, which can only be done effectually by one who understands the nature and action of the agent employed.

Septimus Gibbon, M.D.,
Medical Officer of Health.

St. George-in-the East, Middlesex.

Questions 1, 2, 3. Nothing to be added to last week's answers.

4. We have always recommended or enforced the speedy burial or removal of the body to the deadhouse, so that in many cases the body has been removed the same day, and in the cases of more well-to-do people the body has rarely, if ever, been unburied on the third day, and then lime and sawdust have been placed in the coffin, which was properly screwed down. The rarity of such a delayed interment makes me thus well acquainted with such particulars.

5. Linen and beds destroyed are replaced by the authorities almost invariably within 24 hours.

6. As to the case at 12 Knight's-court, on 24th October, w. of lighterman, 56 years, cholera (6 days), the house was quite clean; there was no trap to sink, nor dustbin, nor water to closet.

As to the case at 4½ Green-bank, the house is next door to the dustyard and lay-stall, the subject of complaint before the magistrate three times since September 1865.

On the two first occasions orders were obtained to abate the nuisance, and on the last an order to prohibit the recurrence of it was granted. This last order was appealed against last Saturday at

the Quarter Sessions at Westminster, and the magistrate's order confirmed, subject to a case being stated for the opinion of the Court of Queen's Bench upon a point of law raised by the appellant.

J. J. Rygate, M.B.,
Acting Medical Officer of Health.

Limehouse.

October 27th, 1866.

1. The medical visitors and nuisance inspectors, 12 in number, are now all dismissed, it not being deemed necessary to maintain the hospital and extra staff of officers, in consequence of the very slight and occasional appearance of cholera and diarrhœa in this district.
2. The treatment of the epidemic, so far as the poor are concerned, is now under the medical officers of the Stepney Union.
3. Orders have been given to the medical officers of the union by their board, to inform me of all cases where disinfecting, &c. are necessary, when an officer under my directions will see to the necessary steps being carried out.
4. All houses where cholera, &c. are found fall under prompt inspection.
5. The disinfection of beds, and the destruction of beds and linen, have been liberally effected; the same has been as quickly replaced. Nearly 300*l.* have been expended on this item alone since July.
6. I beg emphatically to say that, apart from the exceptional cases, the great bulk of the cholera deaths and those from diarrhœa have from the first followed in the train of the fever haunts; that the cholera field and the fever field are convertible terms when the former becomes epidemic. This is principally owing to the gross defects of the Building Act, which permits houses to be built over any filth, the flooring commonly resting on the earth, and the pestilential emanations from which in a multitude of cases have largely contributed to the desolation of families by cholera, and at other times by fever. I am speaking not of this alone, but neighbouring districts equally, or still worse affected in regard to this point in the localization of disease.

Thomas Orton.

Mile End Old Town.

Since my last communication 4 deaths have occurred in the hamlet, one at 23 Calverly-street, 2 at 27 James'-street, and one at 95 West street. I immediately visited the cases and houses. All infected articles of bedding and clothing were instantly destroyed under supervision of inspector of nuisances; the houses were all thoroughly cleansed, purified, and disinfected.

A death had previously occurred in the same house in Calverly-street, but both cases began simultaneously. The last death was in West-street on the 31st October. No other cases have since occurred in any of these houses, nor I believe in their locality, although the houses were occupied by large and poor families.

At 27 James'-street, I directed the removal of the occupants until the necessary sanitary measures were completed.

M. Corner, M.D.,
Medical Officer of Health.

Bow.

October 29th, 1866.

The special arrangements made in this district during the recent epidemic are now terminated, but that careful inquiries are made in all fatal cases of diarrhœa, &c., and the necessary measures for disinfection, destruction of bedding, &c. are carried out when required.

W. T. G. Woodforde, M.D.,
Medical Officer of Health.

St. Olave's Southwark.

November 3d, 1866.

I beg to state, that during the week no fresh case of cholera has occurred in the district.

The hygienic measures adopted at the commencement of the epidemic, which were detailed in my return of the 27th ult., are still carried on with very slight diminution.

J. Northcote Vinen, M.D.,
Medical Officer of Health.

Bermondsey.

As soon as possible after the Order in Council was published the vestry elected a special sanitary committee to meet daily, or as often as necessary. The committee appointed two extra inspectors

of nuisances, and directed their medical officers of health to open a dispensary in a central position. They also sanctioned the immediate appointment of four medical visitors by the medical officer of health, a dispenser, and an assistant medical visitor to assist the medical officer of health, to assist the dispenser at night, and to attend to urgent cases at all times. The medical visitors were experienced medical practitioners; the others were advanced medical students. The medical staff was under the control of the medical officer of health; the inspectors of nuisances were not.

The early treatment of diarrhœa was secured by a house-to-house visitation by the medical visitors, and by the free administration of medicine to all applicants at the dispensary. The dispensary and the appointment of medical visitors were made public by large placards, which were also sent to every factory in the parish. About 15,000 handbills were distributed from door to door, containing the usual sanitary warnings in respect to nuisances, food, water, &c. &c.

The medical visitors each received a copy of the Order in Council, with an explanatory letter from the vestry clerk. They were empowered to employ nurses when necessary, at such remuneration as they might think proper, reporting the name of the nurse and amount of remuneration to the medical officer of health. They were likewise empowered to disinfect and destroy articles of clothing, and from the dispensary disinfectants were furnished for the dejections of cholera patients. The principal agent used was carbolic acid.

In most instances the disinfection of bedding was carried out under the personal superintendence of the medical officer of health; sheeting, pillows, and flock bedding were destroyed by burning. Wet articles disinfected by carbolic acid, blankets by boiling water, and the room and furniture by sulphurous acid.

All articles destroyed were replaced by the parish authorities, or the value given in money by the vestry.

The extra medical staff are dismissed. The poor law medical officers will be remunerated for immediate attendance on any cases they may be called to attend. In the event of an outbreak of cholera the arrangements above described could be renewed at a very short notice.

I should add that the vestry, after the gullies had been properly trapped by the water carts, employed labourers to disinfect them, and all urinals and waste places, with a composition of lime and carbolic acid. The yards, closets, and dust bins were also in some neighbourhoods disinfected, and the small streets and courts watered with carbolic acid.

Wm. Parker, M.D.,
Medical Officer of Health.

Newington.

November 3d, 1866.

The extra services of the four district surgeons terminated October 31, but medicine for diarrhœa may still be obtained at the workhouse dispensary and without an order. The visitation of the houses in the parish continues; about 11,250 have been inspected, leaving 1,330 to be seen.

I enclose a copy of the notice sent the next day to the visit, wherever sanitary work is required, the pen being drawn through those portions of the order which in each particular house may be unnecessary. Up to October 27th 7,441 orders have been made, included in 2,862 of the forms enclosed.

We have every reason to be satisfied with the result.

Wm. T. Iliff, M.D.,
Medical Officer of Health.

Lambeth.

October 26th, 1866.

Ten district medical officers were appointed for house-to-house visitation, and to supply medicines freely to cases of cholera and diarrhœa; a medical visitor was also appointed to assist one of the district medical officers, all of whom furnish daily returns of any cases of cholera or diarrhœa arising within their districts.

I have entirely under my control three inspectors of nuisances, in addition to three sub-inspectors who have been recently engaged by me for the purpose of more efficient house-to-house sanitary inspection.

I have also a qualified medical man temporarily to act wholly under my direction, who, as soon as possible after receiving information, visits every house where cholera occurs, and sees that disinfectants, gratuitously supplied, viz., MacDougal's powder and carbolic acid, are properly employed. He examines the bedding and clothing, and causes the bedding, if infected with the choleraic discharges, to be removed and burnt by one of the inspectors, and the clothing either disinfected or destroyed. Thirty-six lots of bedding have been burnt, and fresh bedding immediately supplied, in addition to which, articles of clothing directed to be destroyed are paid for by the authorities.

Limewhiting every room in which cholera occurs is speedily effected, and after death every corpse is removed as soon as possible to the dead-house previously to interment.

George Puckle, M.D.,
Medical Officer of Health.

Battersea.

November 3d, 1866.

1. Nine medical visitors and two inspectors of nuisances were appointed on the 1st August, the services of the medical visitors were discontinued on the 25th September; not under my control.
2. Notices were circulated throughout the district that advice and medicine could be had gratuitously by applying to the medical visitors. This privilege was withdrawn on the 25th September.
3. The medical visitors were empowered to employ whatever disinfectants they thought fit.
4. Every house in which a person is attacked is visited, and the disinfection of beds, linen, &c. carried out under inspection.
5. Linen and beds destroyed are replaced by the authorities.
6. The houses were generally unhealthy, from defective drainage, overcrowding, dirty habits, and pig keeping.

Wm. Connor, M.D.,
Medical Officer of Health.

Camberwell.

October 29th, 1866.

1st. That during the last week the gratuitous dispensing of medicines has been discontinued; that this course has been adopted simply because during the last few weeks the number of applicants for medicine has dwindled almost to nothing; but that the dispensaries and other arrangements for checking the spread of cholera are in abeyance only, and can be (in case of need) called into active work at a moment's notice.

2d. That, so far as I am aware, there has been only one fatal case of cholera in the parish registered during the week ending Saturday the 27th. The case was that of a child five years of age, who died on the 19th, at 1 Forster's-buildings, Neate-street. The case was returned as one of diarrhœa, but there is reason to believe that it was a genuine case of cholera, for a case of non-fatal cholera has since occurred in the same house. The house is in good condition, is efficiently drained, and has water laid on. The chief cause of complaint is the existence, within a few yards of the door, of an untrapped opening connected with one of the main sewers belonging to the Central Board of Works. The bedding, &c. were, as usual, destroyed under the eye of the inspector of nuisances.

J. S. Bristowe, M.D.,
Medical Officer of Health.

Note.—The following correction was subsequently received from Dr. Bristowe (*Weekly Return, No.* 48):—

November 20th, 1866.

Dr. Bristowe would like to correct a mis-statement in a communication of his published in the 44th Weekly Return. The untrapped sewer-opening, therein spoken of, belonged to one of the parochial sewers, and not to one of the sewers under the immediate control of the Central Board.

The following replies from Health Officers were printed in the Return, No. 45, for the Week ending November 10th.

Marylebone.

November 10th, 1866.

Within the last four days two deaths from cholera have occurred in the All Souls district of this parish, the duration of the disease in each case not exceeding 18 hours.

The first death was that of a woman aged 61 years, living in the third floor of a house in Bolsover-street. The sanitary condition of this house was found to be very good, but on careful inquiry—and indeed to get at facts inquiries must always be not only careful but searching—I found that the grandson of the deceased had two days previous to her death been brought to her room, where he now remains, from North Kent-place, Woolwich, where the father and brother of this child had just before died from cholera; and from the evidence which I was enabled to collect I have no doubt that the contagion was in this case brought from Woolwich.

In the second case, the evidence of the death being by infection from cholera excreta is very clear and striking. The victim in this case was a poor woman who resided in Upper Charlton-street, and who, one day before her attack, was engaged in washing the body linen of the first woman that died.

In both these cases the symptoms were well marked and defined, and both terminated, as I have already stated, in 18 hours.

The body in the latter case was removed immediately after death to the mortuary house, and the body linen, &c. properly disinfected under my personal superintendence.

I cannot conclude this brief report without appending to it my opinion, based upon personal observation, that sufficient care is not taken to prevent the spread of infection by means of infected clothes, bedding, &c.

J. Whitmore, M.D.,
Medical Officer of Health.

Islington.

November 12th, 1866.

Two deaths from cholera at 20 Packington-street will be returned this week ; namely, that of a commercial traveller and his wife. It is a well-ordered and tidy house, and the family in very comfortable circumstances. Such an event as two deaths within a few days in any house in Islington has not occurred since our arrangements were perfected, or since the first outbreak of the disease here; and on this account the circumstances of these two deaths are instructive. On the 2d of November the husband, in the prosecution of his business, went to the east end of London, and remained there the greater part of the day. It is not known what houses he visited nor yet what he ate or drank there. On the 3d he dined in the middle of the day at home off some veal, and in the evening was seized with vomiting. His friends, thinking that the veal had disagreed with him, gave him some brandy. At a later period diarrhœa came on, and when his medical man was sent for he found him collapsed, passing rice-water evacuations, and with suppressed urine. The man died on the 4th, after 26 hours illness. No information of this case or of the death was forwarded to me, and the first I learned of it was from the daily return on Wednesday evening. On the next morning early I called on the medical adviser, and sent an inspector to the house. The medical man told me that the soiled linen had been put into a solution of Condy's fluid, but the inspector found the bed, soiled with discharges, in the garden. The wife persisted in denying that her husband had died of cholera, and refused to allow the bed, which was a valuable feather bed, to be disinfected or destroyed, but brought it back into the house. In the evening, as her medical man failed to persuade her to allow its removal, I had her served with a notice under the 22d section of the Sanitary Act. This was on the 8th November, and on that day her husband was buried. She went to bed in a room at the top of the house, leaving the back parlour, in which her husband died, unoccupied. Shortly after she was attacked with diarrhœa, which became so severe that at 3·30 A.M. of the 9th she came down stairs, and could not be got up again. Accordingly she was taken into the front parlour, and laid upon a chair bedstead, where she died at 3·30 A.M. of the 10th, having been attended by a homœpathic practitioner. Up to this time even the sons would not believe that their father had died from cholera, but now they expressed great anxiety for the destruction of all the infected articles. Everthing likely to be contaminated was accordingly collected, and being previously soaked with carbolic acid was burned. The rooms have yet to be disinfected. I cannot help feeling that this second case might probably have been prevented had immediate information of the first been forwarded to me, and proper steps been adopted while the soiling of the infected articles was fresh, to destroy the virus or prevent the decomposition of the discharged matters.

Edward Ballard, M.D.,
Medical Officer of Health.

Hackney.

November 8th, 1866.

The services of the medical visitors have been discontinued since Saturday last, but will be again available if occasion should arise. Diarrhœa and cholera have ceased as an epidemic ; a few cases only of the former and none of the latter having occurred in this district during the last seven days; the total mortality of Hackney is below the average rate for the district.

There are still two extra inspectors and two sub-inspectors employed in this district in searching out and removing nuisances. The rooms of houses occupied as lodging-houses are being measured under the regulations issued in accordance with the provisions of the Sanitary Act; and other measures adopted for keeping the district in a good sanitary state.

John W. Tripe, M.D.,
Medical Officer of Health.

Holborn.

November 10th, 1866.

In consequence of having received no intelligence of any cases of cholera the Sanitary Committee resolved on the 1st instant to suspend the services of the medical visitors from the 3d instant. The four dispensaries of the parochial medical officers remain open for the gratuitous supply of advice and medicines to all applicants suffering from diarrhœa and cholera. The services of the medical visitors which have been of great value not only in arresting the disease in its incipient stage, but in furnishing this office with copious schedules of sanitary defects can, I am happy to say (in case of need) be called into active play at a moment's notice.

So far as I am aware no case of cholera, fatal or otherwise, has occurred in the district during the present week. In your daily return of deaths registered on the 7th instant, which I received

this morning, there was the following entry: "St. Bartholomew's Hospital, from 59 Hatton-garden, 6th November, coachsmith, 42 yrs., cholera, exhaustion (9 days)." On making inquiry I find that this man, who worked at Messrs. Laurie and Marner's manufactory, near King's Cross, was brought home with all the symptoms of cholera on the same day that his wife and family moved into this house, viz., on 27th ultimo. He was attended from the Farringdon Dispensary, and at once removed into the hospital. His daughter, aged 16, was also seized with cholera two or three days afterwards, but refused to go into the hospital. She has recovered. The house and water supply are in a good sanitary state. The usual method of disinfecting the house, bedding, clothing, &c. will be had recourse to without delay.

SEPTIMUS GIBBON, M.B. (Cantab.),
Medical Officer of Health.

ST. GEORGE-IN-THE-EAST.

November 12th, 1866.

Two fresh cases occurred in a house recently cleansed, but as speedily made unclean. The drainage unusually good.

In our last case the child had eaten sprats for tea three hours before being taken ill. I fear that I am right in thinking that the virulence is in an inverse ratio to the fewness of the attacks.

J. J. RYGATE, M.B.,
Acting Officer of Health.

MILE END OLD TOWN.

November 10th, 1866.

The preventive arrangements as regards cholera remain the same as at the time of my last communication. Since then there have been six fatal cases of cholera, two in the eastern and four in the western division of the hamlet; the circumstances attending the latter were somewhat remarkable, the deaths all occurred in the same street, but in different houses, with a mean distance apart of about 20 yards, two of the houses were on the west and two on the east side of the street; two of the cases were children about five years of age and two adults (male and female); the time of attack and death was almost simultaneous in three of the cases, the fourth about 12 hours later.

I investigated the circumstances of each case, but could not trace their origin to any visible surrounding conditions; in one instance there was certainly overcrowding in one room, and in another, fatal cases had occurred in the same house at the commencement of the epidemic, but it was thoroughly cleansed and purified afterwards. In these cases, as in most others, I have come to the conclusion that the virus of the disease is retained by and circulated through the medium of the sewers, escaping only at irregular intervals and places influenced by atmospheric conditions. Upon two or three days preceding these attacks there was a considerable increase in the temperature, increasing the evaporation of the contents of the sewers, and facilitating the escape of gases, and with them doubtless the cholera germ. Midway between the houses alluded to there is a sewer ventilator (all the houses but one being connected with the main drain, which passes down the middle of the street); the occupants of one of the houses complained of the bad smell arising from this grating near to his house. In two of the back yards each had an untrapped sink—they will be immediately trapped—through these the disease virus may have escaped.

My impression, resulting from and confirmed by much experience and investigation, is that the elements or germs of the disease are still lurking in the sewers, and only kept down by the density of the atmosphere, but I fear to be again brought forth into activity upon the return of propitious meteorological conditions. I have discussed this subject more fully in my report to the Health Committee of the Vestry of Mile End Old Town. Presuming my supposition to be true, it would be of the first importance that effective measures should be forthwith adopted with a view to the removal and destruction of the cholera matter as contained in the sewers; to attain this object I imagine the means most likely to succeed would be in repeated flushings of the sewers at short intervals all over the Metropolis, but especially in those districts where the sewage is not yet intercepted by the great level sewers; in conjunction with this the most powerful and effective disinfectants known should be thrown into the sewers. By these and other anticipatory measures, if adopted forthwith and continued, I believe we may prevent the otherwise, I fear, inevitable return of the disease. It is even now only kept in subjection by energetic action and vigilance.

In all the cases which have led to these remarks the necessary sanitary measures were at once adopted, the houses cleansed and disinfected, and infected articles destroyed by fire.

M. CORNER, M.D.,
Medical Officer of Health.

BERMONDSEY.

November 10th, 1866.

One death from cholera occurred during this week at 4 Russell-street. The house has been inspected, but no sanitary defect was noticed to which the illness could be attributed. Fever prevails in the locality. The bedtick and other articles were burned, blankets soaked in boiling water, and room fumigated with sulphurous acid under my personal superintendence.

WILLIAM PARKER, M.D.,
Medical Officer of Health.

St. George Southwark.

November 10*th*, 1866.

I have only to add to the statements made in my letter of 27th October, that since then the special sanitary committee have passed a resolution to open three chemists' shops, one in each sub-district, for the purpose of giving medicine to those who are in need, and who are suffering from diarrhœa and cholera.

As an illustration how cholera may be propagated, and the cause of its outbreak remain hidden, I may mention the following case which came under my own observation:—A woman, who a few days previously had come to reside in this district, was suddenly taken ill with cholera, and died. The soiled bed linen was placed in a heap in the yard previous to removal and destruction; this was stolen by some woman who had called to see the deceased. No trace of her, nor the fruits of her robbery, could be discovered, although made with all diligence.

Henry Bateson, M.D.,
Medical Officer of Health.

Whitechapel.

Dr. Liddle, Medical Health Officer, addressed the following letter to the Registrar General (*Weekly Return, No.* 46):—

November 19*th*, 1866.

Although no deaths from cholera were registered in London on Thursday last, we must not conclude that the disease has left us, and consequently that it is no longer necessary to continue our exertions in discovering and in mitigating the numerous causes of disease which are perpetually arising among the badly-housed and poor population in the East of London. It is true that much has been done by the exertions of the Vestries and District Boards, and by the indefatigable and praiseworthy labours of the several voluntary associations (headed for the most part by the clergy), in the various sub-districts of this part of the metropolis, in visiting the houses of the poor, and in administering the funds so kindly provided by the benevolent public for the relief of the needy and the afflicted; yet, from the fact that there have been registered in this district during the week ending on Saturday last, among a population of about 79,000, two deaths from cholera, it is still important that the daily return of deaths from cholera should continue to be published, so that the promptest measures for destroying the clothes and bedding of those who have died from this disease, and for disinfecting the rooms where deaths have occurred, may be still carried out.

The mode of proceeding which I have adopted in most of the cases where deaths from cholera have taken place has been (under the superintendence of a qualified medical practitioner) to apply immediately chloride of lime to the clothes and bedding which have been used, and forthwith remove them to the stoneyard, and burn them in a furnace which was erected for the purpose.

The room occupied by the deceased is then disinfected under medical superintendence in the following manner: on the floor of the room to be disinfected an iron pot containing Stockholm tar is placed, into which is thrust a red hot poker or a live coal, the door and windows having been previously closed. The smoke, which issues in large volumes, is speedily diffused over the room, and penetrates into every corner. If, therefore, the tarry compounds are capable of destroying the germs of cholera, this plan of applying them is probably the most effective of any hitherto employed.

St. George-in-the-East.

In reference to the death of a child from cholera, Dr. Rygate, Medical Officer of Health, writes (*Weekly Return, No.* 46):—

November 19*th*, 1866.

A child died in another parish in August, and the parents removed into St. George-in-the-East, bringing with them the bed upon which the child had died. They had been in their new abode about three weeks when cholera broke out down stairs, and the parent, a man, died, and the next day the brother of the above child died. The bed upon which the first child had died had been emptied and the tick washed and refilled with the same flock, and the second child continued to sleep upon this same bed until taken ill. In this parish we have been very active and liberal in our destruction of feathers, flock, bed-ticking, and clothing.

Mile End Old Town.

Dr. Corner, Medical Officer of Health, addressed the following letter to the Registrar General (*Weekly Return, No.* 47) :—

November 25th, 1866.

Two deaths from cholera have taken place during the past fortnight: in one case there were no apparent local causes; the house is in the main thoroughfare; the patient's age was 73. The other case, that of a male, 46 years of age, occurred next door to a house in which there was a death from cholera the week before, when 4 other fatal cases occurred in this street at the same time, and within a few yards of each other, as already reported. In the last case the only perceptible local cause was an untrapped sink at the back of the house, and communicating with the main drain passing down the centre of the street. The house was clean, and fairly built and ventilated; the surrounding neighboureood open and not densely populated. I must reiterate the opinion contained in my previous reports that the cholera poison is still lurking in a passive state in the sewers and other low places its favourite haunts, only waiting suitable meteorological conditions to again come forth into activity, probably more destructive than ever. This being the case, why are not the preventive measures most likely to succeed at once adopted, and especially in those districts where the sewage is not yet intercepted by the great level sewers, and which districts I have clearly defined in my report to the Health Committee of this hamlet as the true cholera field of the recent epidemic? I have suggested immediate, repeated, and simultaneous flushing of the sewers at many different points, with the use at the same time of the most powerful disinfectants. The necessary measures to be adopted in other places than sewers are sufficiently obvious.

Unless we can during the winter months succeed in removing or destroying the cholera poison, both precedent and reasoning justify the conclusion that the disease will again break out with a return of such weather-conditions as are favourable to its development. No fatal case has occurred in the hamlet since the 12th inst.

Camberwell.

Dr. Bristowe, Medical Officer of Health, writes in reference to four cases of cholera (see St. Olave Southwark and Camberwell) as follows (*Weekly Return, No.* 47) :—

November 23d, 1866.

A very serious and unfortunate outbreak of cholera has occurred in a house of a somewhat superior character, occupying an apparently salubrious situation. The facts of the case are as follows:—

A respectable man, a miller, deserted his wife and seven children five months ago, since which time they have resided at the above address in considerable poverty. On Saturday, November 10th, the youngest child, an infant 14 months old, was attacked with diarrhœa, but the diarrhœa seemed slight and did not alarm the mother, who consequently did not send for any medical man. The child went to bed with the mother, and in the morning was found dead. The cause of death being obscure, the Registrar, to whom the mother went on the Monday, directed her to go to the coroner's officer, through whom an inquest was arranged to be held on the following Friday (the 16th). On the Tuesday the mother was taken ill with diarrhœa, and on the Wednesday was sent by her medical man to Guy's Hospital; on the Thursday two of her children were also sent to the hospital. All three have since died there of cholera. On Thursday evening, for the first time, the facts of the case were brought under the cognizance of the sanitary officer of the vestry. On that evening the inspector removed the four children still living in the house to the workhouse, and partly that evening, partly in the course of the next day, had the premises thoroughly disinfected and cleansed, and the bedding and certain articles of dress destroyed. On the Friday evening the two elder children, who were called to give evidence at the inquest, were attacked with symptoms of cholera; one of these has had a severe attack of the disease, but both of them are, I believe, now doing well. Thus, out of a family of eight persons, six have had cholera, and four have died of it. I must add that the house is well drained, the drains are trapped, and the water supply is good. The house itself was not clean, but the uncleanliness was not more than may be explained by the poverty of the inmates. There had been no cholera or even diarrhœa in the immediate neighbourhood, nor has the disease hitherto shown any tendency to spread beyond that one house. I do not pretend to trace the origin of the disease in this house.

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4. Dr. Letheby on Disinfectants.

The Registrar General was favoured with the following observations on the practice of disinfection by Dr. Letheby, Health Officer of the City of London (*Weekly Return. No.* 47) :—

In accordance with your request, I have much pleasure in stating what are the processes of disinfection which I have found most effective in my experience as the Officer of Health for the city of London.

The several disinfectants which I have largely tested are the following :—

1. Chlorine gas.
2. Chloride of lime.
3. Carbolate of lime.
4. Carbolic acid.
5. Chloride of zinc (Sir William Burnett's fluid).
6. Chloride of iron.
7. Permanganate of potash (Condy's liquid).
8. Animal charcoal.

Each of these disinfectants has its own particular value, and may be used on certain occasions in preference to any of the others ; thus,

1. *Chlorine gas*, being a very diffusive body, is best suited for the disinfection of places which cannot easily be reached by other disinfectants. I have used it largely for the disinfection of the vaults of churches, where the atmosphere has been so charged with offensive and dangerous organic vapours, let loose from the contents of the decaying coffins, that the workmen could not enter the vaults with safety. In this manner all the vaults of the city churches have been disinfected, and the contents of them put in order and covered with fresh mould. I have found also that chlorine is best suited for the disinfection of rooms where, as is the case with the poor generally, the occupant cannot be removed for a thorough cleansing ; and I have employed it with great advantage in places where persons have been sick with fever, scarlet fever, small-pox, and cholera. The process which I adopt is the following : about a teaspoonful of the black oxide of manganese is put into a tea-cup, and there is poured over it, little by little, as occasion requires, about half a teacupful of strong muriatic acid (spirit of salt). In this manner the chlorine is gradually evolved, and the action is increased, when necessary, by stirring the mixture, or by putting the teacup upon a hot brick. As chlorine is heavier than atmospheric air, it is best diffused through the room by putting the mixture upon a high shelf. The quantity of chlorine thus diffused should never be sufficient to cause irritation to the lungs of those who occupy the room, and yet it should be sufficient to be distinctly recognisable by its odour. If it be properly managed the chlorine may be thus diffused through the atmosphere of the room, even during its occupation by the sick.

2. *Chloride of lime* has been very largely used in the city during the recent epidemic of cholera. The inspectors have sprinkled it upon the floors of the houses occupied by the poor, and have scattered it about the cellars and yards. In some cases it has been used with water for washing the paint work and the floors of rooms. Altogether indeed, with an average staff of 45 men, we have used rather more than seven tons of chloride of lime in this manner in disinfecting every week about 2,000 of the worst class of houses in the city, and the results have been most satisfactory.

3. *Carbolate of lime*, which is a mixture or rather a chemical compound of carbolic acid and lime, has been used in many cases where the smell of chloride of lime or its bleaching action has been objected to. It has been used by dusting it by means of a dredger over the floors of rooms and cellars ; but as the disinfecting power of this substance is destroyed by chloride of lime, it is of great importance that they should not be used together. The carbolate of lime which we have employed contains 20 per cent. of carbolic acid ; it is essential that this should be its minimum strength, or its power is not sufficiently efficacious. The strength of it may be ascertained by treating 100 grains of it with sufficient muriatic acid, diluted with its own bulk of water, to dissolve the lime, when the carbolic acid is set free, and floats upon the liquid ; this, when collected, should weigh 20 grains at least. The advantage of carbolate of lime is its continuous action, for the carbonic acid of the air slowly lets loose the carbolic acid, which diffuses itself through the atmosphere in sufficient quantity to act as a disinfectant, and it does not destroy the colour of clothing.

4. *Carbolic acid* has been used as the sole agent of disinfection for privies, drains, and sinks, and for the sewers and the public roads. In the former case it has been used in its concentrated state by pouring it at once into the privy or drain, but in the latter case it has been diluted with about 2000 times its bulk of water and sprinkled by means of the water carts upon the public way. In this manner about 1000 gallons of carbolic acid have been used in the city thoroughfares ; and the acid getting into the sewers we have observed that the usual decomposition of sewage has been arrested, and instead of a putrefactive change with the evolution of very offensive gases, the sewers have been charged to a slight extent with carbonic acid and marsh gas. As there are many coal tar

acids now sold for carbolic acid, it is of importance that the adulteration should be recognized. This may be done by observing the strength of the soda solution which will dissolve the tar acid. All the inferior acids are insoluble in a weak solution of caustic soda.

5. *Chloride of zinc*, Sir William Burnett's fluid, or, as it is sometimes called, Drew's disinfectant, is well suited for the disinfection of the discharges from sick persons, but it is hardly applicable to any other purpose. The liquid should be of a proper strength, as having a specific gravity of 1594, water being 1000; and it should contain about from 50 to 54 per cent. of solid chloride of zinc. A tablespoonful of this liquid is sufficient to disinfect each discharge from the body.

6. *Chloride of iron* is applicable in exactly the same manner as chloride of zinc, and is only suited for the disinfection of the discharges from the body. It should have a specific gravity of 1470, and should contain about 40 per cent. of metallic chloride.

7. *Permanganate of Potash* is only suited for the disinfection of drinking water; for not being a volatile disinfectant, and being very slow in its action, and requiring much of it for any practical purpose, it is not available as a common disinfectant; besides which it attacks all kinds of organic matter, and will therefore destroy clothing and be neutralized by every species of organic substance. As a disinfectant of water, however, in localities where good filters of animal charcoal cannot be obtained, it may be usefully employed to disinfect water by adding it thereto until the water retains a very pale but decidedly pink tint. The permanganate which is sold generally has a specific gravity of 1055, and contains about 6 per cent. of permanganate of potash. It will take more than a pint of this liquid to disinfect a pint of the rice-water discharge from a cholera patient, and even then the disinfection is very uncertain.

8. *Animal Charcoal.* I may state, that for the disinfection of water and the removal of dangerous organic impurity I have ascertained by experiment that the best treatment is first to filter the water through animal charcoal, and then to boil it for a few minutes. It may then be safely drunk.

The disinfection of bedding and all articles of clothing is best effected by exposing them in an oven to a heat of from 260° to 300° Fahrenheit. The exposure should be sufficiently long to ensure the thorough heating of every part of the material to that temperature. When such a process cannot be used, the clothing should be put into boiling water, and kept there until the water cools to the common temperature.

I refrain from entering into any explanation of the mode of action of these several disinfectants; for whether the agent of disease is a living germ, capable of reproducing itself in the human body under certain conditions, as most likely it is, or whether it is an unorganized, or even as Dr. Richardson supposes, a crystalline compound, the practical results are the same and are unquestionable; and, in conclusion, I would say, by way of summary that for the disinfection of sick rooms, chlorine and chloride of lime are the best agents; for the disinfection of drains, middens, and sewers, carbolate of lime, and carbolic acid are the best; for the discharges from the body carbolic acid, chloride of zinc, or chloride of iron are the best; for clothing, the best disinfectant is heat, above 260° if a dry heat and 212° if a wet heat; and for drinking water, filtration through animal charcoal and a boiling temperature.

I may mention that the best disinfectant for stables and slaughter-houses is that prepared by Lewis, Ash, and Co. at Bow. It is a mixed chloride and hypochlorite of zinc, and it has the advantage of mixing freely with the liquid matters of the slaughter-house, and not tainting the meat with any unpleasant odours. We have used it very largely for this purpose, and it is also applicable to the disinfection of houses in place of chloride of lime; which it much resembles in its chemical nature and mode of action.

College Laboratory, London Hospital,
November 22d, 1866.

5. Cholera at Charlton (Woolwich).

(*Weekly Return, No.* 43.)

Charlton, *October 25th*, 1866.

I am sorry to inform you that a severe outburst of cholera has occurred in our parish. The usual meeting of the Board took place yesterday, and I reported that there had been a continuous improvement in the health of the parish. There had been no case of cholera since the 3d of October, and less diarrhœa than is usual at this time of the year, only one fatal case having occurred during the month, and but eight fresh cases of diarrhœa (and these chiefly of a mild character) had been brought under the notice of the "medical visitor" during the past week. Such being the favourable sanitary condition of the parish, it was under discussion whether the services of the medical visitor should be dispensed with; it was, however, resolved to continue his services for a short time longer.

During the last 24 hours a choleraic wave has passed over our parish, and several have been suddenly stricken with the disease, and up to this time seven cases have proved fatal, the duration of the attacks varying from 8 to 16 hours. All these cases have occurred in the marsh districts, in the lower parts of the parish adjoining Woolwich Dockyard. In this neighbourhood there are streets of small houses, built on the marsh land below the level of high-water mark, and also much below the level of the high road. The houses are simply placed on the soil without any basement whatever, and are surrounded by tidal ditches, and from the heavy rain-fall of late the water is in many of them up to the level of the floor boards. Our authorities have endeavoured, but without avail, to rectify this state of things. Until the metropolitan main sewer was constructed there was no means whatever of draining any of these houses, and the sewage simply found its way into the adjoining tidal ditches. Now, however, the drainage of the district is being expeditiously carried out by the Board of Works, and as fast as a line of sewer is completed a connexion is made into the main sewer with each house, and the drain cut off from the tidal ditch, but it must be many months before this can be completed, and until then we can only trust in a merciful Providence, for the sanitary means at our command can be of little avail. In the upper parts of the parish and the surrounding neighbourhoods there has been no case of cholera; they are unusually healthy, and are quite free from diarrhœa.

Robert Finch, M.D.,
Medical Officer of Health.

(*Weekly Return, No.* 44.)

October 31st.

I beg to furnish you with some further particulars of the progress of the outbreak of cholera in this district, and the measures which have been taken to meet the disease.

My letter to you of the 25th instant informed you of the extreme suddenness of the outbreak; and immediately on the report of the existence of cholera in this parish a special meeting of the board was convened to take such steps as might be necessary, and a daily meeting has since been held. I have already acquainted you with the precautionary means that had been adopted; and in addition to the "medical visitor" already appointed, two other "medical visitors" in the immediate vicinity of the outbreak were appointed under my superintendence for the gratuitous attendance of the sick. Three dispensaries were established at the residences of the three medical visitors for the gratuitous supply of medicines, and the chemist in the village was empowered to supply medicines gratuitously under the advice of the medical officer of health.

A placard was circulated announcing the names and addresses of the medical visitors, and also where medicines could be obtained. The medical visitors were also empowered to supply to the sick all necessaries, such as nourishments, stimulants, blankets, &c., at their discretion.

The inspector of nuisances was authorized to obtain any assistance that either the medical officer of health or himself might require. A close and constant inspection, amounting to house-to-house visitation, has taken place in the district, the roads watered with diluted carbolic acid, and chloride of lime or carbolic acid poured down all drains and gulley openings, and all sewerage works have been temporarily suspended.

The disinfection has been carried out effectually either under the supervision of the medical visitors or the inspector; every house where a case has occurred is visited, and diluted carbolic acid poured down the drains, &c., the rooms washed with a solution of chloride of lime, and the clothing also washed in a solution of chloride of lime, and the bedding, if soiled, has been immediately removed and burnt, it being considered better to destroy the bedding, and to replace it gratuitously, than to attempt to disinfect it by heat in this district. It was proposed to establish a temporary hospital, but there being no suitable building in this district which the board could obtain that project had to be abandoned. A contract was taken for burials; each body to be removed within two hours of death to the Charlton deadhouse (an isolated building far removed from any dwelling), the corpse to be covered with chloride of lime, and the burial to be completed as early as practicable.

Such have been the means employed to combat this sudden outbreak, and I am pleased to report that the disease is rapidly subsiding. It attacked us with alarming and sudden severity, but its virus was expended in the first few days. The early cases were suddenly seized without any

premonitory symptoms whatever, and rapidly sunk. From the commencement of the outbreak on the 24th to the evening of the 26th of October 14 cases have proved fatal, the duration of the attack varying from 7 to 18 hours. Since that date the severity of the disease has very much abated, not only in the number of deaths but also in the encouraging fact that the intensity of the new cases is less severe; two deaths only occurred yesterday and only one to-day. There have been no fresh seizures of cholera for two days, and the cases of diarrhœa brought under the notice of the medical visitors have much diminished. It is difficult to assign any reason for the suddenness and intensity of this outbreak. It cannot certainly be charged to the water supply. Here I believe every house has an abundant supply of good water for domestic and other purposes, furnished by the Kent Water Company. The water is pumped up from artesian wells, bored into the solid chalk about 300 feet deep. It is a very hard water, containing salts of lime in abundance, but very little organic matter. Since the first alarm of cholera in the metropolis, about three months ago, the supply has been turned on twice a day during the week, and also once on Sunday, from 10 a.m. to 1 p.m. I have visited the works, and from their construction I cannot believe that any contaminated surface water can find its way into these wells. Could any impurity in the Kent Company's water have been the cause of this visitation other parts of the neighbourhood would have suffered, but the disease has, with a single exception, been confined to the marsh district and lower parts of the parish.

Most probably the cause of this outbreak is to be attributed to the unfortunate natural position of the locality (it being below high-water mark), to the extraordinary rainfall of late, and also to the fact of the drainage of this district being in a transition state.

The works, though temporarily suspended in consequence of this outbreak, will be resumed directly the emergency has passed, but until completed our sanitary measures can be only palliative.

ROBERT FINCH, M.D.,
Medical Officer of Health.

P.S.—A continuous improvement; no death to-day (1st November), and no fresh attacks.

The following letter was addressed to the Registrar-General on the outbreak of cholera at Woolwich (*Weekly Return, No.* 44) :—

Sir, *October 29th*, 1866.

When I wrote last week I was afraid from the severity with which the new attack broke out that we should have a heavy list of deaths to register; and I fear by this time the number in Woolwich and Charlton cannot be fewer than 40, all since Wednesday evening last, when the attack commenced. You will perceive that nearly the whole of the mortality has occurred in a district in which there is no provision for ventilating the southern outfall sewer. Up to the present time the epidemic does not appear to have touched any point beyond John-street, but has ravaged the districts lying to the westward of it both in Woolwich and Charlton, and its lateral range has been confined to points on either side of the sewer. The marsh districts referred to by Dr. Finch are immediately adjoining this main sewer. The district in question is very open, and with the exception of the marsh part of it, above the level of the river and well drained, at least as far as the parish of Woolwich is concerned. Of two deaths from cholera registered in the Arsenal district last week, one was that of a man who worked in the part now referred to.

If you refer to the deaths registered throughout the southern districts during the whole duration of the present epidemic, I think you will find that an undue proportion has occurred on the lower part of the course of the southern outfall sewer at Deptford, Greenwich, Woolwich, Plumstead, &c.; so that whilst the close and normally unhealthy parts of Lambeth, Rotherhithe, and Bermondsey have escaped, the more open districts lower down have suffered severely. The southern outfall sewer, you are aware, has a long sluggish course, so that by the time its contents reach the pumping station at Deptford they are in a fitting state to give out vast volumes of pernicious gases, even if they do not yield the essential gas *cholerine*.

Two years since we had a formidable visitation of gastro-enteric fever, clearly traceable to the want of ventilation in the same sewer; and it is singular that the dockyard district has on former occasions been singularly free from cholera, the deaths in the epidemic of 1854 being less than 20. Putting all these facts together I cannot but recognise an intimate relation between the impure state of the sewer and the present outbreak.

I remain, &c.
R. RUEGG.

To the Registrar-General.

Report to the Chairman of the Metropolitan Board of Works on the locality in which the Woolwich outbreak of cholera occurred, by Mr. Grant, Assistant Engineer (*Weekly Return, No.* 44) :—

November 3d, 1866.

THE following description of the locality in which the recent outbreak of cholera has taken place will, I think, satisfy you that it is unnecessary to go beyond the spot itself to find a reason for the mortality; and that to attribute it to the discharge of sewage at Crossness, three to four miles distant, or to the ventilation or want of ventilation of the outfall sewer, is to divert attention from the evils which really require to be remedied.

First as to Lower or New Charlton, situate between the Lower Woolwich Road and the River Thames. It comprises about 300 small houses, built upon a peaty quaggy marsh six feet below high-water mark, and bounded on the west side by a wide, stagnant, and foul ditch, which has formed the outlet for a considerable part of the drainage of West-street, and separates the part built upon from the richly manured market gardens and marsh lands of East Greenwich. The soil, originally most unsuitable for being built upon, has been made much worse by the cesspools and privy pits made for house drainage, and which, when overcharged, are emptied into pits sunk in the little gardens adjoining the houses. In some cases there are sunk tanks for rain water close to the privies.

The local board has recently laid several lines of pipe sewers and drains for the drainage of these houses into the main outfall sewer; and in connexion with this work, closet pans have been fixed in some of these privies; some cesspools have been filled up, and others are about to be. In few, if any, cases I believe has water been laid on to these closet pans, and all those I saw were foul with human excrement.

In addition to the foregoing, the northern half of West street and also of East-street are "unmade;" a mass of mud, ruts, and stagnant waters.

Between East-street and West-street and elsewhere are a number of piggeries. With few exceptions, there are no water tanks or cisterns of any kind. Water is supplied for about one hour daily by a stand-pipe from which the women fill any barrel, tub, or pan they may possess; the barrels being often green, mouldy, and leaky.

The houses are built so that the floors are level with the surface, and are consequently damp and cold. Few, if any, of the houses, though very small, are occupied entirely by one family, two or more being the rule.

A few recently built houses in North-street are much superior to the rest, and possess good wrought-iron tanks or cisterns with water laid on to the closet pans.

The foregoing may be briefly summarised thus:—

The site low, subsoil naturally wet, spongy, and bad, made worse by cesspools, and by having been made the depository for the foul matter taken out of these; bounded on the west by a wide stagnant and foul ditch which has hitherto taken the overflow of some of the cesspools. The drainage and the water supply are both most imperfect; the small and wretched houses are overcrowded with a population in poor circumstances.

But in addition to that which may be said to be the chronic condition of the locality, I was informed that for two or three days before the cholera broke out, about the 24th or 25th of October, a large quantity of offal and dung from the slaughterhouses of Mr. Smith of Woolwich was spread upon the surface of Mr. Shepherd's market garden ground, which bounds this locality on the west side; that the smell was most offensive all over this locality. When the disease broke out Mr. Shepherd's attention was called to this, and he caused the offal and manure to be ploughed in or otherwise covered up.

In Mount-street and Charlotte-street, Charlton, on the south or upper side of the Woolwich-road, there has been a great and sudden outbreak of disease, with many deaths.

In No. 1 Mount-street one mother and her three children died, and in the same house there had been two previous deaths since the beginning of August, making six altogether. Here the site is comparatively elevated, perhaps 20 to 30 feet above Thames high-water mark, and the subsoil is the fine grey sand which overlies the Woolwich chalk. The house consists of four small rooms, with a very small scullery at the rear. In each of these four rooms was one family. The lower rooms are 7 feet 6 inches high, the upper 8 feet 3 inches. There is a small back-yard, in which are a closet and pan without water, communicating, so far as I could see, with a cesspool, a small rain-water tank close to it, an iron stand-pipe, but no tank or cistern for receiving the water supplied by the Kent Waterworks Company. The water is stored from day to day in a mouldy old barrel, and such tubs and pans as the tenants have. In one corner of the yard was the dead body of a cat, and the mouldy garbage thrown out during the process of cleaning which has been commenced. Adjoining the house is a very foul small stable, the floor of which is saturated with old rank smelling dung. There is no drainage.

In Plumstead, on the west side of Woolwich, many brick and pipe branch sewers have been constructed within the last twelve months; but much work yet remains to be done. Part of Plumstead, between the parish church and Plumstead railway station, lies low. A brick sewer has been constructed in connexion with the outfall sewer near the railway station. A most foul ditch, however, into which the drainage of a brewery and many houses flows, still takes this drainage down into the marshes and over the outfall sewer, contaminating the air for a great distance. This ditch might long ago have been intercepted and the drainage taken into the brick sewer. With respect to the drainage of all these localities, as the outfall sewer has been completed for four or five years, and the pumps at Crossness at work for more than a year and a half, the branch sewers might have been completed long ago; but, under existing Acts, local boards have many difficulties to contend with. After the main sewer has been constructed by the Metropolitan Board the local board have to make the branch, but cannot, without notices and infinite delays, make the branch drains, or abolish the cesspools, or lay on water. Then they are powerless in such cases as at Lower Charlton, where the most wretchedly built houses are erected in rows upon low lying marshy ground, surcharged with moisture and vegetable matter. Such sites are really unfit for human habitations. If the air and all the surroundings were of the purest the houses would be barely large enough for one ordinary family. With foul air, bad drainage, insufficient and imperfect water supply, damp and dirt, indoors and out, and at least double the number of a poorly fed population crowding into these small houses, the wonder is, not that an epidemic should suddenly and occasionally break out, but that the locality should ever be free from epidemic disease.

There can be no doubt that people living in such circumstances do not live half their days.'

The result of my observations is that the outfall sewer has nothing whatever to do with this outbreak of cholera.

The men employed at Crossness and their families (about 150 souls) live at the top of the reservoir, and not far from the point of discharge into the river, and there is no sickness among them. The ventilating shafts from Charlton through Woolwich to Plumstead are stopped up, and have been for a long time, the ventilation being through the tall chimnies of the dockyard and gas-works; and, where causes sufficient to account for the disease may be found in and round the houses of those affected, it seems to be unnecessary and unwise to look elsewhere. By the increased vigilance now being displayed by the local authorities much may be done to mitigate the evils to which I have referred; but much more will remain so long as such a large number of human beings are permitted to occupy houses not fit for the healthy occupation of half their number.

To Sir John Thwaites. JOHN GRANT.

Mr. W. R. Morris, engineer of the Kent Waterworks Company, addressed the following communication to the Registrar General (*Weekly Return, No.* 45) :—

November 10*th*, 1866.

I have received your request for particulars of the water supply to the Woolwich Dockyard and Charlton Districts, and particularly to the localities where the late outbreak of cholera has prevailed; and in reply I have to inform you that in these places the water, in common with the whole supply to the Kent Waterworks Districts, is obtained from deep wells sunk in the chalk, as described by Dr. Finch in his letter of 31st ult., and published in the Weekly Returns of your office. As regards the quantity supplied, the pressure and time will admit a delivery of 1000 gallons daily to each house, through a ½ (inch?) pipe. Whatever quantity may be wasted, there are few or no instances in the above places where provision has been made for receiving or retaining any such quantity for use.

You state that in some cases an offensive smell is reported to have been experienced at the commencement of the day's water supply. This must have a local origin, otherwise it would be continuous, neither would it be the exception, but the rule, as the same pipe supplies the whole of the houses with water.

Such a smell could arise only from two causes; a leak on the leaden supply pipe on the premises might occur in crossing a drain, in which case, on the cessation of pressure from the main, impurities, gaseous or otherwise, would fill the leaden pipe, and the first ensuing delivery of water would create such an offensive smell as that complained of. This has several times happened, and is always readily detected and set right.

A second cause is more common, and occurs more or less frequently in a better class of houses. Water is delivered into cisterns with which an overflow pipe is connected. This pipe discharges into drains, cesspools, or sewers, and unless it be "trapped" (as it rarely is) the foul air from the drains is brought into immediate contact with the water in the cistern, and thence passes into the house. The offensive smell is always most perceptible on the first flow of the water from the waste pipe disturbing the contents of the cesspool or imperfect drain; and after a flow of clean water it ceases for a time.

If you will favour me with the means of ascertaining the particular houses in Charlton which your informant alludes to, I should be greatly obliged, and would have a close examination made.

In answer to your inquiry whether it be true that water had been discontinued to waterclosets on account of nonpayment of rates, I have to state that such is not the fact. There has been no refusal to pay the charges for water, and the water rate always includes the closet. I apprehend that this mistake has arisen from the company declining to supply waterclosets direct from their mains. Many houses in Woolwich and Charlton were formerly so supplied by the late Plumstead and Woolwich Company, but on the Kent Company taking their works such mode of supply was discontinued, as contrary to the provisions of the "Metropolis Water Supply Act."

Not only does such direct communication between the pan of a watercloset and the water main cause great waste of water, but it has been long known that it leads to the most offensive results; and hence a clause in the Metropolitan Water Supply Act was inserted, forbidding such a mode of service.

(*Weekly Return, No.* 45.)

November 12*th*, 1866.

The epidemic has entirely passed away. There have been no fresh attacks for more than a week. The two deaths which occurred in the present month were from secondary fever. The services of two of the medical visitors have been dispensed with; one is retained to watch over the lately infected district. The drainage works, which were suspended at the time of the outbreak, have been resumed, and will be rapidly completed. The total number of fatal cases in Charlton parish during the late outbreak has been 26,—all, with a single exception, confined to the lowest parts of the district, and among the poorest of the population.

ROBERT FINCH, M.D.,
Medical Officer of Health.

(*Weekly Return, No.* 46.)

Kent Waterworks, Mill-lane, Deptford,
November 17th, 1866.

Mr. W. R. Morris, the engineer of the Kent Water Company, states that the number of houses in Woolwich and Charlton supplied with water from the works is as follows :

Number of houses supplied in Woolwich - -	4,356
Ditto ditto Charlton - -	1,083

In 1861 Woolwich contained 4,596 inhabited houses, Charlton 1,117.

No extra charge is made for a single watercloset, and we have no record that will enable me to distinguish those houses without water supply to their closets.

Dr. Finch, Medical Officer of Health for Charlton, has addressed the following communication to the Registrar General (*Weekly Return, No.* 49) :—

As to the statement that "the epidemic broke out in Charlton and extended to the adjacent parts of Woolwich," it is quite incorrect.

Up to the evening of October 24th no case of cholera or even diarrhœa had occurred in Charlton parish for three weeks, and on that day the epidemic broke out.

The first case occurred at Woolwich in the Arsenal district (a mile and a half to the east of Charlton), at 36 Waterman's Fields. The patient died at 3 o'clock P.M. The second case at 15 Prospect-place, Woolwich Dockyard, at 5·30 P.M. The third case at Albion-road, Woolwich Dockyard, at 7·45 P.M. The next case, and the first in Charlton parish, was at No. 1 Mount street, within a few yards of Woolwich, at 8 P.M. Cases Nos. 5 and 6 occurred at Acorn-street, Woolwich Dockyard, and 3 West-street, Charlton, at 8·30 P.M. No. 7 at 19 East-street at 10·30 P.M. and No. 8 at Maryon-grove at 11·30 P.M. These were all the cases that occurred in both parishes on the day of the outbreak. The epidemic passed over Woolwich from east to west.

As regards the statement of "offensive manure being permitted by the Charlton authorities to be carted on the fields," this is a little unfair. The fact is, this refuse was brought in the night from Woolwich parish and carted on the fields of Charlton, but as soon as it was discovered the inspector immediately ordered it to be ploughed in and covered with carbolic acid. The owner of the field wrote a letter of regret and apology, and the police were communicated with to prevent a repetition of so flagrant an act.

This is not the first time that refuse has been brought from Woolwich into Charlton, and several summonses have been taken out against persons so offending. Only as late as 11th August last a summons was taken out against a man for depositing large heaps of refuse opposite North-street, Charlton, which had been brought from Woolwich parish. The Medical Officer of Health having reported to the Board, "that if allowed to accumulate it would become a dangerous nuisance;" therefore the statement that the Medical Officer of Health had allowed these things to exist is incorrect. Equally wrong is the statement that "he did not remonstrate against large sewerage operations being allowed during the outbreak."

One of the first acts of the committee, on the advice of their Medical Officer of Health, and as reported by him in his letter to the Registrar General of 31st October, was to order the sewerage works to be temporarily suspended; only the few connexions which were in progress were completed; and when the old sewer in East-street fell in during the outbreak, the inspector was directed not to disturb it, but simply to cover it over with matting and earth and carbolate of lime.

As regards the level of the ground, site of the houses, and poverty of the population, it is surely not affirmed that the Medical Officer of Health is to be held responsible.

VI.—NOTES ON CHOLERA IN 1866 IN THE SEVERAL DISTRICTS OF ENGLAND.

II.—SOUTH EASTERN COUNTIES.

1. Surrey (*extra-metropolitan*).

45; 1. Godstone; *Godstone.* Population 9,642. Cholera 17; Diarrhœa 2. A farm labourer aged 70 years died in the Union workhouse at Bletchingly on 9th August from Asiatic cholera (3 days); the deceased is stated to have come from the neighbourhood of London three days previously to seek for harvest work. No further deaths occurred until the 18th of the same month, when a railway labourer at Oxted died from cholera (18 hours); this was followed by the deaths of two other adults on 23d and 27th. A rat-killer aged 76 died at Limpsfield on 13th September of choleraic diarrhœa; on the 16th September the disease broke out at Oxted among some navvies employed upon the construction of a neighbouring line of railway. Between 16th and 22d September six of these men and one of their wives died from cholera, described as of a most malignant type. The registrar states that the huts wherein these navvies lived were built in a very damp situation. At Limpsfield the disease appeared again on 7th October when the wife of an agricultural labourer died of Asiatic cholera (20 hours); on 8th, 9th, and 15th the children of a railway labourer, and a railway labourer also died; the last fatal case, also in Limpsfield, occurred on 18th October to the widow of an agricultural labourer aged 82 years. In the epidemic of 1849 only five deaths occurred from cholera, of which four took place at Bletchingly (three in the Union workhouse).

46; 1. Croydon; *Croydon.* Population 37,093. Cholera 9; Diarrhœa 34. The 1,061 deaths registered during last year in this sub-district showed an increase of only 29 upon the number recorded in the previous year, which was fully accounted for by the increase of population. The first fatal case of cholera was that of a plasterer, aged 29 years (8 hours), on 31st July at Pitlake; an infant died at Penge on the previous day, but this case was certified as only choleraic diarrhœa (4 days). On 2d August a labourer died in the workhouse infirmary, aged 45 years, of cholera (19 hours); the remaining six cases were as follow:—On 2d August, at 25 High-street, a porter, aged 46 years, cholera (28 hours), cerebral congestion. On 3d August, at Thornton Heath, the son of a plasterer, aged one year, cholera (17 hours). On the same day at Sydenham-road, a domestic servant, aged 43 years, cholera maligna (7 days). On 28th August, at Myrtle-street, East Croydon, the widow of a shoemaker, aged 60 years, cholera maligna (10 hours). On 10th September, at the Oaks, South Norwood, the son of a stock-dealer, aged four months, choleraic diarrhœa (8 days). On 23d September at Thornton Villas, Upper Norwood, the daughter of a fitter, aged seven years, choleraic diarrhœa (20 hours). Of the 34 deaths from diarrhœa, 20 were of infants not exceeding one year, nine of persons over 60 years of age; the remaining five only being of adults between 18 and 55 years.

46; 2. Croydon; *Mitcham.* Population 9,381. Cholera 6; Diarrhœa 11. The wife of a leather-dresser, aged 75 years, died of Asiatic cholera on Mitcham Common on the 17th August. No other fatal case occurred until 3d September when the wife of a floorcloth-printer, aged 33 years, died of cholera (3 days); one child in the same family died on 26th September of diarrhœa (48 hours), and another on 3d October of choleraic diarrhœa. On 5th October the child of a carman, aged nine years, died from Asiatic cholera (21 hours) at the Causeway, Mitcham. A labourer, aged 84, in Mitcham, from Asiatic cholera (12 hours); and the last case was the wife of a labourer, aged 60 years, who died on 16th October of Asiatic cholera (20 hours). The 11 deaths from diarrhœa were almost all of infants and old persons.

In the whole district of Croydon 15 deaths from cholera and 45 from diarrhœa were registered in the year against 94 and 43 during the epidemic of 1849, and 90 and 55 in that of 1854. In 1849 the first fatal case of cholera occurred on 13th July in the Watermen's Asylum, Penge; afterwards 13 died in Barrackfield, 11 on Croydon Common, and 17 in the Union workhouse. The disease was most fatal on 27th August, on which day seven deaths occurred; at Pitlake the wife and three children of a sawyer died in the same house. It was noticed during the epidemic of 1849 that the part of the Croydon sub-district situated in the immediate vicinity of the gasworks was entirely free from the epidemic. In the Mitcham sub-district in 1849 the greatest mortality occurred at Bush, in Merton parish, where 12 persons died in September.

47; 1, 2, 3, and 4. Kingston; sub-districts *Wimbledon*, *Kingston*, *Esher*, and *Hampton.* Population of District 36,479. Cholera 17; Diarrhœa 15. The only fatal case of cholera in Wimbledon was the child of a carpenter aged seven years on 5th October. In Kingston the first death from cholera occurred in the Union workhouse, on 16th July, of a female aged 29 years; no further deaths took

place until 5th August, from which day until 27th of the same month seven deaths occurred in Waterman's-row, Back-lane, Waterside, The Marsh, Wanderings, and other parts of the same poor neighbourhood. The last case was of the child of a labourer aged six years on 2d November at Wanderings. In Esher sub-district at Weston-green, Thames Ditton, a sharp outbreak occurred on 9th August which resulted in the deaths of five adults between that day and the 12th of the same month. The small beershop on Weston-green, where the disease appeared, was kept by a man and his wife in a notoriously uncleanly manner. There was a piggery at the back of the house which had become a public nuisance. On 9th August the beershop-keeper died, the cause of his death being certified as follows :—"Asiatic cholera (36 hours). Fever and delirium. Vomited large quantities of blood a few hours before death." The man's wife, who on the morning of her husband's death was well enough to go into Kingston and back, was attacked during the night, and died on 10th, after an illness of only nine hours. A woman who had been called in to nurse the two deceased, and the potman who lived in the house, both died on the following day, the 11th, after attacks of 14 and 6 hours respectively ; and on the 12th a carpenter, who had acted as undertaker in the previous cases, died from diarrhœa and cholera. Immediate measures were taken to prevent the spread of contagion by the burning of all the infected articles of furniture, and the disinfection of the house and premises. In the Hampton sub-district the only case of cholera was of a bargeman, aged 19 years, and occurred at Hampton Wick on 2d August. During the years 1849 and 1854, the deaths from cholera in the four sub-districts of the Union taken together were 32, and 48, against the 17 which occurred in the visitation of 1866.

48 ; 1. Richmond ; *Richmond.* Population 12,665. Cholera 10 ; Diarrhœa 6. The first case of cholera (certified as choleraic diarrhœa) was of a bricklayer, aged 71 years, who died on 16th July, at 2 Worpleway, Marshgate. On 23d August the widow of a carpenter died of choleraic diarrhœa, in Brewer's-lane. Between 31st August and 16th September four deaths from cholera and four from diarrhœa occurred in the Union workhouse. Two other deaths occurred on the 10th October, one in Artichoke-alley and the other in the workhouse. The last fatal case was of a railway labourer at St. John's-row, Kew-road, on 13th October. In 1849 there were 26 deaths from cholera, of which Water-lane furnished five and the workhouse one.

48 ; 2. Richmond ; *Mortlake.* Population 6,137. Cholera 2 ; Diarrhœa 3. On 22d July the son of a general labourer, aged 11 years, died of Asiatic cholera (22 hours) ; the other was of a female infant aged nine months from choleraic diarrhœa, at the back of Barnes-terrace, on 24th August.

The deaths from cholera in the District of Richmond, which did not exceed 12 in 1866, were respectively 48 and 69 in the visitations of 1849 and 1854.

2. Kent (*extra-metropolitan*).

50 ; 1. Dartford ; *Bexley.* Population 13,026. Cholera 6 ; Diarrhœa 7. The whole of the deaths from cholera occurred in Erith ; the first fatal case was that of the child of a master shoemaker at Picardy on the 26th July ; the remaining five took place at intervals during August and September, the last (of a labourer) occurring on October 9th. Of the six deaths, three were of adults and three of children. In the epidemic of 1849, 46 deaths from cholera were recorded, of which 35 occurred in the parish of Crayford, and three at Bexley ; both these places escaped in 1866, while the deaths in Erith were only one less than those in 1849.

50 ; 2. Dartford ; *Dartford.* Population 13,180. Cholera 4 ; Diarrhœa 8. The first death from cholera occurred in the Union workhouse on the 28th July ; the wife of a farm labourer died on 2d September at Milton Street, Swanscombe, and the two other cases were brought ashore from vessels lying in the Thames. In 1849 there were 58 deaths from cholera.

51 ; 1. Gravesend ; *Gravesend.* Population 18,782. Cholera 19 ; Diarrhœa 16. On the 15th July the child of a shipwright, aged seven months, died of choleraic diarrhœa at 46 Kempthorne Street, and on the 22d a seaman died of cholera in the workhouse. On the 8th and 15th August two children of a labourer died at 5 Queen's-terrace, Milton, after but a few hours' illness. The last fatal case occurred in the Infirmary, Bath-street, Gravesend, on the 9th October. Of the 19 deaths from cholera 15 were at Gravesend, and four at Milton ; of the former, four occurred on board vessels in the Thames. Seven cases were recorded in the workhouse, most of which were of women. In 1849, 196 deaths occurred from cholera, and in 1854, 84.

52 ; 1. North Aylesford ; *Northfleet.* Population 9,600. Cholera 5 ; Diarrhœa 8. On the 15th July a child of 10 months died of "cholera infantum (2 days) ;" no further cases occurred until 11th August, when two terminated after but a few hours' illness ; the last two deaths occurred at 4 Westbourne-terrace, on 17th and 27th August.

52 ; 2. North Aylesford ; *Strood.* Population 9,521. Cholera 2 ; Diarrhœa 3. There were 41 deaths from cholera in 1849.

53 ; 1. Hoo ; *Hoo.* Population 2,861. Cholera 10 ; Diarrhœa 2. The first fatal case of cholera was that of the wife of a farm labourer on 5th August ; six fatal cases occurred in the workhouse between the 9th and the 18th. No death took place between the 24th August and the 15th September, when the last occurred. Cholera was more fatal in Hoo in 1866 than in 1849, when only seven deaths were returned.

54 ; 1. MEDWAY ; *Rochester.* Population 17,550. Cholera 6 ; Diarrhœa 0. The daughter of a commercial clerk died in Colegate-terrace, Chatham, on 18th August. Two other deaths occurred in Chatham, on 21st and 29th. The first death in Rochester took place on 23d September, a second on 25th in St. Bartholomew's Hospital, and the last on 7th October in the same institution. In 1849, 49 deaths resulted from cholera, the first fatal cases occurring among the soldiers at Fort Pitt.

54 ; 2. MEDWAY ; *Gillingham.* Population 34,255. Cholera 12 ; Diarrhœa 13. The whole of the deaths from cholera occurred in Chatham ; the first took place in the workhouse on 28th July, followed by three in August, and one on September 27th ; from this date no death occurred until 20th October, when the son of a master baker died (14 hours) at Brook ; five deaths resulted from this second outbreak ; the last on 3d November was that of the son of a watchmaker. Of the 12 deaths from cholera, seven occurred at Brook, Chatham. In 1849 the deaths from cholera in this sub-district were 78.

55 ; 1. MALLING ; *Aylesford.* Population 8,036. Cholera 4 ; Diarrhœa 9. The first death from cholera was that of the captain of a barge at Newhithe, East Malling, on 31st July ; the mate of a barge died at Millhall, Aylesford, on 26th August ; and the last death was at Ryarsh on Sept. 13th.

55 ; 2. MALLING ; *East Peckham.* Population 7,554. Cholera 12 ; Diarrhœa 7. On 3d May a butler at the Rectory, Mereworth, died from English cholera (18 hours) ; but the first fatal case of an epidemic character occurred on September 17th at West Peckham, followed by 10 others in rapid succession, the last (the daughter of a greengrocer, aged seven years) occurring on 30th September. Of the 12 deaths from cholera, seven took place at West Peckham, and three at East Peckham ; eight of these deaths occurred among the hop-pickers and their families. In this sub-district there were only six fatal cases of cholera in 1849.

58 ; 1. MAIDSTONE ; *Yalding.* Population 4,882. Cholera 11 ; Diarrhœa 3. On 12th September the child of a farm labourer died at Horn's Lodge after an attack of diarrhœa (4 days), ending in convulsions (12 hours) ; on the following day the mother and another child in the same family died of cholera (12 and 8 hours) ; on 14th a third child died ; and on 15th, at the same address, the son of a fish dealer, aged 13. This severe outbreak in one family was followed by seven other deaths, two of which occurred in the hospital near the town and two at Shingle Barn. The last death occurred on 4th October. All the 11 deaths occurred in Yalding.

58 ; 2. MAIDSTONE ; *Marden.* Population 4,905. Cholera 2 ; Diarrhœa 3. The two deaths from cholera were of the wives of labourers, aged 29 and 47 years, at Marden, and occurred on 6th and 14th September.

58 ; 3. MAIDSTONE ; *Loose.* Population 5,867. Cholera 1 ; Diarrhœa 5. The only death from cholera was of a farm labourer at Sutton-street, Bearsted, on 12th September. In September 1849 cholera broke out among the hop-pickers, chiefly Irish, and proved fatal to 44 persons ; only two or three deaths then occurred among the natural residents of East Farleigh, where the greater part of the mortality took place.

58 ; 4. MAIDSTONE ; *West Maidstone.* Population 10,907. Cholera 6 ; Diarrhœa 6. The first fatal case of cholera in this sub-district was that of the mate of a barge, aged 22 years, who died on 6th August in Dann's-court, High-street (21 hours) ; this death was followed by three others in Dann's-yard on 11th, 16th, and 18th August, the two latter being the wife and daughter of a wharf labourer. On 5th October a blacksmith died in the cholera hospital in the Loose road ; and the last case was that of the wife of a quarry labourer, who died on the 25th October. In 1849 there were 26 fatal cases of cholera, and there was a great mortality in Bristow's-yard, Upper Stone-street.

58 ; 5. MAIDSTONE ; *East Maidstone.* Population 12,109. Cholera 3 ; Diarrhœa 9. The three fatal cases of cholera occurred in Bonny's-yard, on the 20th August and 4th and 5th September, all male adults (two labourers and a Chelsea pensioner). Of the nine deaths from diarrhœa seven were of young children.

67 ; 2. FAVERSHAM ; *Faversham.* Population 9,473. Cholera 8 ; Diarrhœa 4. On 20th July an oyster-dredger died of cholera at Upper Brents, Preston ; no further death occurred until 5th August, when a mariner died in the Union workhouse ; two brickfield labourers died on 6th, the child of a dredger on 8th, and the last two cases were recorded on 15th and 26th August.

67 ; 3. FAVERSHAM ; *Teynham,* Population 4,061. Cholera 5 ; Diarrhœa 3. Three deaths from cholera occurred on 28th and 29th July and 4th August, at Conyer, Teynham, to three adults, (15 to 20 hours) ; the other two cases were of young children, one on 8th September at Linsted, and the last on 12th October at Teynham.

68 ; 1. MILTON ; *Milton.* Population 14,775. Cholera 21 ; Diarrhœa 9. A child aged 7 years died in Union-road, Milton, on 23d June, of English cholera (27 hours) ; but no further death occurred until 23d July, when the wife of a seaman died at Upchurch of choleraic diarrhœa (20 hours) ; on 29th July a seaman died in High-street, Sittingbourne, followed by one in the Union-road, Milton, on 3d August. The outbreak was most fatal during August, but several deaths occurred in September, and two in October, both of infants in Sittingbourne ; the last took place in Crown-yard on 23d October. Of the whole 21 deaths from cholera 11 occurred in Sittingbourne, eight in Milton, and one each in Upchurch and Borden.

69 ; 1. SHEPPEY ; *Minster.* Population 16,937. Cholera 22 ; Diarrhœa 17. An outbreak of cholera occurred in this sub-district during the month of August, and was principally fatal to the artizans in the Royal Dockyard. The two first fatal cases occurred in Sheerness, on 20th August,

followed in rapid succession by others throughout the month ; in September 10 deaths occurred. The last fatal case was that of a child who died on 29th September. With the exception of a few deaths in the Union Workouse, Minster, all occurred in Sheerness, and the disease was especially fatal in Blue Town, where a cholera hospital was established.

70; 1. THANET ; *Minster.* Population 3,836. Cholera 3 ; Diarrhœa 0. These three deaths from cholera occurred in the Union workhouse on August 28th and 31st, and 4th September.

70; 2. THANET ; *Margate.* Population 10,019. Cholera 11 ; Diarrhœa 8. The first fatal case of cholera was that of the daughter of a farmer, aged 22, who died at 6 Lansell's-place on 26th August ; she had been ill for 12 months, but died after an attack of choleraic diarrhœa (12 hours). On 28th August, the disease appeared in a severe form at 13 Upper Marine-terrace, three persons dying there on that day, and a fourth on 1st September ; the fatality in this house was traced to the effects of the water of a well which supplied the inmates. (*See the subjoined details relating to this outbreak which are reprinted from the London Weekly Returns.*) Two other fatal cases of choleraic diarrhœa were recorded before the middle of September. On 3d October, the disease again appeared in the family of a farm labourer, living at 14 Dane-hill-row; the father died on 3d, followed by a child on 10th, and another son and daughter died at the Cholera Hospital in Mill-lane on the 14th and 17th.

CHOLERA AT MARGATE.

(*Reprinted from the London Weekly Return No.* 47, *for the Week ending November* 24, 1866.)

IT sometimes happens that people living in London go to watering places, where they are attacked by cholera. The following painful and typical case was brought under the notice of the Registrar General, who requested Professor Frankland to analyze the water of the well, which appears to have been the means of distributing in one house the disease among about 20 inmates, of whom several died.

LIST of FATAL CASES of CHOLERA registered in the District of MARGATE, during the Year 1866.

6 Lansell's-place, 26th August, female, 22 years, amenorrhœa, (ill 12 months), choleraic diarrhœa (12 hours).
13 Upper Marine-terrace, 28th August, female, 13 years, choleraic diarrhœa (16 hours).
Ditto, ditto, female, 48 years, ditto (15 hours).
Ditto, ditto, male, 17 years, Asiatic cholera (12 hours).
Ditto, 1st September, female, 66 years, ditto (17 hours).
King-street, 26th August, male, 4 years, choleraic diarrhœa (8 hours).
21 Lower Marine-terrace, 11th September, female, 52 years, choleraic diarrhœa (30 hours).
14 Dane-hill-row, 3d October, male, 51 years, cholera (12 hours).
Ditto, 10th October, male, 13 years, cholera (6 days).
Cholera Hospital, 14th October, male, 9 years, and on 17th October, female,* 22 years, exhaustion by the consecutive fever after cholera in both cases.

C. R. PILCHER, Registrar.

Two of the inmates of the house, 13 Upper Marine-terrace, returned to London, were attacked and died at St. John's Wood, where their deaths were registered.

Ufton House, Avenue-road, St. John's Wood, 1st September, governess, 32 yrs., cholera (5 days).
Ufton House, 75 Avenue-road, 3d September, pupil at Ufton House, female, 12 yrs., cholera (7 days).

The following is a detailed statement of the attack by a gentleman who was residing in the house at the time :—

The writer begs to submit the following plain statement of facts in which he took a part himself, and will be happy, if required, to attend in person and give any information or answer any questions that may be put to him. At the same time he trusts that if it be necessary to give publicity to any investigations to be made with reference to it, that all names, to save pain and annoyance to those concerned, will be withheld.

On the 18th August last a party consisting of Mrs. ———, a lady from London, her two daughters, myself and sister proceeded to Margate, and took apartments at No. 13 Upper Marine Terrace, where my mother, who had preceded us a few days, joined us. We observed during the first hour we were in the house that the water was unusually hard, so much so that the best perfumed soap almost refused to lather and turned to a curdle, but knowing from experience that sea-side places are often badly supplied with water we took no further notice of it. On the following Monday (20th August), Mrs. ——— was seized with a slight attack of diarrhœa, but as she was in delicate health it did not attract special attention. On the succeeding Wednesday or Thursday, however, as it still continued, she was obliged to call in medical assistance. On the following Sunday evening, August 26th, a heavy thunderstorm visited the town, and an unusually large quantity of rain fell. The hot water

* This patient was removed from 14 Dane-hill-row; she left her situation, upon hearing of her father's death, and was shortly afterwards taken with symptoms of cholera, lingering several days.

that was brought up to the bedrooms the next morning was thought to emit a peculiar smell, and a glass of cold water that was brought up in the forenoon for the purposes of drinking had such an unpleasant taste and looked so turbid that it was handed round to all in the room and various opinions expressed on it. We then learnt that the water was supplied from a well at the bottom of the garden and not from the reservoir of the waterworks. In consequence of which, accompanied by a gentleman, son of the above lady, I called at the house of the secretary or manager of the water company, but not finding him at home, related to his daughter the business on which I wished to see him, and promised to call again later in the day. I saw him a few hours afterwards, and on asking him in what way we could obtain a supply of the company's water, he said that the landlord of the house had heard of complaints being made of the water and had already seen him relative to it, and that it had been resolved to have the water laid on immediately. The whole of our party in the evening went for a long walk, thinking that the coolness of the air would perhaps counteract the lethargy with which we all seemed to be strangely affected. We retired to bed about 11 p.m., and between two and three o'clock the next morning Mrs. ——— was seized with diarrhœa, and such violent cramps that when she got out of bed she was obliged to cling to her daughter, with whom she had been sleeping, for support. She took a little brandy and a pill, one of those that had been procured for my mother, and was somewhat relieved. About six o'clock, however, the daughter came up to the son, who was sleeping in the same room with myself, and begged him to go for a doctor. On his preparing to go down stairs, the lady who had taken the drawing-room floor three days previously accosted him, and asked him if he could oblige her with some brandy, saying that one of her little pupils, aged about 12 years, had been taken seriously ill, and she was intending to send for a doctor. He had not left the house before a gentleman who with his wife and two children had been staying in the house about a week, made his appearance, and said he had been very unwell himself during the night, and was just going to get medical advice for his little girl who was seriously ill. The physician, having been previously called up during the night, sent his partner or assistant, who attended to all the three families at the one visit. This was shortly after six o'clock on Tuesday morning August 28th. The assistant repeated his visit about eight o'clock, I believe, and during the whole day was incessant in his attentions. I speak now about Mrs. ——— who belonged to our party, not knowing the details of what took place in the other part of the house. About 11 o'clock she rallied somewhat, but was still in a low state. About one o'clock the purging ceased, and from that time she kept everything taken into the stomach. Nourishment was administered in the shape of essence of beef, champagne wine, arrowroot, &c., and at one time at not less intervals than five minutes. She then appeared, and expressed herself as being better, but very weak. At three o'clock it was evident even to an ordinary observer that she was sinking fast, the colour of her flesh becoming darker, and her vitality less strong. At a few minutes past six in the evening she breathed her last. I had been standing the last hour or two by the bedside, and had noticed the change that had been coming over her, and her breathing becoming fainter and fainter. It is right to mention here that she had, in common with us all, from the beginning of our stay in Margate, lost her appetite and suffered from constipation of the bowels, accompanied with headache, which no doubt, allowed the system to absorb anything injurious she may have taken. She was a full-bodied person and enjoyed good health, though the lungs and the liver were the weak points in her constitution, and perhaps she had not been the last few months quite as strong as usual, I believe from the continual confinement of city life. She drank on the Monday two bottles of soda water manufactured by Reeve & Co., Margate, who we afterwards learnt used water from a well on the premises.

The little girl referred to above died about nine o'clock the same evening, and the waiting boy of the house, whom we had seen run across the road about one o'clock in the day, died between eleven and twelve. Mr. ——— immediately removed his family, and I heard two days after that his little girl had recovered, while his other child had been dangerously attacked. I have heard since that, of the other party who had returned to their town residence, the governess and two more of the children had been taken ill, and that the governess and one child had succumbed to it. This makes a total of five deaths out of about 20 people who were stopping in the house. Regarding the medical certificate, on which the registration was based, giving as the cause of death in Mrs. ———'s case "choleraic diarrhœa of 15 hours' duration," I can only say, that though diarrhœa was the disease that first set in, it seemed to cease about one o'clock, and to be followed by a virulent attack of cholera.

The water in the bottle enclosed was drawn from the well on the Thursday morning, 30th August, and is apparently clearer than that used on the Monday, the day after the thunder storm.

I have also to remark that a public pump stands at the corner of a piece of waste land or common, about 50 feet from the garden of the house, no doubt supplied from the same spring, and apparently daily used by the surrounding inhabitants. I saw, on the Monday, a party of children round it, some of whom were drinking the water.

The house we were in, viz., No. 13 Upper Marine-terrace, had the reservoir water laid on before I left Margate on the 30th, but I understood that there were other houses in the same row using the well water.

I would observe, in conclusion, that I may be somewhat mistaken in a few of the minutiæ of the above statement, but the main facts I will vouch to be correct.

The following will, I think, answer Professor Frankland's questions respecting the water drunk at Margate in the case of the three deaths that occurred there on the 28th August:—

(1) The water was certainly drunk by all those attacked.

(2) It was drunk, both boiled and unboiled, in about the following quantities by each person :
½ pint in morning boiled for tea or coffee.
¼ pint unboiled, mid-day, mixed with claret (except by two who drank bottled stout instead).
½ pint boiled in evening for tea.
½ pint unboiled for supper, either pure or mixed with claret.

(3) In the case of Mrs. ——— the last administration was about ½ pint unboiled at supper-time, four hours before the attack commenced; she had, during the previous 48 hours, drunk at least a quart unboiled extra mixed with spirits of camphor; she was also suffering from constipation of the bowels.

Analysis of the Water by Professor Frankland.

I have analytically examined the water of the well supplying the house, No. 13 Marine-terrace, Margate, in which a sudden outbreak of cholera occurred on the 28th of August last, destroying five lives. A small sample of the water was collected a few days after this outbreak. It contained 93·40 parts of solid matter in 100,000 parts. Of this the very large amount of 7·36 consisted of organic and other volatile matter; unfortunately this sample was too small for detailed examination. A larger sample of the water collected on the 18th of September by Mr. Pilcher, the Registrar, exhibited a totally different composition; it contained 82·75 parts of solid impurity in 100,000 parts of water, and of these only 1·13 part was organic and other volatile matter. The following are the results of the analysis of the larger sample:

Solid matter in 100,000 parts		82·75
Organic and other volatile matter		1·13
Oxygen required for oxidation of organic matter		0·0885
Hardness	Total	30·2
	Permanent	12·4
	Temporary	17·8

This sample was also well aerated, and far removed from putrescence; one litre of it contained the following gases:

	Cubic centimetres.
Carbonic acid	21·406
Oxygen	5·342
Nitrogen	14·942
Total	41·690

Thus the character of the water had entirely changed, and it is highly probable that during a heavy fall of rain which just preceded the outbreak of cholera there occurred an overflow of a cesspool which, as I am informed, is situated near to the well; the well-water thus becoming contaminated. I have ascertained that this water was drunk by all the persons attacked, and that it was taken partly boiled and partly unboiled.

I have, &c.
E. Frankland.

It was asserted that the landlady and other inmates of 13 Marine-terrace afterwards succumbed; the Registrar's reply to inquiries will complete the narrative.

Miss ——— is still alive, and has not been ill for more than a day or two, and that I believe (from conversation I had with her) arose more from excitement and worry than from any other cause; a great many of her goods were seized by the sanitary authorities and burned, and when I last saw her she was not recompensed in any way, and that appeared to affect her more than any thing else that has transpired.

The Sanitary Committee has ceased to exist, or rather to meet, as there is no need for them to do so.

As far as I can learn, there was dissatisfaction among the medical men of the town; for in Ramsgate each medical man had a certain district assigned to him for which he received 30*s.* per day, while in Margate only one, and that the parish medical officer was so employed.

In reply to inquiries accompanying a copy of the Weekly Return, the following answers were received from Dr. T. J. Rowe, M.D., who attended the patients attacked by cholera and diarrhœa at 13 *Marine-terrace, Margate* (*Weekly Return No.* 48.):—

In respect to your queries, I believe that there were no other deaths than those (six) recorded in the report. All the other cases that left the house (13 Marine-terrace) recovered, *i. e.*, save the two that died at St. John's Wood.

All the lodgers in the house came from different parts of London, but I do not think any of them suffered from diarrhœa prior to coming to Margate.

The landlady of the house is living and well.

Perhaps I may add, that the Sanitary Committee caused the water of the public pumps to be examined, and the result was, that all save one were condemned, and at once closed. The W.C. water being laid on.

Margate, December 1*st*, 1866.

70; 3. THANET; *Ramsgate.* Population 18,007. Cholera 43; Diarrhœa 16. Cholera was fatal in Ramsgate considerably before the first death occurred in Margate. The first death was of a publican who died at 12 Royal-terrace on 8th August; the disease was fatal throughout August and September, and the last case occurred on 5th October. The fatality of this disease was almost confined to those parts of the town inhabited by the working classes, fishermen, shipwrights, labourers, fly drivers, &c.; 10 of the deaths occurred in the Cholera Hospital, and four in the Seaman's Infirmary. The Model Cottages, Hodgman's Cottages, and Mount Pleasant Cottages returned more deaths than most of the other streets, in which only one death occurred.

71; 4. EASTRY; *Deal.* Population 12,105. Cholera 14; Diarrhœa 5. On 1st August a seaman died of cholera (3 days); on 15th a hawker died in a travelling van; and on 23d the child of a shoemaker died in Lower-street (20 hours). This death was followed in rapid succession by 10 others, the last case occurring on 10th September. A great mortality occurred at the "Jolly Sailor" public-house, in which the deaths of the publican and his wife and three lodgers took place between 30th August and 9th September.

72; 1. DOVER; *St. James.* Population 12,419. Cholera 5; Diarrhœa 6. The first death from cholera was of the wife of a travelling hawker, in Fisher's-yard, on the 6th September; this case was followed by five others, the last two, the children of a labourer in an oil mill, occurred on 19th September.

72; 2. DOVER; *St. Mary.* Population 10,914. Cholera 5; Diarrhœa 7. On 16th July a seaman died at Cross Wall of choleraic dysentery (15 hours); no further death took place until 4th August, when the infant son of a boilersmith died (6 hours). On August 22d and September 10th and 15th, three further deaths occurred.

73; 1. ELHAM; *Folkestone.* Population 17,341. Cholera 9; Diarrhœa 8. The first fatal case of cholera in Folkestone was that of the stoker of a steam vessel, aged 64 years, who died in Alfred-terrace (18 hours). Of the other eight cases which subsequently occurred, five took place at Mill Bay; the child of a railway labourer on 18th September, a marine-store-dealer and two of his children on 3d and 9th October, and the wife of a labourer on 12th October.

3. SUSSEX.

76; 3. HASTINGS; *St. Mary-in-the-Castle.* Population 15,884. Cholera 1; Diarrhœa 21. On 25th August a gipsy chairmaker, aged 60 years, died in a tent near St. Andrew's Gardens after a five days' attack of diarrhœa, with consecutive fever; and on the following day his wife died, whose cause of death was certified as "cholerine, diarrhœa three days, childbirth 12 hours, exhaustion." Of the 21 deaths from diarrhœa, 18 were of infants under two years of age. In the three sub-districts, Ore, All Saints, and St. Mary-in-the-Castle, comprising the District of Hastings, only three deaths were referred to cholera in 1866, whereas the number of fatal cases in 1849 was 51, and in 1854, four.

84; 3. LEWES; *Lewes.* Population 10,116. Cholera 7; Diarrhœa 4. The wife of a pedlar died in the workhouse at Cliffe on 14th August from choleraic diarrhœa (48 hours). No further death occurred until 3d October, when a shoemaker died at St. John-under-Castle from English cholera, brought on by eating unwholesome shell fish; and on 5th the wife of another shoemaker died in St. John-street from choleraic diarrhœa. Between the 13th and 19th October, both inclusive, two deaths from diarrhœa and four from Asiatic cholera occurred in the workhouse. In Lewes District (containing six sub-districts) the deaths from cholera were only two in each of the visitations of 1849 and 1854.

85; 2. BRIGHTON; *St. Peter.* Population 42,156. Cholera 11; Diarrhœa 49. The first death occurred on 28th July and the last on the 3d September. Excepting three which were recorded in the workhouse, no two others occurred in the same street or place, and the deaths were distributed over the above period. Of the 49 deaths from diarrhœa, 31 were of infants under one year of age.

85; 3. BRIGHTON; *The Palace.* Population 21,948. Cholera 3; Diarrhœa 10. No death from cholera occurred until 16th October, when a fisherman, aged 38 years, died at 62 Russell-street of Asiatic cholera (3 days), and on the 22d another fisherman and his wife died in the same house of choleraic diarrhœa, (each four days). [In the three sub-districts of Brighton only 14 deaths from cholera were returned in 1866, while the fatal cases in 1849 and 1854 were 194 and 38 respectively.]

90; 2. WORTHING; *Littlehampton.* Population 6,737. Cholera 14; Diarrhœa 4. The first death from cholera occurred on 1st August at Littlehampton to a stone-cutter, aged 56, who had suffered from diarrhœa for four previous weeks; two female adults died on 6th and 8th August at the same place. With the exception of one on 16th August, at Leominster, no further deaths took place until 20th August, when the son of a labourer, aged three years, died. On September 8th, the disease appeared in a virulent form, and carried off 10 persons, principally fishermen, seamen, and their families, in the space of eight days; the last case occurred on 16th September.

90; 3. WORTHING; *Arundel.* Population 3,797. Cholera 5; Diarrhœa 4. Four of the fatal cases of cholera occurred between 7th and 12th August in Arundel; the fifth was that of a labourer, aged 78 years, who died at Burpham on 20th September. No death from cholera occurred in

Worthing Town, situated in Broadwater sub-district, where great attention has been paid to efficient drainage.

In the three sub-districts of Worthing 19 deaths from cholera were recorded in 1866, against 8 and 6 in 1849 and 1854 ; the increase occurring entirely in Littlehampton.

92 ; 2. CHICHESTER ; *Chichester.* Population 8,884. Cholera 12 ; Diarrhœa 6. The whole of the 12 deaths occurred between 22d July and 4th August : eight were of adults and four of children between two and four years old. The first death occurred in Cavendish-street, to a journeyman tallowchandler ; three deaths afterwards took place in High-street and three in St. Pancras-street ; the last two deaths were of a tailor and alderman, aged 74 years, in St. John-street, and of the wife of a carpenter in George-street. The sanitary condition of Chichester had for some time been known to be unsatisfactory. In the three sub-districts of Chichester there were 12 deaths from cholera in 1849, only three in 1854, and 12 again in 1866.

94 ; 2. WESTBOURNE ; *Westbourne.* Population 3,726. Cholera 17 ; Diarrhœa 2. Cholera was epidemic here between 22d July and 28th August. The first death was of a fisherman, aged 23 years, at Bosham, on 22d July ; between 23d and 26th three children of a shoemaker died at the Hermitage, Westbourne. After this date, excepting one at Nutbourne, all the remaining deaths occurred in Westbourne, and principally at the Hermitage or Workhouse. Of the 17 deaths from cholera, 10 occurred at the Hermitage, and three at the Workhouse. The last death was of the daughter of a fisherman, aged seven years, at the Hermitage on 24th September. Only two deaths from cholera were recorded in Westbourne Union in each of the visitations of 1849 and 1854.

4. HAMPSHIRE.

95 ; 1. HAVANT ; *Havant.* Population 7,212. Cholera 9 ; Diarrhœa 0. The first two deaths from cholera were of the son and daughter of a fisherman on 21st and 25th July at Emsworth ; the third followed on 1st August, the remainder taking place between that and the 12th of the same month, on which day the last occurred at Warblington. Five were recorded at Emsworth, three at Havant, and one at Warblington ; with the exception of a Scripture reader the whole of the deaths were of fishermen, or seamen, and their relations.

96 ; 1. PORTSEA ISLAND ; *Kingston.* Population 23,089. Cholera 39 ; Diarrhœa 19. The first death from cholera occurred at North End, Portsea, on 20th July, and the next few cases appeared at intervals of a day or two, but three deaths took place on 30th July and three on 1st August ; deaths followed in succession till nearly the middle of September, the last case occurring on 12th of that month. The whole of the deaths occurred in the crowded streets and courts occupied by the labouring classes in Portsea ; five were recorded in Oxford-street and five in Prince's-court, and three each in Hope-street and Salisbury-place, the three in the latter all in one house.

96 ; 2. PORTSEA ISLAND ; *Portsea Town.* Population 19,967. Cholera 15 ; Diarrhœa 13. With the exception of the child of a shoemaker, aged nine years, who died in St. James'-street on 1st August, no fatal case of cholera occurred until 21st of that month, after which date deaths from this cause took place at intervals of a few days until 19th October, when the last case, that of the wife of a blacksmith, occurred in College-street. All the deaths were recorded in the streets and courts occupied by the families of seamen, shipwrights, and labourers.

96 ; 3. PORTSEA ISLAND ; *Portsmouth Town.* Population 10,346. Cholera 27 ; Diarrhœa 15. In this part of the town the first death from cholera occurred in East-street on 19th July, but 21 of the 27 deaths from this cause took place in the month of August ; the last epidemic case may be said to have occurred on 7th September, although the child of a waterman, aged four months, died on 10th November from debility and diarrhœa, occasioned by an attack of cholera two months previously. Five of the deaths (besides several from diarrhœa) were recorded in East-street and its tributary courts ; five in Crown-street, of which four (all of adults) occurred in one house ; and two in Carvers-court, St. Mary-street.

The Registrar states that the water supply for the town of Portsmouth is obtained from springs near Havant, eight miles distant, and is not liable to contamination of any kind : there are a few wells in the district, which are slightly impure, but they are very little used for domestic purposes : there has been no scarcity in the supply of water.

96 ; 4. PORTSEA ISLAND ; *Landport.* Population 41,426. Cholera 62 ; Diarrhœa 70. The first death from cholera was of the daughter of a soldier, aged six years, at 11 Oxford-terrace, Albert-road, Southsea, on 17th July ; this was followed by two other deaths in the same house on 20th and 23d, and by two others in Southsea. The first death in Landport occurred 25th July. Cholera continued fatal in portions of both Southsea and Landport until the middle of September ; the last death occurred in Brunswick-square, Southsea, on 17th September. The deaths, from cholera were not confined to a few streets, the largest number in single streets being five recorded in Marylebone-street, and four in Green-street, in addition to several from diarrhœa in each. With scarcely any exception, all the deaths from cholera occurred in the families of seamen, shipwrights, and labourers of different classes ; a considerable proportion were of children.

In the four sub-districts of Portsea Island, the total deaths from cholera in 1866 were 143, against 568 in 1849, and 20 in 1854. In 1849 the disease was most fatal in Fountain-street and

Nance's-row in Kingston ; in Catherine's-row, and White's-row in Portsea Town ; in Prospect-row, and East and West streets in Portsmouth Town; and in Brunswick, Hyde, and Montague-streets in Landport.

97; 1. ALVERSTOKE; *Alverstoke.* Population 22,653. Cholera 19 ; Diarrhœa 11. On May 15th, a yeoman died at Brockhurst of English cholera ; but no fatal case of an epidemic character occurred until 18th July, when a boy R.N., aged 15, died in Haslar Hospital ; this was followed by three deaths between 21st and 25th July in South-street, Gosport. From this date to the 4th September deaths continued to be recorded ; the last two deaths occurred on the last-mentioned day in Haslar Hospital. Of the whole 19 deaths from cholera, five took place in Haslar Hospital, five in South-street, Gosport, six in other parts of Gosport, and two in Alverstoke. The deaths from cholera in 1849 in Alverstoke were 126, of which 13 were recorded in Haslar Hospital.

98; 1. FAREHAM; *Fareham.* Population 9,640. Cholera 8; Diarrhœa 7. One death from cholera occurred on 26th July in Trinity-street, Fareham ; the remaining seven fatal cases took place at Porchester. The first death in this parish was on 16th August, two followed on 24th, two on 27th, one on 28th, and the last on 13th September. Most of the deaths occurred in the families of seamen, fish dealers, and labourers.

99; 1. ISLE OF WIGHT; *Cowes.* Population 10,449. Cholera 19; Diarrhœa 2. The first death from cholera occurred on 24th July at Barton's Village, Whippingham. 12 of the deaths took place in August, two in September, and the last fatal case at West Cowes on 1st October. Of the 19 deaths, nine each were recorded at Whippingham and West Cowes, and only one at East Cowes. The whole of the deaths (with only one exception, the wife of a butcher) occurred among the labouring classes.

99; 2. ISLE OF WIGHT; *Newport.* Population 13,761. Cholera 70; Diarrhœa 12. The first fatal case in this sub-district (and also the first in the whole island), that of the wife of a mariner, aged 20 years, occurred at Little London, Newport, on 17th July ; on the same day also died, the infant child of a mariner at the same address, and the child of a labourer, aged five years in Sea-street. The disease continued very fatal until nearly the middle of September ; after the 9th of that month only two deaths occurred, one in the workhouse at Carisbrooke on 22d September, and one on 19th October. In July, 21 deaths were recorded ; in August, 38 ; and in September, 11. In the workhouse, Carisbrooke, 28 of the deaths took place ; in Trafalgar-road seven, in Sea-street five, and in Orchard-street four.

In the quarter ending 30th September 69 deaths from cholera and nine from diarrhœa having occurred in Newport sub-district, Mr. Moore, the Registrar, made the following communication to the Registrar General, in reply to questions relating to the water supply. (*See London Weekly Return No.* 44.) :—

That part known as the town of Newport is supplied from rivers, public wells, and private wells. The largest portion of the town has an additional, but not a copious, supply by the Newport and Carisbrooke Water Company from the well-known pure Carisbrooke Springs. The hamlet of "Hunny Hill," a suburb containing about 50 houses, has no other general supply than that obtained from a polluted mill-pond, about 400 yards distant ; but during the cholera crisis (1866) the Guardians of the Poor temporarily supplied that part from the Carisbrooke springs, a mile distant, by means of water-carts, which supply is now discontinued. The hamlets of "Gunville" and "Forest-side" are supplied from soak-wells, ponds, and land drainage, the barracks and prison at Parkhurst from deep wells, and the workhouse from a deep well and a pond. The remainder of the district, being rural and thinly inhabited, is variously supplied from wells, springs, and rivulets.

Generally speaking, the water in the country is not liable to contamination ; but many of the town wells are contaminated with sewage and other impurities. The rivers bordering two sides of the town are polluted with sewage, but the water in them is now little used for drinking purposes. There has been a scarcity of water in the summer months, both in town and country. In the town the lower part has been moderately supplied by the water company, while the parts on a higher level have been inadequately served by reason of the water from the Carisbrooke springs being allowed to flow slowly and insufficiently through the mains and pipes unassisted by mechanical and hydraulic pressure. Other parts of the town are wholly dependent upon private wells, and these mostly of an inferior description, and consequently suffer a scarcity in dry seasons.

99; 3. ISLE OF WIGHT; *Ryde.* Population 17,715. Cholera 12 ; Diarrhœa 3. Cholera was fatal here almost at the same time as at Newport and Cowes ; the first death, of a child, occurred in the infirmary on 26th July ; from this day to 7th August inclusive, eight other deaths followed. One death occurred on 10th September at the Infirmary, and two others (a jeweller, aged 66 years, and the wife of a labourer, aged 70) at Shanklin, on 20th and 28th October respectively. Seven of the 12 deaths from cholera were recorded in the infirmary, and two in Castle-street.

99; 4. ISLE OF WIGHT; *Godshill.* Population 8,020. Cholera 3 ; Diarrhœa 1. The death of a child occurred on 25th July at Ventnor, from choleraic diarrhœa. A labourer, aged 26, died on 2d August, at Godshill, and a journeyman butcher at Niton on 3d August.

[In the entire island, composed of five sub-districts, 105 deaths from cholera occurred in 1866, against 152 during the epidemic of 1849, and only four in 1854. In 1849 the mortality from cholera in Cowes and Newport was almost the same as in 1866 ; but in Ryde, which escaped with 12 deaths in 1866, 55 occurred in 1849.]

105 ; 1. SOUTHAMPTON ; *Southampton.* Population 43,414. Cholera 107 ; Diarrhœa 44. In the autumn of 1865 there was in the sub-district a slight epidemic of cholera and diarrhœa, which caused 21 and 69 deaths respectively. Professor Parkes, in his report on this outbreak (*Eighth Report of the Medical Officer of the Privy Council*, 1865, *p.* 392), states that in Southampton and its neighbourhood there occurred altogether between the 22d September and 4th November 60 cases of cholera, of which 35 were fatal.

In 1866 the first fatal case of cholera was that of a child, aged two years, on 13th June, in Bevois-street. This child was the son of a fireman of the Peninsular and Oriental steam ship *Poonah*, recently arrived at Southampton from Alexandria ; the father landed from the ship on the 10th June, he was attacked with diarrhœa the next day, and died on the 19th, his child having died in the meantime. (*See Professor Parkes' Report on Cholera in Southampton, Ninth Report of the Medical Officer of the Privy Council*, 1866, *p.* 244.)

Two cases of choleraic diarrhœa occurred during June. On 6th July the wife of a seaman, aged 40 years, died in Middle-street after an attack of only nine hours ; other cases followed in rapid succession, and the disease was severely epidemic until the middle of August, after which date the deaths rapidly declined, but the last case did not occur till 8th October, when the cook of a steam vessel died after only 12 hours' illness. Three deaths occurred in June, 80 in July, 15 in August, seven in September, and two in October. The mortality from cholera was almost entirely confined to those parts of the town inhabited by the labouring classes, although it caused deaths in a large number of differently named streets ; 20 were recorded at Anspack House, St. Michael, nine in Winchester-street, five in Queen-street and Rose-court running out thereof, and three each in Edward-street, Marine-parade, and Cross-street ; of the remainder of the deaths not more than two occurred in any one street. In 1849 the deaths from cholera in Southampton were 240, and in 1854, 48.

107; 1. ROMSEY ; *Romsey.* Population 6,795. Cholera 16 ; Diarrhœa 2. On 18th July the son of a journeyman bricklayer, aged 15 years, died in Narrow-lane of cholera, certified as "Asiatic;" on the same day deaths occurred in Banning-street and at Middlebridge. By the end of July 13th deaths had been recorded, and the last death, of a labourer aged 77 years, occurred on 19th August. Of the whole 16, seven took place at Middlebridge, and four in Banning-street. In 1849 and 1854, 15 and one deaths were respectively recorded from cholera. The disease first appeared in 1849 in Banning-street, and nine of the 15 deaths occurred there.

III.—SOUTH MIDLAND COUNTIES.

6. MIDDLESEX (*extra-metropolitan*).

132 ; 2. STAINES ; *Staines.* Population 8,687. Cholera 1 ; Diarrhœa 6. The fatal case of cholera was that of a greengrocer, aged 53 years, in the workhouse at Stanwell on 5th October, certified as "Asiatic," with collapse after an attack of 48 hours' duration. The six deaths from diarrhœa were all of infants under one year of age.

133; 1. UXBRIDGE ; *Hillingdon.* Population 8,844. Cholera 2 ; Diarrhœa 6. The two deaths from cholera occurred in the workhouse on 31st August and 6th September respectively, both of adults.

133 ; 3. UXBRIDGE ; *Hayes.* Population 9,157. Cholera 1 ; Diarrhœa 6. On August 15th the infant child of a labourer died in North-hyde-lane of English cholera. The cases of diarrhœa were all of infants, except one of a female aged 84 years. In the Uxbridge District, comprising three sub-districts, only four deaths were referred to cholera in 1866, against 40 in 1849, and 49 in 1854.

134; 1. BRENTFORD ; *Isleworth.* Population 15,533. Cholera 7 ; Diarrhœa 16. Four deaths from choleraic diarrhœa occurred in Church-street on 21st and 22d August. On 18th September the wife of a gardener, aged 77, died at Scrattage, Heston, from cholera ; and the last two cases took place on 28th and 30th October respectively in the workhouse. Of the 16 deaths from diarrhœa 14 were of infants under one year of age.

134 ; 3. BRENTFORD ; *Brentford.* Population 13,976. Cholera 5 ; Diarrhœa 21. A lighter-man, aged 44 years, died on 27th July of English cholera at New Brentford ; the next three cases were those of a labourer and two children in Allen's-yard on 30th July and 1st and 2d August. The last death was that of the daughter of a grocer aged 10 years, at Old Brentford on 17th October. Of the 21 deaths from diarrhœa 16 were of infants not exceeding one year. In 1849, 110 deaths from cholera were here recorded, of which Old Brentford furnished 86.

134; 4. BRENTFORD; *Chiswick.* Population 6,505. Cholera 12; diarrhœa 9. On 11th July, the wife of a labourer died in Devonshire-place after an attack of only 12 hours ; and eight additional deaths occurred before the end of the month. No other death occurred until 12th September; and the last two cases, on 29th September and 7th October, were both recorded at Strand-on-the-

Green. Three of the deaths from cholera occurred in Wood-street, two in Devonshire-street, and one each in Devonshire-place and Devonshire-road. During the epidemic of 1849, 15 deaths took place in the neighbourhood of Strand-on-the-Green.

[In the entire district of Brentford only 24 deaths from cholera occurred in 1866, against 184 and 196 respectively in 1849 and 1854.]

135 ; 3. HENDON ; *Willesden.* Population 3,879. Cholera 4 ; Diarrhœa 11. On 25th July the daughter of a grocer, aged five months, died from cholera in Manor-mews ; the second case was that of the child of a labourer, aged nine years, in Canterbury-yard, and on the 5th and 6th October the wife and child of a railway signal fitter died in Alpha-place after attacks of only a few hours' duration. All four deaths occurred in Kilburn, three being of young children.

136 ; 3. BARNET ; *Finchley.* Population 8,281. Cholera 2 ; Diarrhœa 3. The first death from cholera was of a master painter on 17th October in Market-place ; the other was of a newspaper correspondent in the Lunatic Asylum on 2d November from choleraic diarrhœa.

137 ; 1. EDMONTON ; *Hornsey.* Population 11,082. Cholera 3 ; Diarrhœa 9. No death from cholera occurred until 28th October, when a gentleman's coachman died in Southwood-lane, Muswell-hill ; on 30th a labourer who had suffered from diarrhœa for four days died of cholera at North-hill ; and the last case occurred on 19th November, when a labourer died at the Wellington-inn, Highgate, of Asiatic cholera (10 hours.) All the nine deaths from diarrhœa were of infants not exceeding one year.

137 ; 2. EDMONTON ; *Tottenham.* Population 13,240. Cholera 6 ; Diarrhœa 18. The first death from cholera occurred on 3d September at Scotland-green, followed by one in the Markfield-road on 5th ; no other took place till 19th, when a child died in Grove-court. The last three occurred on 28th and 30th October, and 5th November. Four of the six deaths from cholera were recorded in Markfield-road. Of the 18 deaths from diarrhœa, 15 were of young children, mostly of infants under one year of age.

137 ; 3. EDMONTON ; *Edmonton.* Population 10,930. Cholera 3 ; Diarrhœa 18. Of the three deaths from cholera, two (both of adults) occurred at Southgate on 4th August and 21st September ; the last case was that of an infant in Lower-fore-street on 26th September. Of the 18 deaths from diarrhœa, 11 were recorded in the workhouse, 10 being of adults. During the epidemic in 1849, 41 fatal cases of cholera occurred, of which the Chase, Southgate, furnished 18, and the Workhouse eight.

137 ; 4. EDMONTON ; *Enfield.* Population 12,424. Cholera 4 ; Diarrhœa 6. On 29th July a child died of cholera in Metcalf-road, Lock-lane ; the next case occurred in Baker-street on 27th September ; and the last two cases at Alma-road, Ponder's-end, and Love's-row on 20th and 25th October. Five of the six deaths from diarrhœa were of infants.

[In the six sub-districts of Edmonton, only 16 deaths from cholera occurred in 1866, while in the two visitations of 1849 and 1854 the fatal cases were 101 and 90.]

8. BUCKINGHAMSHIRE.

150 ; 1. WYCOMBE ; *High Wycombe.* Population 11,583. Cholera 5 ; Diarrhœa 4. Of the five deaths from cholera, two occurred in Oxford-road and two at the Green, Wooburn. The first took place on 25th August, followed by another on the 28th, and two on 6th and 20th September. The last death, that of a child in Railway-place, Wycombe, occurred on 16th October. All four deaths from diarrhœa were of children.

12. BEDFORDSHIRE.

183 ; 3. LEIGHTON BUZZARD ; *Ivinghoe.* Population 2,477. Cholera 9 ; Diarrhœa 2. The first death from cholera occurred on 9th September, followed by two on 11th, one each on 13th and 14th three on 16th, and the last on 23d. Five were of adults aged 20 years and upwards, and the whole nine were recorded in the parish of Ivinghoe, which in 1861 contained a decreasing population. No deaths from cholera occurred in this sub-district in 1854.

Note on the outbreak at Ivinghoe. Communicated by P. H. Holland, Esq., M.R.C.S., Medical Inspector, Burial Acts Office.

Seven of the nine fatal cases of cholera occurred in one little court, inhabited at the time by only 26 persons, 12 of whom were attacked. All these deaths occurred within a fortnight. Two other fatal cases only occurred in the whole village, and one of those sufferers had been staying in the same court. The exciting cause of the outbreak must, therefore, have been both local and temporary, for the inhabitants of the immediately adjoining houses escaped, and the disease soon ceased in the affected court. The water of the well supplying this one court, though generally pure, was at this particular time discovered to be very much polluted with putrescent matter, some at least of which had evidently been recently introduced, for dead but still undecayed earth worms were found in it. Water was obtained from another source, and the local epidemic quickly subsided. It did not appear that the first victims had previously been amongst sufferers from cholera, or that they communicated the disease to others.

Eight of the nine victims were known to have drank water proved to have been such as would, in ordinary seasons, have been likely to excite typhoid fever, diarrhœa, or other kindred disorder The immediate neighbours of the sufferers, apparently equally exposed to all other influences tending to produce cholera, but who did not drink of this polluted water, with only one exception, escaped its fatal power.

183; 4. LEIGHTON BUZZARD; *Edlesborough.* Population 3,436. Cholera 6; Diarrhœa 2. An agricultural labourer died in Edlesborough on 10th October of Asiatic cholera, followed by one death on 12th, 14th, 16th, and 28th of the same month; the last fatal case was that of the wife of an agricultural labourer on 1st November. All the six deaths occurred in Edlesborough and in the families of agricultural labourers.

[During the epidemic of 1854, 17 deaths from cholera occurred in the entire district of Leighton Buzzard, against 16 in 1866; in 1854 the mortality from this disease was almost confined to the Leighton Buzzard sub-district, and no deaths occurred in either Ivinghoe or Edlesborough.]

IV.—EASTERN COUNTIES.

14. Essex.

194; 1. WEST HAM; *Stratford.* Population 15,994. Cholera 160; Diarrhœa 20. The first fatal case of cholera was that of a dock labourer, aged 75 years, who died in High-street on 13th July, after an attack of only nine hours. The disease, therefore, appeared here almost simultaneously with the first deaths in St. George-in-the-East, Stepney, Poplar, and other of the Eastern districts of the metropolis. During July, 94 deaths occurred, in August 60, in September five, and the last was recorded on 2d October in Leyton-road. The fatality of the disease was at its height between the middle of July and the middle of September; and the number of deaths occurring either before or after those periods was comparatively small Eleven deaths were recorded in Castle-buildings; nine in Leyton-road; six each in Queen-street and New-street; five each in High-street, Union-street, and Chapel-street; and four each in Angel-place, Windmill-lane, Chant-street, Waddington--street, West-street, and Castle-street. In 1849 the deaths from cholera were 64 in this sub-district, and it is worthy of remark that High-street, West-street, New-street, and others of those mentioned above, suffered during that epidemic, as well as during 1866.

194; 2. WEST HAM; *West Ham.* Population 25,195. Cholera 219; Diarrhœa 30. The first death from cholera here was of the wife of a ship yard labourer, who died in Burnham-street, Plaistow on 12th July. On the same day a death occurred in Canning's town, while the two first fatal cases in West Ham, proper, took place on 16th, and at Forest-gate on 17th. The disease took very nearly the same course as in Stratford sub-district; it was severely epidemic only between the middle of July and the middle of August, after which it rapidly declined, but a few deaths continued to occur during September and October, and the last death took place in Abbey-lane, Plaistow, on 8th November. Of the whole 219 deaths from cholera, 111 were recorded in Plaistow, 43 in West Ham, 24 at Forest-gate, and 19 each in East Ham, and Canning's-town. In 1849, when the population was probably less than a quarter of what it was in 1866, only 48 deaths from cholera occurred, divided between West Ham, East Ham, Plaistow, and Forest-gate. (*For details of the epidemic of* 1866 *in West Ham, see "Extracts from Weekly Returns,* 1866," *ante p.* 132; *and Mr. Radcliffe's Report on Cholera in East London in Ninth Report of Medical Officer of Privy Council.*)

194; 3. WEST HAM; *Leyton.* Population 7,536. Cholera 11; Diarrhœa 6. No death from cholera occurred until 31st July, when the widow of a cork cutter died in Cooper's-lane; eight other deaths took place between the 1st and 12th August, of which seven were recorded at Leytonstone, four being of inmates of the workhouse. The last fatal case of an epidemic character occurred on 22d August on Wanstead Flats, but a bricklayer's labourer died at Phillybrook, Leyton, on 11th October of choleraic diarrhœa.

194; 4. WEST HAM; *Walthamstow.* Population 10,594. Cholera 1; Diarrhœa 8. The fatal case of cholera was that of the daughter of a builder, aged 50 years, at Walthamstow, from choleraic diarrhœa (two days).

[In the entire district of West Ham, comprising the four preceding sub-districts, a total of 391 deaths from cholera occurred in 1866, against 124 in 1854, and 134 in 1849; it must, however, be borne in mind, that the population in this suburban district has recently increased at an almost unexampled rate, and that the mortality from cholera at the two visitations of 1849 and 1854, was proportionately to the population greater than in 1866.]

195; 1. EPPING; *Chigwell.* Population 5,987. Cholera 5; Diarrhœa 2. On 29th July and 4th August, two deaths from cholera occurred at Buckhurst-hill, Chigwell; the other three took place at Loughton between 6th and 25th August.

195; 2. EPPING; *Epping.* Population 5,018. Cholera 3; Diarrhœa 1. The three deaths from cholera occurred on Epping Plain, Thoydon Garnon; the first was of an adult on 19th July, and the last two of the children of a husbandman, aged respectively seven and eight years, on 8th and 14th August. In 1854 an outbreak occurred in the workhouse at Epping which the Superin-

tendent Registrar attributes "to the dreadful state of the drainage at that period:" out of 99 inmates 33 died. In October 1865 there was an outbreak of cholera at Thoydon Bois which within a fortnight attacked eleven persons, eight of whom died (*Eighth Report of the Medical Officer of the Privy Council, p.* 29.).

197; 1. ROMFORD; *Romford.* Population 9,741. Cholera 11; Diarrhœa 3. The first fatal case of cholera was that of a farm labourer, on 6th October, in Collier-row, Romford; at the same place three more deaths followed on 8th, two on 9th, three on 11th, and the last of an epidemic character on 13th. The whole of these 10 deaths occurred in the families of farm labourers, in Collier-row, between 6th and 13th October; six were of young children. The last death from cholera was of the daughter of a hairdresser at Dagenham, on 3d November. In the epidemic of 1849, cholera was fatal in 68 cases in Romford; of these four occurred in Collier-row, and 26 in Dagenham parish.

197; 2. ROMFORD; *Ilford.* Population 5,405. Cholera 1; Diarrhœa 5. The death from cholera was of the widow of a labourer at Aldbro' Cottages, Ilford, on 10th October, after an attack of only 13 hours' duration. There were here 59 deaths from cholera in 1849.

197; 3. ROMFORD; *Barking Town.* Population 5,591. Cholera 9; Diarrhœa 6. The child of a blacksmith died in Heath-street on 30th April. No further death occurred until 21st July, when the wife of a sawyer died in Fisher-street; this case was followed by six others, the last taking place on 8th August. Three of the deaths were recorded in New-street. Of the six deaths from diarrhœa, five were of infants, and the other of a female, aged 76 years. At the cholera visitation of 1849, 29 deaths occurred, of which six each were recorded in Heath and Fisher-streets.

197; 4. ROMFORD; *Hornchurch.* Population 6,228. Cholera 2; Diarrhœa 2. Of the two deaths from cholera, the first occurred at Hornchurch on 1st August; and the last at Great Warley on 28th October. Both were of children.

201; 2. ROCHFORD; *Prittlewell.* Population 5,394. Cholera 21; Diarrhœa 8. On 30th July the wife of an engraver and on the same day the daughter of a waterman died of cholera at Southend. The remainder of the deaths occurred at intervals up to the 17th September, when the last took place in the Leigh-road, Prittlewell. Two occurred in July; 10 in August, and nine in September. Six were recorded in Southend, five in Prittlewell, eight in Leigh, and the other two in Southchurch. In 1849 there were 41 deaths from cholera, of which 16 occurred at Leigh, and 10 at Prittlewell.

210; 3. SAFFRON WALDEN; *Radwinter.* Population 5,035. Cholera 7; Diarrhœa 1. The whole of these seven deaths from cholera occurred at Great Sampford, between 4th and 19th November; in several of the cases the illness was of very short duration. There was no death from cholera here in 1849.

V.—SOUTH WESTERN COUNTIES.

17. WILTSHIRE.

264; 1. SALISBURY; *Salisbury.* Population 9,039. Cholera 2; Diarrhœa 0.

The Registrar-General has been favoured by A. B. Middleton, Esq., M.R.C.S., with the following information relative to the sanitary condition of Salisbury during the three years of epidemic Cholera, 1849, 1854, *and* 1866.

In 1849 the cholera visited Salisbury (as did the plague of former times) with fearful severity, 165 deaths having occurred within three months amongst a population of about 9,300. At that time the subsoil of the city was soaked with moisture almost to its surface, and the sewerage was partly into small canals (lined with bricks, but not watertight) derived from the river Avon, and running through nearly every street, some of them covered, others open; and partly into cesspools, many very large, placed in a porous subsoil, often quite close to the wells, which were very shallow. The *water-supply* was chiefly from those wells, but many cottagers took their water from the open channels, which thus, at the same time, served the twofold purpose of fountains and sewers. Much of the beer was brewed with water from the channels, which received the contents of hundreds of privies and water-closets. The well water, generally very bad, was after heavy rains stinking and coloured with cesspool filth.

In 1851 an Inspector was obtained from the Board of Health, and a plan was made for combined sanitary works, not only for the city proper, but embracing the whole borough, *i.e.* taking in the Close and the part of Fisherton Anger parish, which is a suburb of Salisbury, across the Avon. It is worthy of remark, that, notwithstanding the dreadful cholera visit of 1849, the resistance to inspection was determined; and as the promoter of inspection, having failed to obtain the signatures of *one-tenth* of the ratepayers—the small proportion then legally required by the Public Health Act—I succeeded by inducing the Board of Health to use the compulsory clause of the Act, whereby an inspector could be sent to any town having an annual mortality over 22 in 1,000, the mortality of Salisbury, exclusive of cholera, having for years been nearly 27 in 1,000.

In 1853, within two years from the inspection, a majority having been obtained at the Local Board, works were actually commenced, the objects of those works being, 1, subsoil drainage; 2, sewerage; 3, water-supply. The works constructed consist of, 1, *larger mains*, being brick culverts; 2, *smaller mains*, of glazed earthenware pipes; 3, *subsoil drains*, of porous pipes; 4, *house drains*, of glazed earthenware. The main sewers are brought to a common outfall into the Avon below the city. The *water-supply* is from a well 68 feet deep, sunk in the chalk down, a short distance north of the city, and is continuous for 16 hours daily at high pressure. A reservoir exists 140 feet above the Avon level, and the water is circulated through iron mains and galvanized iron service pipes. The water obtained is not hard, but is of very excellent quality, and quite free from organic matters. The daily quantity pumped is about 600,000 gallons, which, taking the borough population at 12,600, gives about 48 gallons per head.

The public works for drainage, sewerage, and water-supply were completed in 1854. Of course, as the connecting of houses therewith extended over a longer period, it will be impossible to fix any date for their completion; indeed, even now some few remain unconnected, but it may be safely said that by the end of 1856 a majority of the *private* works were finished.

In 1854, during this transition state, a cholera epidemic happened, and from it 15 deaths were registered in Salisbury. At that time the public works having been done the subsoil must have already become much drier, although not quite dry, as now it is, because the channels, since destroyed, then existed, and were one great cause of dampness, not being water-tight.

Many houses having been connected with the mains at this time, the question arises whether cholera happened in any premises so connected, and supplied with the new water? After a careful personal investigation, I record the fact that all the 15 cases occurred in houses remaining in their old condition.

In 1866, with the *public works completed and the private works nearly so*, Salisbury may claim an absolute freedom from attacks of the cholera epidemic. It is true that the register contains one death from cholera and one from choleraic diarrhœa, but the case of cholera was imported under the following circumstances: A young man, *resident for some time near Southampton*, was there attacked with cholera, and brought thence to his parents' house in Salisbury; he was then in the stage of collapse, fainted at the railway station, and lingered 3 or 4 days after his arrival at home.

The Salisbury Local Board of Health district includes the Close, and part of Fisherton lying within the borough, the deaths of which are registered in Alderbury district. From personal examination of the registers, I find that the Close in 1849, with a population of about 560, had 3 deaths from cholera; it was then undrained, having cesspools, and wells adjacent with bad water, as in the town; in 1854, in a transition state, no cholera cases; in 1866, sanitary works done, also no cholera. Fisherton, undrained, and water bad, in 1849, out of a population of about 1,800, had 11 cholera deaths; in 1854, in transition state, 4 cholera deaths; in 1866, sanitary works done, there was 1 death registered as *cholera*, but that case was of a very questionable character. A woman, aged 43, of drunken and dissipated habits, during hot weather ate excessively of bad cucumber, and drank correspondingly gin and beer; her death followed, and was registered as *cholera* upon the certificate of the assistant of a medical man. [*See a valuable pamphlet by Mr. Middleton on "The Benefits of Sanitary Reform;" read before the British Association at Bath in* 1864.]

19. Devonshire.

281; 1. St. Thomas; *East Budleigh*. Population 4,649. Cholera 1; Diarrhœa 2. A farmer, aged 73, died on September 13th, at Otterton; "diarrhœa, 6 days; Asiatic cholera, 36 hours."

281; 2. St. Thomas; *Exmouth*. Population 7,171. Cholera 28; Diarrhœa 5. 19 of the deaths from cholera occurred in the parish of Littleham, including eight in Fore-street; the first fatal case occurred on September 3d, and the last on October 31st; the deaths were not confined to persons of any particular occupation, but were much more numerous among adults than children.

281; 3. St. Thomas; *Woodbury*. Population 3,916. Cholera 11; Diarrhœa 1. The whole of the deaths from cholera took place in the parish of Woodbury; four died in one family in October. The first case was that of a sawyer's daughter, on September 23d, and the last that of a labourer's daughter on November 23d. Of these 11 deaths, eight were of females.

281; 5. St. Thomas; *Topsham*. Population 4,777. Cholera 19; Diarrhœa 9. The first death from cholera occurred on August 12th, followed by three other deaths during the month; three of the deaths were of persons aged 75 years and upwards. Four deaths occurred on September 13th. White-street and Fore-street suffered the most. The last death was that of a seaman's son on September 25th. There was no death from cholera in this sub-district during the epidemic of 1849.

281; 6. St. Thomas; *Heavitree*. Population 6,556. Cholera 14; Diarrhœa 1. Seven of the deaths from cholera occurred in Jubilee-place, St. Leonard's; the last fatal case in Jubilee-place was on October 11th, when a dairyman, aged 52, died from "diarrhœa, 2 days; cholera, 7 hours." The last two deaths occurred on October 22d in Weirfield-street, where the sons of a cabinet-maker, aged respectively six and eight years, died, the first after 16 hours' and the second after 19 hours' illness.

281; 7. St. Thomas; *St. Thomas*. Population 6,053. Cholera 1; Diarrhœa 9. This death from cholera was of a labourer's daughter, aged four years, on September 27th, in Cockle's-court.

281; 8. St. Thomas; *Alphington.* Population 4,097. Cholera 2; Diarrhœa 3. First death from cholera the son of a storekeeper, aged 12, at Alphington, on September 4th; second, a blacksmith, aged 45, at Tedburn St. Mary, on October 8th. There was no death from cholera in the year 1849.

281; 10. St. Thomas; *Kenton.* Population 5,442. Cholera 41; Diarrhœa 8. Cholera was fatal to a farm labourer, aged 58, at Kenton, on June 21st; another fatal case occurred on the 29th; in September eight deaths were registered; in October there were 31 deaths, the last being that of a labourer, aged 45, on October 26th in the County Lunatic Asylum. 37 deaths of males (30 of these occurring in the County Lunatic Asylum at Exminster) were recorded against four of females. The following are the localities, with the number of deaths in each:—Exminster 33, Kenton three, Kenn three, and Powderham two. In 1849 the deaths from cholera were three, not one occurring in the parish of Exminster.

282; 1. Exeter; *St. Sidwell.* Population 18,530. Cholera 67; Diarrhœa 19. The first death from cholera was that of a labourer, aged 70, in Union-terrace, St. Sidwell, on August 12th. The epidemic was at its height in September, more than half of the deaths taking place during that month. Three members of one family died shortly after each other in September; a pedlar (gipsy), aged 28, in Rack-street, on September 26th, after 12 hours' illness; and his two children in the workhouse, one on the 28th the other on the 29th. The disease raged very severely in Preston-street, where 17 of the deaths occurred, two or three in a day. The last death was that of a tailor's wife, aged 49, in Rack-street, on November 10th. The number of deaths from cholera in the year 1849 was 11.

282; 2. Exeter; *St. David.* Population 15,212. Cholera 45; Diarrhœa 21. A labourer's wife, aged 23, died from cholera, on August 11th, in Ewing's-lane. The disease was most fatal in September, but few deaths occurring in October, and only three in November; the last two deaths were those of a herbalist's widow and her son, who died in King-street, the son on November 4th and the mother on November 10th; the duration of attack in the majority of cases was very short. During the epidemic of 1849 the deaths from cholera were 33.

283; 1. Newton Abbot; *Teignmouth.* Population 11,184. Cholera 23; Diarrhœa 6. The first death from cholera was that of a seaman's daughter, aged eight years, at Ringwood-road, on June 6th; no other death took place until September 10th, when an agricultural labourer, aged 50, and his son, aged two years, died at Cockwood, Cofton; on the 14th the widow died, making the third death in this family; not one of these three deaths was certified. There was no other death until September 20th, but by the end of the month 15 fatal cases had been recorded, including four in Park-row, Dawlish. The last death was that of a carpenter's son (who had previously lost his father from cholera), on October 10th. Only two deaths from cholera occurred during the epidemic of 1849.

283; 2. Newton Abbot; *Chudleigh.* Population 6,747. Cholera 4; Diarrhœa 2. The first fatal case of cholera was that of a stoker in the navy, aged 27, who died on September 6th, at Knighton; the last two deaths occurred in Fore-street, Bishopsteignton, and were respectively a gardener and his wife, the wife on October 23d and the husband on the 25th.

283; 3. Newton Abbot; *Moreton Hampstead.* Population 2,718. Cholera 1; Diarrhœa 2. A labourer, aged 46, died at Clay, North Bovey, on October 12th, of cholera, after 22 hours' illness.

283; 5. Newton Abbot; *Newton Abbot.* Population 10,467. Cholera 15; Diarrhœa 9. Cholera was fatal principally at Hackney, Newton Abbot, and Kingsteignton, the majority of the deaths taking place in October. The first fatal case was that of a labourer's wife, at Ipplepen, on August 20th; the last, a lighterman's daughter, at Kingsteignton, on November 11th.

283; 6. Newton Abbot; *Torquay.* Population 21,585. Cholera 9; Diarrhœa 10. On August 20th, cholera was fatal to the wife of a china mender, aged 38, in Temperance street; the next case occurred at Higher Union-lane, on September 3d. Nearly all the deaths took place in labouring families; the last being that of a labourer's wife at the Torbay Infirmary, on October 8th. The number of deaths from cholera in 1849 was 72, the epidemic chiefly prevailing in Swan-street and Warren-place.

284; 1. Totnes; *Paignton.* Population 4,266. Cholera 31; Diarrhœa 1. In 1849 there was no death from cholera in this sub-district, but in 1866 a sharp outbreak occurred, the duration of attack in the majority of cases being very short. A male, aged three years, died on August 1st at Stoke Gabriel; on the next day there was another death at the same place. The next fatal case was not recorded until August 21st, but after that date deaths took place daily, and by the end of the month numbered 18. In September only three occurred, the last on the 9th, making a total of 21 deaths at Stoke Gabriel. On 6th October three fatal cases were recorded at Paignton, another on the 7th and 11th, and the last at Goodrington on October 18th. Farm labourers and their families were the principal sufferers.

In compliance with a request from the Registrar General, Charles Pridham, Esq., L.R.C.P.Ed., has kindly supplied the following interesting and detailed account of the circumstances attending the outbreak of cholera in the sub-district of Paignton.

The village of Stoke Gabriel, situated on the east bank of the river Dart, has a substratum of slate and green stone. The first point that attracts attention in a sanitary point of view is the occurrence of watercourses which carry the rain-fall from the surrounding hills to the river, and

receive the surface drainage of the village in their course. During wet seasons a plentiful supply of water carries off most of the impurities which find their way to these streams, but after any continuance of dry weather, as in the fall of 1866, the courses of the streams become almost dry, and sewage matters becoming deposited form a fertile source of miasmatic disease. In addition to this, the inhabitants save with great care substances likely to be of service as manure, and the receptacles for, or rather deposits of, the refuse of fish and other putrefying substances were apparently kept as near as possible to the houses. I should mention that fish is one of the chief articles of food of the inhabitants.

Although the general fall of the land is obviously towards the river, yet at certain points, as at the Higher Court, where cholera was very fatal, small patches of level ground occur without any natural fall, and the houses are built below overlying ground; so much so, that fifteen feet from most of the houses where cholera prevailed the ground is higher than the eaves of the houses, thus preventing the circulation of fresh dry air in the dwellings, and withholding any chance of natural drainage from the back courts. Of artificial drainage there was none; and I regret to find that the limited amount which has been carried out since the visitation of cholera does not serve the desired end, *a decided failure* in the anticipated amount of discharge having resulted, the inhabitants declining or neglecting to drain into it. The labouring class in this village, in whose homes the disease was most fatal, are, with a few exceptions, improvident and dissipated in the extreme.

Lower Court (*Stoke Gabriel*), and *Waddeton*. Four deaths. In this court three deaths occurred. A carpenter (peculiarly exposed from his employment as undertaker to contact with the bodies of those who had died) succumbed during consecutive fever. The other two persons resided close to a privy (which one of them had cleaned out shortly before his attack) and near one of the streams previously alluded to, which at this point is particularly offensive, and receives much noxious matter. The three drank water from a well in the middle of the court, sunk in very low ground, and in all probability receiving soakage from the watercourse and privy. The water, on examination, was found to be very impure.

Close to this court a man was staying; he was suffering from choleraic diarrhœa and cramp, was removed to his own home at Waddeton, a mile distant, and recovered. A fortnight after a gardener, who resided in the next house (at Waddeton), was seized with cholera and died. The water this man was in the habit of drinking was good; but in his employment as gardener at Waddeton Court he daily used liquid manure of a very offensive description. The privy accommodation at the rear of his house was bad.

Upper Court (*Stoke Gabriel*). 15 deaths. In this court, in the house of a rag and bone dealer, prior to the first undoubted cases of cholera, three cases of an anomalous character occurred, two of them (in children) fatal. The two first cases of undoubted cholera in this court were those of a woman and her husband. The woman had attended upon and washed for the two children, previously mentioned. The next three deaths were in two houses, one adjoining the premises of the rag and bone dealer, the other adjoining that of the man and wife previously attacked. The disease then spread along the course of an ill-constructed drain which ran in front of the houses, and into the open mouth of which the excreta from the first-named patients had been poured. One or two deaths occurred in each house in the course of this drain, which was not calculated for the conveyance of sewage, but merely for surface water from the road. All the patients had been drinking water from the same source, which was found on examination to be of a most offensive description, and charged with decomposed animal and vegetable matter. Fifteen deaths occurred in eleven days in the eleven houses comprising this group. At two points openings are made in the orchard walls opposite the houses, resembling on a large scale the slits at which before pillar posts were invented we were accustomed to post our letters, and through these openings the inhabitants discharged their excreta, stale fish, &c., there to lie and decompose within fifteen feet of the houses.

Combe Shute (*Stoke Gabriel*). Three deaths. This locality is most unfavourably situated, and the two first deaths registered as cholera in the sub-district occurred here. The houses are within 300 yards of a considerable extent of mud and grass land, which at spring-tides is covered with water, but at other times is a swamp, and at night a dense fog arises from it. The house in which the two first cases occurred is of a very inferior description, and the children are reported to have been ill-nourished and destitute of every comfort. The stream, which runs close to it, renders the house very damp and unwholesome; immediately in front is a sort of catch-pit, generally half full of manure, and when the water springs are high it becomes a pond of dirty water, which, as the water subsides, fulfils all the qualifications of a pest-pit. The well common to the inhabitants is at a lower level than the houses, and being very shallow appears to derive its supply of water from the stream, which carries with it the overflow of the dung-pit and corner used as a privy; the water was reported as being bad. A poor man who was attacked in the opposite house left for Tuckenhay, on the west side of the Dart, and there died in a few hours. The death of a woman was the only one that appeared unconnected with any local causes. She lived in a healthy situation, and drank pure water, but was what is termed a weakly person.

Goodrington (a hamlet a mile and a half from Paignton). Four deaths. The first person attacked in this hamlet was a woman who had lately returned from nursing her father, mother, and sister at Stoke Gabriel; she recovered. A fortnight later two fatal cases occurred, viz., Mr. and Mrs. D——, for whom the woman's husband worked, and they had shown his wife great kindness during her illness. The water they were in the habit of drinking was contaminated and rendered very offensive in consequence of drainage from the closet getting into the well. A fortnight after Mrs. B——, who resided midway between the house of the first woman attacked and that of

Mr. and Mrs. D——, took the disease and died; also a man named P—— who worked for and occasionally drank the same water as the D——'s. Out of a population of eighty at most, six took the disease and four died. I reported the first case which occurred to the Nuisance Committee, but I regret to state no measures were taken to prevent the spread of the disease until other cases occurred.

Roundham (a hamlet about a mile from Paignton). Four deaths. The first case that occurred in this locality was that of a man who was frequently in the habit of visiting Brixham, where cholera was raging. The subsequent deaths (three in number) occurred also to persons who were drinking water of a most deleterious character, containing three times the impurity found in any of the water supplied by the London companies; the well it was taken from receiving the sewage from a completely choked drain which ran in its vicinity. The supply of water was very small as well as deleterious, and only rendered drinkable from the accidental fact that the sewage ran through a bed of sand before it reached the well. From the day of this well being locked up no new case of cholera occurred. I had reported to the Local Board, two months previous to the first of these cases, on the insufficiency of the water supply and the choked state of the drain; the only reply I could get from the Board being, "The want of water at Roundham Cottages is greatly to "be lamented, but is solely the fault of the owners of that property, who have joined in making "an excellent well, but cannot agree among themselves as to the placing of a pump."

284; 2. TOTNES: *Brixham.* Population 6,750. Cholera 78; Diarrhœa 5. Seven deaths from cholera occurred in August (the first on the 18th), but in September and the early part of October the epidemic was very fatal, especially amongst the seafaring population; the last death that took place was in Higher-street, Brixham, on October 29th. 20 deaths occurred at Upper Brixham; 13 in Higher-street, six in Fore-street, and several in King-street and Greenswood. The number of deaths in 1849 was 75.

In answer to inquiries, Mr. Lakeman, the Registrar, writes as follows.—

The parish of Brixham is divided into the districts of Lower and Upper Brixham. The district of Lower Brixham has adopted "The Local Government Act," and is under the management of a Local Board. The inhabitants of this district are supplied with water from two public wells situated in the heart of the town; one of these has been recently sunk by the Local Board, and the water is considered pure; the other is a very old well, and has been thought to be polluted. There is also in this district a reservoir belonging to the Admiralty, which is situated in the midst of the town, and is supplied by a pipe leading from a stream about a mile from the town; a conduit, situated at the quay, from which the public draw water, is supplied from this reservoir, the water from which is of very questionable purity, as the reservoir is a mere open pond, and the water is exposed in a large surface to the sun and air.

The district of Upper Brixham is supplied with water from several sources, of these the principal one being a spring called "St. Mary's Well," which, although slack in the summer, has never been known to be dry: the water from this source is considered to be of very good quality. Another supply is derived from a well at Greenswood, which is in fact in the Lower Brixham district, although the people using the water live in Upper Brixham. The means they have hitherto used for obtaining the water from the well is by dipping pails into the water, but the Local Board intend placing a pump to prevent pollution of the water by drawing. Another source of supply in this district is a well situated at Polhearne, where a pump has been placed recently to avoid the dipping of pails. Other supplies of water are obtained in both districts from private wells, and from rain-water caught from the roofs of houses.

The mortality from cholera in 1866 is attributed, in great measure, to the people living in an unhealthy state from overcrowding, imperfect conveniences, and defective drainage.

The deaths were almost confined to the poorer classes, and it was a noticeable fact, that cholera prevailed very severely in the neighbourhood of the three water supplies of Upper Brixham above spoken of; whether the cause was the pollution of the water or the affinity of any miasm to the damp localities I do not pretend to say, but the disease was much more concentrated around these supplies than in any other locality in the parish, except in one part of Lower Brixham, where there was no public water supply at all.

284; 3. TOTNES; *Dartmouth.* Population 5,429. Cholera 20; Diarrhœa 15. The epidemic prevailed here in August, principally in farm labourers' families, at Higher Dittisham, several families losing more than one member; there were also a few deaths at Lower Dittisham, the last case recorded being that of a thatcher's son, aged 12, on September 4th. More than half the deaths from diarrhœa were of adults aged 40 years and upwards.

284; 4. TOTNES; *Totnes.* Population 5,881. Cholera 14; Diarrhœa 5. The first death from cholera was that of a lighterman's daughter, aged three years, at St. Peter's Quay, on July 26th. The next was on August 16th, when an agricultural labourer died in the workhouse. A labourer and two daughters died in August at Tuckenhay, Ashprington, after illnesses of very short duration. The last fatal case was that of a labourer's widow, aged 50, in the workhouse on September 28th.

287; 1. PLYMOUTH; *Charles the Martyr.* Population 23,390. Cholera 7; Diarrhœa 28. The matron of the Female Home, Hill Street, died of cholera on August 27th; two other deaths also occurred in the same house, one on August 30th, and the last on September 12th. The last death recorded was that of a child at the workhouse on October 30th. The Registrar speaking of the outbreak in the Female Home, states that it originated from the opening of a drain

(which had become choked) under the window of the laundry, and the stench was so powerful as to affect almost every one in the house. Prompt means were adopted to remove the inmates during the necessary repair of the sewer. A great deal has been done by the authorities within the last few years for effecting a better sanitary condition of the town. In 1849 the number of deaths from cholera was 264, chiefly occurring in labourers' and tradesmen's families in Plymouth.

287; 2. PLYMOUTH; *St. Andrew.* Population 39,209. Cholera 6; Diarrhœa 67. The first fatal case of cholera was that of a labourer's daughter in Granby-street on August 5th; the last death (the infant son of a soldier after 23 hours' illness) occurred September 23d at Granby-lane. In 1849 the deaths from cholera in the district of Plymouth were 830, against 59 in 1854; and 13 in 1866. The registrar states that the condition of Plymouth is generally healthy, and that the cases of cholera have not arisen from epidemical influences, but rather from local causes, neglect of the rules of health, and from pestiferous vapours in dwellings, caused by filth and the want of necessary comforts in sickness.

292; 2. CREDITON; *Bow.* Population 3,516. Cholera 16; Diarrhœa 0. With the exception of a death at Bow, on October 15, the whole of the deaths from cholera took place at Zeal Monachorum; they occurred as follows:—October 7th, three deaths; October 8th, eight; October 9th, one; October 13th, two; and October 14th, one. Mr. Bibbings, the Registrar, states that the water-supply of Bow is brought in iron pipes from a reservoir about a mile distant from the village; all the other parts of the sub-district are supplied from wells, none of which are liable to pollution excepting at Zeal Monachorum, where the runnings from the roads are apt to leak into the wells. There was not a single fatal case of cholera in the sub-district during the epidemic of 1849.

292; 3. CREDITON; *Crediton.* Population 6,533. Cholera 2; Diarrhœa 1. An innkeeper died of cholera, after 12 hours' illness, in Dean-street on August 27th; and the son of a land drainer, at Bowden-hill on September 14th.

293; 1. TIVERTON; *Silverton.* Population 5,120. Cholera 4; Diarrhœa 2. These deaths from cholera occurred at Bradninch, the first on September 28th, and the last on October 10th.

293; 4. TIVERTON; *Tiverton.* Population 10,447. Cholera 26; Diarrhœa 10. The deaths from cholera occurred principally among workmen of different occupations; the epidemic appears to have subsided for a time, and then broken out afresh, for no death was recorded from September 18th until October 1st, when a child died of cholerine in Melbourne-street; deaths continued to occur at intervals during the remainder of the month, the last fatal case being that of a sawyer, aged 68 (who had previously lost his wife from cholera), at Townsend on October 27th.

294; 2. SOUTH MOLTON; *Chulmleigh.* Population 5,062. Cholera 8; Diarrhœa 2. A sharp outbreak of cholera occurred among two or three families of farm labourers, the disease proving fatal within a few hours after first attack; the epidemic was strictly confined to Chulmleigh, and only lasted a week; the first death took place on September 9th, and the last on September 16th. It was fatal to three adults and five children. No death occurred from cholera during the epidemic of 1849.

297; 1. BIDEFORD; *Bideford.* Population 5,851. Cholera 2; Diarrhœa 3. On August 21st, a gentleman, aged 44, died in the High-street of "Asiatic cholera, 20 hours, apnœa, 12 hours;" and a shipwright, aged 17, in Milton-place on October 22d, after 13 hours' illness.

297; 2. BIDEFORD; *Northam.* Population 4,460. Cholera 11; Diarrhœa 1. Seamen and their families were the chief sufferers from the epidemic, and it was confined to two streets, Meeting-street (Appledore) and Irsha-street; there being six deaths from cholera in the former, and five in the latter. The first fatal case was recorded on July 29, and the last on September 3d.

21. SOMERSETSHIRE.

316; 2. BRIDGWATER; *North Petherton.* Population 5,305. Cholera 1; Diarrhœa 2. On August 26th, the widow of a carpenter, aged 56, died in Fore-street from choleraic diarrhœa (48 hours).

316; 4. BRIDGWATER; *Bridgwater.* Population 13,694. Cholera 6; Diarrhœa 14. Four of the deaths from cholera occurred at Eastover, Bridgwater, in October. The last fatal case recorded was that of an engineer's wife, aged 35, in St. John-street, on November 1st. 213 deaths from cholera were registered during the epidemic of 1849, Eastover being one of the localities that suffered considerably.

316; 5. BRIDGWATER; *Huntspill.* Population 4,003. Cholera 2; Diarrhœa 3. Both the deaths from cholera occurred at Huntspill; the first that of a blacksmith, aged 29, on September 30th; and the last that of a female, aged 55, on October 9th.

316; 6. BRIDGWATER; *Polden Hill.* Population 3,701. Cholera 1; Diarrhœa 1. A farm labourer, aged 67, died at Burtle, Catcott, from cholera on October 5th.

323; 2. WELLS; *Glastonbury.* Population 10,635. Cholera 20; Diarrhœa 6. The majority of the deaths from cholera occurred in September, to farm labourers and their families; the last fatal case recorded was that of a farm labourer's wife, aged 33, on October 15th. Several cases

occurred in North Load-street; and in the High-street two persons died in one family from choleraic diarrhœa.

328; 1. BEDMINSTER; *Bedminster.* Population 22,346. Cholera 6; Diarrhœa 22. The first death from cholera was that of a mariner, aged 20, in Princes-street, Toll-gate-lane, on April 24th; the next case was that of a farrier in Upper Somerset-terrace, on August 19th, his daughter also dying from cholera on the following day. The last death occurred on October 28th, at Stillhouse-lane (a sawyer's widow, aged 80). The deaths from cholera during the epidemic of 1849 were 243.

328; 2. BEDMINSTER; *Long Ashton.* Population 5,864. Cholera 2; Diarrhœa 4. A milkman, aged 48 years, died at Long Ashton, on August 25th, and a tailor's daughter, aged six months, at the workhouse, on November 15th, from cholera.

328; 4. BEDMINSTER; *St. George.* Population 4,811. Cholera 16; Diarrhœa 3. The whole of the deaths from cholera occurred at Pill St. George; four fatal cases were recorded in October (the first on the 22d), and the remainder in November. The epidemic was particularly fatal in November, among railway labourers and their families. In 1849 the deaths from cholera were 32, and its fatality was then strictly confined to Pill St. George.

The following incident (published in the *London Weekly Return, No.* 45.) will be sufficient to give some idea of the state of the village of Pill:—

The sanitary officers found one man sleeping in a watercloset surrounded by rice-water choleraic discharges, and they learnt on good authority that this man had been in the habit of sleeping in different waterclosets about the village for the past six months, and when driven away from one he sought shelter in another.

VI.—WEST MIDLAND COUNTIES.

22. GLOUCESTERSHIRE.

329; 1. BRISTOL; *St. Mary Redcliffe.* Population 14,335. Cholera 4; Diarrhœa 12. First fatal case of cholera occurred on 19th July, when a grocer's daughter, aged nine years, died in Temple-street. The last case was the wife of a groom, aged 40, in Cart-lane, on 27th October. In 1849 there were 167 deaths from cholera.

329; 2. BRISTOL; *Castle Precincts.* Population 10,194. Cholera 5; Diarrhœa 13. Two of the deaths from cholera occurred in St. Peter's Hospital (workhouse), on 18th September. In 1849, when the deaths from cholera were 224, 31 took place in this hospital.

329; 3. BRISTOL; *St. Paul.* Population 15,775. Cholera 3; Diarrhœa 13. The first death from cholera occurred in Unity-street, St. Philip, on 21st July; the second in Old Market-street, on 16th August; and the third in Lathom-court, St. Philip, on 27th August. In 1849 the deaths from cholera were 117.

329; 4. BRISTOL; *St. James.* Population 10,325. Cholera 1; Diarrhœa 12. The only fatal case of cholera occurred on 21st October to a cooper. Of the 12th deaths from diarrhœa 10 were those of children under one year of age.

329; 5. BRISTOL; *St. Augustine.*—Population 15,398. Cholera 4; Diarrhœa 14. First fatal case of cholera occurred on 18th September to a tailor's cutter, aged 40, after an attack of nine hours' duration; on 24th September the daughter of a cab driver, aged 10 months, died from "Asiatic cholera, 3 days, consecutive fever, 17 days." There were no further deaths until 12th November, when the two sons of a mason's labourer, aged respectively one and eight years, died in Warren's-court from Asiatic cholera (13 hours and 7½ hours).

330; 1. CLIFTON; *Clifton.* Population 21,375. Cholera 1; Diarrhœa 8. A sawyer, aged 50, died at Cumberland Basin, on 8th September, from "diarrhœa 48 hours, Asiatic cholera, 3 days."

330; 4. CLIFTON; *St. Philip and Jacob.* Population 31,753. Cholera 9; Diarrhœa 21. The first death from cholera took place 26th July, in Canning-street; and the last, 6th September, in Jubilee-street.

Mr. David Davies, M.R.C.S., Medical Inspector to the Bristol Board of Health, forwarded to the Registrar General the Report of the Health Committee, from which the following paragraphs are extracted (*London Weekly Return, No.* 44.):—

"With reference to the sanitary condition of the city and county of Bristol, your Committee have to report that at the present time it is most satisfactory, there not being any cases of cholera, or, so far as your Committee are informed, of epidemic disease of any kind; and it appears by the last week's returns of the Registrar General that the rate of mortality for that week was at the very low annual rate of 14 per thousand. As regards the late visitation of cholera to this district, it appears from the report of the medical inspector, that the first case of Asiatic cholera in this city during the present year (which was also the first reported in England) occurred at Princes Street

Turnpike, on the 23d of April, and that the last case was in a cottage near Bedminster Turnpike, on the 24th of September. Between these dates, and with a clear interval of three months between the first and second cases, it appears that 45 cases of cholera and choleraic diarrhœa of a specific character have been reported; 27 died and 18 recovered. The disease appeared in isolated cases at intervals in 25 different places, and affected 28 different houses. The points wherein the epidemic appeared are scattered pretty equally over the district, within a circle of the most distant ones, which were as follows: — Richmond Hill, Montpelier; Windmill Hill, and Parson Street, Bedminster; Cumberland Basin; Park Hill, and Kingsdown Parade. In only three cases did the disease extend to the adjoining house, and it is the opinion of the medical inspector that this arose from the first case in each of these places not having been reported at an earlier period for the application of preventive measures. Fourteen cases have been traced to infection from other places where the disease prevailed in an epidemic form; and it is more than probable that the other cases were communicated in a similar manner, although as yet the medical inspector has not been able to trace the communication.

"Anticipating that the district would be visited by the epidemic in the summer and autumn, the Committee gave instructions early in the spring that every part of the district should be minutely inspected with special regard to the expected epidemic; and in April they appointed a number of workmen, under the supervision of the nuisance inspectors, to cleanse and disinfect all privies accessible to them, and to whitelime all courts, alleys, and passages. All nuisances which were discovered by the inspectors were reported, and either the landlord or the occupier was required to abate the same.

"When the disease reappeared on the 21st July, the measures considered necessary to prevent the spread of the epidemic were taken in all the early cases by your officers under the instructions of the medical inspector. After the appointment of officers by the local authorities under the Diseases Prevention Act, the disinfection of houses, clothing, and other matters was carried out very efficiently by them, your officers continuing to disinfect all drains and open privies, and to remove nuisances. Wherever a case of cholera appeared, all the drains and sewers communicating with it were charged with sulphate of iron or other chemicals by the officers of your Board, and all the sewers in the low levels were kept so charged until the end of September.

"In consequence of this, as your Committee believe, none of the drains or sewers became contaminated with infection, no case of the disease having been traced to this source.

"The measures adopted appear to have been uniformly successful in arresting the disease at each point, irrespective of the state of the weather, which during the occurrence of the earlier cases was dry, and afterwards wet; and your Committee consider themselves justified in believing that the preventive measures adopted by them, and by the local authorities, under the Diseases Prevention Act, were, under the blessing of God, the means of saving the city from a widely spread epidemic, and they hope that similar measures will be adopted in other places, as the prevalence of the disease in one town endangers every other in the country.

"Your Committee are sorry to find that the epidemic lingers in other places in England. They cannot but regard this fact with some anxiety, but trust the coming winter will eradicate it; at all events, it will be their endeavour, should fresh cases unfortunately occur in your district, to meet them by applying remedies with the promptitude and energy which are necessary for the success of such measures.

"The Committee consider that the expenses incurred by your Board and the local authorities in carrying out preventive measures have been on the soundest principles of economy, as, had the disease assumed an epidemic form, the public would have become responsible for many years for the support of a large number of widows and orphans." [*See also Paper on "Asiatic Cholera in Bristol" by Dr. W. Budd, published in the British Medical Journal of 13th April* 1867.]

25. Staffordshire.

371; 1. Stoke-upon-Trent; *Hanley.* Population 16,848. Cholera 3; Diarrhœa 23. The fatal cases of cholera occurred as follows: 19th July, in Market-street, a commercial traveller, aged 57; 17th November, in Church-street, the wife of a beer seller, aged 50; 19th November, in Bath-street, the widow of a collier, aged 46. Diarrhœa was almost exclusively confined to children under one year of age.

371; 2. Stoke-upon-Trent; *Shelton.* Population 18,331. Cholera 5; Diarrhœa 28. The first fatal case of cholera was that of a female, aged six months, at Etruria, on 2d July; two more deaths of children occurred in July; one in August (an adult); and the last on 4th November (a house-agent, aged 46, after an illness of 22 hours). Cholera was fatal to 43 persons in 1849.

26. Worcestershire.

383; 3. Stourbridge; *Kingswinford.* Population 34,257. Cholera 13; Diarrhœa 36. The first fatal case of cholera occurred on 1st July, at Wall Heath, when the daughter of a bricklayer, aged one year, died of choleraic diarrhœa (36 hours); the next case did not occur until 5th September, when the disease appears to have broken out at Rocks Hill, Brierly Hill, where seven

deaths were recorded between the 5th and 13th of September, four of them being described as Asiatic cholera; four deaths also occurred at Delph, the last on 21st September. During the epidemic of 1849 cholera was fatal to 212 persons.

393; 2. KINGS NORTON; *Edgbaston.* Population 16,037. Cholera 2; Diarrhœa 9. The first fatal case was that of the son of a factor, aged six weeks; the second, the widow of a steel-pen manufacturer, aged 65.

393; 3. KINGS NORTON; *Harborne.* Population 16,996. Cholera 6; Diarrhœa 15. The first death from cholera took place on 12th June at Nursery-lane, Harborne; the last being that of a carpenter, aged 70, at Oldbury-road, Smethwick. Four of the deaths occurred in Green's Village, during the month of October.

27. WARWICKSHIRE.

394; 1. BIRMINGHAM; *Lady Wood.* Population 34,728. Cholera 1; Diarrhœa 38. This case of cholera occurred in Ryland-street North, on 13th August, to the daughter of a bricklayer, aged one year. 27 of the deaths from diarrhœa were those of children under two years of age.

394; 3. BIRMINGHAM; *St. Martin.* Population 30,252. Cholera 2; Diarrhœa 44. Both these cases of cholera occurred on 29th August, to widows of labourers, aged respectively 52 and 68 years.

394; 4. BIRMINGHAM; *St. Peter.* Population 14,806. Cholera 1; Diarrhœa 27. The case of cholera occurred on 19th July, in No. 3 Court, Duddeston-row, to the son of a brassfinisher, aged three months, "English cholera" 3 days.

394; 7. BIRMINGHAM; *St. Mary.* Population 17,477. Cholera 1; Diarrhœa 29. The son of a carrier, aged one year, died of English cholera on 24th October.

394; 8. BIRMINGHAM; *St. George.* Population 44,405. Cholera 5; Diarrhœa 76. The first death from cholera occurred 20th May, and the last 3d September; they were all described as English cholera. In three cases inquests were held.

394; 9. BIRMINGHAM; *All Saints.* 'Population 19,820. Cholera 1; Diarrhœa 20. On 4th August, the wife of a gold-cutter, aged 42 years, died from cholera.

In the district of Birmingham, comprising nine sub-districts, with a total population of upwards of 200,000 persons in 1861, only 11 deaths from cholera occurred in 1866, 17 in 1854, and 29 in 1849; in the same years the deaths from diarrhœa were 289, 560, and 427.

VII.—NORTH MIDLAND COUNTIES.

30. LINCOLNSHIRE.

434; 1. GAINSBOROUGH; *Owston.* Population 4,649. Cholera 7; Diarrhœa 3. Three deaths from cholera occurred at West Butterwick; an agricultural labourer, aged 67, on the 10th August, and two agricultural labourers' widows, aged respectively 73 and 45. Of the seven fatal cases of cholera four occurred at West Ferry. In 1849, when there were 16 deaths from cholera and 11 from diarrhœa, the epidemic was most fatal at West Ferry and West Butterwick.

434; 4. GAINSBOROUGH; *Gainsborough.* Population 7,339. Cholera 20; Diarrhœa 16. After seven fatal cases of diarrhœa, only two of which were those of adults, cholera broke out at Albion-place, Gainsborough, on 27th July; first fatal case, the wife of an agricultural labourer, aged 33, died in 17 hours. Of the 20 deaths from cholera, eight occurred in Bridge-street, where the last death took place on 13th November. In 1849 there were 211 deaths from cholera, 56 of which occurred in Bridge-street.

VIII.—NORTH WESTERN COUNTIES.

33. CHESHIRE.

455; 3. RUNCORN; *Runcorn.* Population 13,590. Cholera 10; Diarrhœa 15. The first death of an adult from cholera was that of a master mariner on 1st September, after 16 hours' illness. On 10th October, a mariner also died from "Asiatic cholera, 9 hours," in the cholera hospital. The last fatal case occurred at Regent-street on 9th November to an engine driver at steam saw mill, "cholera, 24 hours, bronchitis, 3 days."

456; 2. NORTHWICH; *Northwich.* Population 12,941. Cholera 13; Diarrhœa 10. Six of the deaths from cholera occurred at York-buildings, and four at Leftwich-lane. The first death occurred

at Leicester-street, Witton, on 2d July, of a flatman, aged 65. On the 27th and 29th September, two wives of flatmen died at Leftwich-lane; and at York-buildings on 3d November, a son and daughter of horse drivers on river, died, aged respectively two and four years.

456; 3. NORTHWICH; *Over.* Population 8,304. Cholera 54; Diarrhœa 4. On 18th June a pansmith at Wharton, died from Asiatic cholera, aged 42, after 14 hours' illness. The epidemic continued with increasing violence up to 22d August, when the last death occurred at Over, of a bricksetter, aged 69. In July the epidemic proved fatal to 43 persons, 29 of whom (including children) were engaged in salt manufacture. Mr. Arrowsmith, the Registrar, states that the water supply of the sub-district is derived chiefly from wells, but in some cases from a brook which is contaminated by a large quantity of sewage running into it at a higher level. There is no proper system of sewerage, the water supply is inadequate (many of the inhabitants having to go long distances to fetch it), and there is an almost total neglect of sanitary measures. In 1849 only four deaths from cholera were recorded.

456; 4. NORTHWICH; *Middlewich.* Population 5,644. Cholera 8; Diarrhœa 1. Cholera was fatal on 9th July to a saltmaker's wife, aged 39, at Mere Heath, Davenham; duration of attack, 19 hours. The last death of an adult was that of a boatman at Canal Side, Middlewich, aged 68 years; duration of attack, 12 hours.

459; 2. GREAT BOUGHTON; *Chester Castle.* Population 21,672. Cholera 77; Diarrhœa 26. The epidemic was very virulent in this sub-district. Two children died from cholera at Little Barrow and Ashton on the 4th and 8th August; but the disease was not epidemic until the middle of September. On the 11th September, the child of a tailor, aged three years, died after only seven hours' illness at the Newgate; not more, however, than 11 deaths occurred from this disease before the end of September. The epidemic was most fatal during October, when 49 deaths occurred; 14 were recorded in November, and the last (a labourer in a coalyard) on 6th December. During the course of the epidemic 23 deaths were recorded in the Hospital.

459; 3. GREAT BOUGHTON; *Chester Cathedral.* Population 19,762. Cholera 41; Diarrhœa 24. The first death from cholera was of an infant on 30th July, after which no death occurred from this disease until 10th August, when a railway fireman, who had been suffering from diarrhœa for a week, died after an attack of cholera of a few hours. The disease did not, however, appear in an epidemic form until the beginning of September, and eight deaths occurred during that month, 21 in October, and the remaining 10 in November; the last case was recorded in Talbot-street on 28th November.

459; 4. GREAT BOUGHTON; *Hawarden.* Population 9,528. Cholera 16; Diarrhœa 1. A case of bilious cholera occurred on 5th June, and two other deaths on 10th and 17th August; the disease, however, did not become epidemic until the middle of September, and 11 deaths occurred between 17th September and 15th October. The last death took place on 8th November. Of the 16 deaths from cholera, six were recorded at Queen's Ferry, four at Hawarden, and three at Ewloe.

In the entire district of Chester, 136 deaths from cholera were recorded during the epidemic of 1866, against 24 in 1854, and 91 in 1849. The following particulars are the results of inquiries as to the source of the water supplied to Chester, and were furnished to the Registrar General for publication in his third Quarterly Return for 1866, by the Registrar of the Chester Cathedral sub-district:—

Dunham-on-the-Hill, where a death occurred from "neglected diarrhœa, 5 days, collapse, 2 days," is situate between six and seven miles, N.E. from Chester, and overlooks the river Mersey. It is considerably elevated, and admirably adapted to the most thorough drainage; it is nevertheless most miserably deficient in this respect, and I have noticed for many years that it is much more liable to attacks of scarlatina, &c. than many villages less favourably situated. It is a mass of red sandstone rock, and the water has in many places been allowed to work hollows in the strata, in which it lodges, and is frequently quite green and putrid, where a few hours' work with a pick and spade would remove it all; it is, however, now much better than it formerly was. The water supply at that end of the village where the above-mentioned death occurred is derived from a pump well in the yard of the Wheatsheaf Inn; this water is apparently very good and pure, and is used by all the neighbouring cottages, &c., and none of them have suffered anything apparently from the use of it, except the inhabitants of one house. This house is a very dilapidated one, and the habits of its inhabitants seem to be on a par with the house, as a more filthy place outside and in it would be hard to find. It seems to have been used as a kind of lodging house for the poorest class of travellers, and may have received the infection from that source; at all events I yesterday registered a second death in the same house of a woman, aged 49 years, Asiatic cholera, 48 hours. The rest of the inmates of the house I understand have left it, and the place is now shut up. Two deaths from diarrhœa have occurred in places near each other, one mile N.E. from Chester, where the water is derived from pump wells apparently pure and sweet, clay subsoil, neighbourhood efficiently drained and healthy. All the other cases have occurred within the limits of the borough of Chester. The drainage is, I consider, very good, great exertions having been made of late years in that direction; but the water supply is very indifferent. The whole of the borough is supplied by the Chester Waterworks Company with water taken from the river Dee; the river cannot perhaps be considered particularly pure at the best, inasmuch as it receives the sewage of Llangollen, Wrexham, Farndon, Holt, and a variety of smaller places before it reaches Chester; but unfortunately the part of the river from which the water is taken is further contaminated by being the receptacle of the sewage of the whole of the eastern half of the borough of Chester

itself. This part of the river is formed into a sort of lake of about one mile in length by some 60 to 80 yards broad, bounded at the lower end by a stone causeway erected for the purpose of holding up the water to supply the mills, and at the upper end by the shallows of Broughton Ford; into this basin the drainage of the town is carried by at least four several sewers at different points, and in its depths lie the accumulated filth of generations, but from it is daily taken the whole supply of water for the city. It is only right to say that the Waterworks Company are now engaged in the construction of works to enable them to take the water from the long reach of the river below Heron's Bridge, where they would certainly escape the contamination of the Chester sewage and be able to deliver the water as pure as the condition of the upper river will allow. In the meantime the citizens are very much dissatisfied with the article supplied, and there are constant complaints and debates both in the town council and out of it, upon the subject of the supply and the danger to the health of the inhabitants to which we are at present exposed.

460*a*; 1. WIRRAL; *Neston*. Population 5,223. Cholera 52; Diarrhœa 3. The first death from cholera occurred at Park Gate, Neston, on 2d September, and during that month 47 of the 52 deaths took place, the disease being most fatal between 7th and 14th. During October four deaths occurred from the same cause at Little Neston, and the last death took place on 3d November at the same place. Of the 52 deaths from cholera 36 were recorded at Neston, seven at Park-gate, Leighton, and six at Little Neston.

460*a*; 2. WIRRAL; *Eastham*. Population 9,167. Cholera 6; Diarrhœa 8. The first death from cholera occurred on 11th September at Brimstage; the next four between 26th September and 2d October at Bebington; and the last case, of an infant, also at Bebington, on 7th December.

460*b*; 1. BIRKENHEAD; *Birkenhead*. Population 36,212. Cholera 61; Diarrhœa 61. Cholera broke out early in May among some German emigrants in port, and resulted in 10 deaths, which were recorded in the Hospital at the Emigration Depôt, in addition to those registered within Liverpool district. The first death from cholera occurred among the residents of the sub-district on 29th July in Poole-street; and on 13th August a ship chandler died at Oak Bank; but the disease did not become epidemic until the end of August. During September, 21 deaths were recorded, 19 in October, and seven in November, the last two occurring at 32 Queensbury-street, on 16th November. Egerton and Queensbury streets contributed the largest number of deaths.

460*b*; 2. BIRKENHEAD; *Tranmere*. Population 14,485. Cholera 10; Diarrhœa 13. A death from cholera occurred on 24th August, but no subsequent deaths took place until the middle of September, during which month four were recorded, followed by three in October, and one in November; the last fatal case occurred on 2d December. The whole of the 10 deaths occurred in Tranmere.

460*b*; 3. BIRKENHEAD; *Wallasey*. Population 10,723. Cholera 7; Diarrhœa 9. On 27th July a cotton broker died at Wallasey from cholera; but no further death occurred until 10th September, when a fatal case appeared at Poulton-cum-Seacombe. Four deaths took place during October, the last case on 23d of that month. Five of the deaths from cholera occurred at Poulton-cum-Seacombe, and one each at Wallasey and Liscard.

Dr. Baylis, the Medical Officer of Health for the town of Birkenhead, states that many of the cholera cases in Birkenhead occurred in persons daily or occasionally visiting Liverpool, where the disease prevailed; but that he distinctly traced a connexion in 35 deaths (including those of the 10 German emigrants) out of the whole 61, with people, houses, or confined places infected with the disease. Birkenhead is altogether supplied with water from wells in the red sandstone situated at Spring Hill, Birkenhead, and Flaybrick Hill, Claughton; each well furnishes about one half of the regular service of 12,000,000 gallons weekly, but they are capable of yielding 20,000,000 on extraordinary occasions. Spring Hill is becoming covered with dwellings from the natural extension of the town. Flaybrick Hill has still a country surface. The supply of water is generally constant during the day, except when shut off for repairs of pipes, &c., but in some parts it is given only from 6 to 12 A.M. An analysis made by Dr. Muspratt on 4th May 1867, showed that the Flaybrick Hill water contained 3·889 grains of chloride of sodium per gallon, a mere trace of nitrates, and no organic matter: the Spring Hill water contained 3·093 grains of chloride of sodium per gallon, a trace of nitrates, and no organic matter.

The following communication was received from Dr. Baylis (in answer to inquiries) on October 25th. (*See London Weekly Return No.* 44.)

The town of Birkenhead is associated with several other townships in forming the Birkenhead Registration District; one or two of these are populous, and being conterminous with it, as to houses, form apparently one town, though these latter are under a different local government. The following statements refer only to Birkenhead proper.

In addition to the ordinary means for resisting an epidemic a system of deodorising all the worst middens in Birkenhead was instituted in prospect of cholera. Quick lime, at first used, was almost immediately abandoned; chloride of lime (then substituted) has been now almost replaced by granular peat charcoal, which seems to be at once both effective and convenient for this purpose.

There is only one inspector of nuisances for the town, and he is under my control and direction.

The indigent poor (of the town) have three parish surgeons to attend them in ordinary, these also attend cholera cases in their respective districts; but on the outbreak of the disease here the board of guardians provided for the use of the whole union a hospital for cholera cases, with a resident surgeon in charge. None of their arrangements were placed under my care. No medical visitors were appointed.

The parish medical officers and other medical men give their own directions to their own patients, but my inspector and self take every means, and successfully, of being quickly informed of every case which occurs, and of instructing the friends in all the required precautions; the ashpit, as well as those in the vicinity, is disinfected with chloride of lime; all the soiled clothes are steeped in a chlorine solution, the soiled bedding burnt, and the floors and stairs sprinkled with undiluted carbolic acid, and the house afterwards thoroughly cleansed. When the epidemic had fairly established itself, the burning of the soiled bedding was handed over to the parish authorities, who, however, cordially act in unison with my requests and advice.

Wherever a death occurs all the soiled clothes, the house, and ashpits of the vicinity are thoroughly disinfected under my own or inspector's supervision; but where the cases do not die, we cannot always do these things, as I possess no means of certainly ascertaining their existence, nor have I power to improvise them.

The poor are reimbursed for the loss of the bedding and linen destroyed without unnecessary delay.

The whole of the six deaths registered in the week ending 20th October occurred in the worst constructed and arranged part of the town. The earliest deaths took place in better neighbourhoods, and the spreading of the disease was evidently under check from the means employed. As it descended to bad localities, however, these means appeared to lose their efficacy, and I now look for the effect of cold weather the more anxiously in consequence. Only two deaths, as far as we yet know, have occurred within the last ten days, and I anticipate that we shall have but few more cases.

34. Lancashire.

The Cholera Epidemic in Liverpool.

461; 1. Liverpool; *St. Martin.* Population 81,228. Cholera 672; Diarrhœa 258.

461; 2. Liverpool; *Howard-street.* Population 24,816. Cholera 247; Diarrhœa 97.

461; 3. Liverpool; *Dale-street.* Population 29,078. Cholera 137; Diarrhœa 81.

461; 4. Liverpool; *St. George.* Population 16,827. Cholera 13; Diarrhœa 15.

461; 5. Liverpool; *St. Thomas.* Population 29,142. Cholera 73; Diarrhœa 64.

461; 6. Liverpool; *Mount Pleasant.* Population 47,410. Cholera 209; Diarrhœa 123.

461; 7. Liverpool; *Islington.* Population 41,241. Cholera 134; Diarrhœa 93.

462; 1. West Derby; *Toxteth Park.* Population 69,284. Cholera 236; Diarrhœa 138.

462; 2. West Derby; *Everton.* Population 70,983. Cholera 178; Diarrhœa 166.

462; 3. West Derby; *Walton.* Population 11,834. Cholera 34; Diarrhœa 20.

462; 4. West Derby; *Crosby.* Population 5,075. Cholera 5; Diarrhœa 5.

462; 5. West Derby; *Litherland.* Population 5,084. Cholera 2; Diarrhœa 1.

462; 6. West Derby; *West Derby.* Population 52,740. Cholera 45; Diarrhœa 77.

462; 7. West Derby; *Wavertree.* Population 10,845. Cholera 4; Diarrhœa 8.

The following details are chiefly derived from the able report of Dr. Trench, Medical Officer of Health for Liverpool, on the health of the borough in 1866.

Cholera first appeared in Liverpool in May, when it was introduced by some German emigrant ships which were in port on their way to America. The disease was at this time entirely confined to these steamships and their occupants, and not a single death occurred among the residents of the town for several weeks after the departure of the last of these vessels. During the first three weeks of May five deaths were registered as having occurred within the Dale-street sub-district on board the "Helvetia," and 23 on board the hospital ship "Jessie Munn," in addition to the 10 deaths before noticed as having been registered at the same time in the emigration depot at Birkenhead. The "Helvetia" finally left on 28th May, and although from that date to the beginning of July scarcely a week passed without one or two deaths being referred to cholera, yet Dr. Trench says that careful inquiry satisfied him that all these cases "were of the bilious type, and so purely sporadic;" they were all, moreover, isolated cases, and were not followed by other deaths "in the families or neighbourhood of the deceased." During the last fortnight in June the weather was oppressively hot, but on each day from 1st to 6th July refreshing rains cooled the atmosphere, and must, to a considerable extent, have cleansed the streets and drains. On Sunday, 1st July, a death from cholera, certified as "English," occurred at No. 2 Court, Bispham-street. This locality is described by Dr. Trench as "one only too well known "to the sanitary officers, being inhabited by the lowest of the Irish population, and situated "in the worst part of what may be justly described as the chief fever district of the parish. "The court itself contained three straight up-and-down houses and an open midden. It "was altogether so close confined and unfit for human habitation that the grand Jury had, "in July 1865, confirmed my presentment, and ordered the demolition of two of the houses "and the conversion of the common cesspool into a watercloset; and there only awaited some "legal or other formalities to have the order carried into effect." Directly the medical officer was informed of the occurrence of this death in a locality so unfortunately disposed towards the fatal spread of the disease, every effort was made to induce the relations and friends of the deceased

to consent to the immediate removal and burial of the body. They, however, insisted upon keeping it till Tuesday morning, in order that a "wake" might be held during Monday night; and on Tuesday morning, when the medical officer attended to use his influence in hastening the funeral, he found the three houses "crammed with men, women, and children, while drunken women "squatted thickly on the flags of the court before the open door of the crowded room where the "corpse was laid. There had been in the presence of death one of those shameful carousals which, "to the disgrace of the enlightened progress and advanced civilization of the nineteenth century, "still linger, as dregs of ancient manners, among the funereal customs of the Irish peasantry." Before the end of the week the husband of the deceased was dead; and before the end of July 48 persons had died of cholera within a radius of 150 yards of the scene of this Irish wake. Dr. Trench in his report dates the epidemic of cholera in Liverpool from the time and place of the death above described. Cholera, as an epidemic, was almost entirely confined to the "lowest, "dirtiest, most crowded, and most squalid streets of the borough; and nearly the whole of 1,782 "victims of this disease within the municipal boundaries occurred among the lower classes of "those dependent for their bread on weekly wages. There was a singular coincidence between "the streets and localities suffering from cholera in 1866 and those in which the greatest number "of deaths from typhus had occurred during the epidemic of that disease which prevailed more or "less during the years 1862–6. Both cholera and typhus were most fatal in those streets situated "on the low lying ground, either on the border of the river facing the quays, or in the valley "which sweeps north and south between the sandstone ridges that rise in successive elevations to "the uplands of Everton, Low Hill, and Windsor." Dr. Trench, in dealing with the subject of contagion from cholera, remarks, "I am not aware of any physician, clergyman, or priest in "the borough having died from the disease." The case of Dr. Ross, the surgeon to the "Helvetia," was the only exception to the above statement, and he probably fell a victim to his want of caution in soiling his hands with the dejecta of a patient while moving him in bed. No stronger proof of the restricted contagion of cholera need be urged than the fact that in the "Helvetia" and other emigrant vessels in which the disease appeared it did not cross the quarter deck, nor spread from the steerage to the cabin passengers.

Of the 1,762 deaths from cholera which occurred in the borough of Liverpool between 1st July and 30th November, 11 took place in the week ending 7th July. The numbers of fatal cases increased week by week to 174 in the seven days ending 18th August; in the next five weeks the deaths fluctuated considerably, and were 132, 193, 138, 179, and 146 in the week ending 22d September. After this date the deaths from cholera fell rapidly, and in the last three weeks of November they were five, one, and two respectively. In addition to the deaths recorded in the hospital ship "Jessie Munn" during the outbreak among the German emigrants, the following deaths from cholera were recorded in public institutions: 236 in the Cholera Hospital in Ashfield-street in the St. Martin sub-district, 174 in the workhouse in Mount Pleasant sub-district, and 25 in the workhouse in Smithdown-road, Toxteth Park. The following is a list of some of the streets which suffered most severely from cholera during the epidemic of 1866, with the number of deaths from that disease, and the enumerated population at the census of 1861. The deaths in each street include those which occurred in the subsidiary courts.

Name of Street.	Population, 1861.	Deaths from Cholera, 1866.
Lace	939	17
Sawney Pope	825	18
Milton	1,018	28
Sherwood	605	17
Bent	487	7
Regent	969	27
Midghall	758	12
Kew	1,128	24
Gladstone	241	8
Cavendish	854	20
Stockdale	663	13
Oriel	1,756	24
Ford	1,156	20
Paul	1,573	24
Maguire	316	11
Lime-kiln-lane	1,366	18
Mile End	357	10
Dryden	1,514	16
Beau	1,057	17
Nash Grove	489	10
Gascoyne	1,076	24
Eaton	526	13
Chisenhale	1,415	20

Liverpool is supplied with drinking water partly from artificial lakes constructed for the purpose in the high lands of Rivington, near Chorley, which Dr. Trench pronounces to be free from every possible source of sewage contamination. The remainder of the supply is drawn from four deep wells in the red sandstone, situated within or near to the borough of Liverpool, viz., in Soho-street,

Hotham-street, Windsor, and Water-street. The two first are only used occasionally, and have not been pumped at all since September 4th, 1866; the two latter supply the healthiest districts of the town. During 1866 the supply was on the intermittent system as follows :—

January 1st to April 30th from 7 to 10 a.m., and from 3 to 5 p.m. = 5 hours daily.
May 1st to June 30th from 7 a.m. to 12 a.m., and from 5 to 7 p.m. = 7 hours daily.
July 1st to November 20th from 7 a.m. to 7 p.m. = 12 hours daily.
November 21st to December 11th. Supply constant.
December 12th to December 31st from 6 a.m. to 9 p.m. = 15 hours daily.

The deaths from cholera in the districts of Liverpool and West Derby during the epidemics of 1849 and 1854 were 5,308 and 1,290, against 1,989 in 1866 : the deaths from cholera in 1866 in the municipal borough of Liverpool were 1,782. Many of the same streets suffered severely in all these visitations. During the epidemic of 1849 the daily deaths averaged 35 in July, 51 in August, and 29 in September, the most fatal day being 13th August, when 84 deaths occurred. In 1866 the daily deaths averaged only seven in July, 22 in August, 21 in September, and six in October; the highest number of deaths occurring on any one day being 36 on 23d August.

The following information was supplied by Dr. Trench to the Registrar General on October 29th. (*See London Weekly Return, No.* 44.)

On the first appearance of cholera in the port of Liverpool, the town council rented a block of new warehouses near Bank Hall for the reception of emigrant passengers and crews of infected ships.

The vestry of the parish accepted the responsibility of providing for these people; the owners of vessels paying the daily allowance of 1*s.* 6*d.* for each individual, in accordance with the provisions of the 49th Section of the Passengers' Act, 1865. It was arranged that the slightest case of sickness, whether premonitory of cholera or not, should, whether by night or day, be at once removed from the warehouses to the workhouse hospital. For this purpose a surgeon was in constant attendance, and vans ready horsed were kept opposite the warehouses. The rooms of the warehouses were daily fumigated with chlorine gas, and the floors sprinkled with a solution of chloride of zinc before being swept.

The cost incurred by the council in the fitting up of the warehouses, in the purchase of beds and bedding, &c., in the erection of large trough waterclosets, and in the bringing of water to the spot, amounted to 1,095*l.* The vestry of the parish were, I understand, far from being reimbursed by the arrangements with the owners. After the Orders in Council under the Diseases Prevention Act were enforced, the vestry of the parish took the lease of these warehouses into their own hands, and continued them, as houses of refuge, for the temporary accommodation of the families of the sick of cholera. They have also been found useful, even lately, for emigrants, among whom, in lodging houses, or on board ship, cholera had appeared.

In the commencement of the epidemic, and before the vestry were able to bring all their arrangements into practical effect, the council undertook the disinfection of houses, and the disinfection or destruction of the soiled bedding, clothing, &c.

When the parochial authorities had established their staff, it then only devolved upon the council to put in force, when required, the provisions of the Nuisance Removal Act, and thereby to aid the efforts of the vestry.

The Health Committee of the Council, in order to prevent any delay in the issuing of summonses or in any of the prescribed requirements of the law, met daily to receive and act upon the reports of their sanitary officers; and during the months of July, August, and September they directed informations to be laid for the abatement of 734 nuisances. But as it was represented to them, that the process by which the owner or agent can be compelled to limewash his house was dangerously dilatory, they directed the borough engineer to undertake in all cases, at the public cost, the limewashing and cleansing down of infected houses.

The plan pursued was the following: In the case of sickness or death from cholera, the vestry upon removal of the patient, caused the disinfection of the house by chlorine gas; then the limewashers went in and completed the purification.

The number of apartments thus limewashed amounted to 6,184, and the cost was 698*l.*

The disinfectant used inside houses, where the vapour could be temporarily confined, was chlorine gas.

The Council directed a solution of carbolic acid to be used in the disinfection of the middens, cesspools, grids of sewers, and courts of the streets wherein cholera had appeared. It was the outdoor disinfectant.

The mode of using the carbolic acid was as follows :

Watercarts were used, and in place of the disperser a proper tap was fitted. Each driver was provided with a jar of carbolic acid, and a measure which was sufficient for the capacity of the water-barrel. These were sent round to all the courts and alleys, and the carbolic acid used to disinfect drains, middens, privies, &c., and to wash the surface of the courts when required.

Other watercarts were sent to distribute a weaker mixture of carbolic acid and water on the surface of the streets in lieu of ordinary watering.

These carts were used in all weathers.

The street gullies were also treated with carbolic acid in the form of Calvert's powder.

As a rule these operations were performed twice a day.

The scavengers who follow the contractor's men in the removal of night-soil were also provided with a solution of carbolic acid.

	£	*s.*	*d.*
The cost of carbolic acid amounted to -	1,098	18	5
„ carbolic powder - - -	17	0	0
„ cartage and distribution - -	373	14	8
- £	1,489	13	1

In March of this year, the Council had completed the erection of a disinfecting apparatus upon Dr. Henry's principle of dry heat from compressed steam, with a range of washing-tubs and a plentiful supply of hot water. The cost of erecting and fitting up this establishment was 892*l.* 9*s.* 4*d.*, and the weekly cost of keeping it in operation averages 4*l.* 7*s.* a week. It is open to the public gratuitously on the recommendation of any medical man, clergyman, district visitor, relieving officer, or official. The total number of articles disinfected at this apparatus during the last 31 weeks, including beds and clothing, amounts to 15,238, of which 14,218 were from cholera infected houses. It was however ordered by the Health Committee that no straw mattrass or bed made of shavings, or any articles which appear to be almost valueless, or upon which the stains of cholera dejections are evident, shall be disinfected. The superintendent was directed in all such cases to put them on one side, to sprinkle them freely with carbolic acid, and then to arrange with an appointed officer of the vestry for their valuation and destruction.

Cholera car. Since the year 1864 the Health Committee have kept two carriages, one for the use of fever and the other of small-pox patients, not being paupers for whom the parish vans are provided. On the breaking out of cholera they bought a third carriage for cholera patients. These carriages are horsed by contract; can be obtained free of charge by a simple note from the attendant physician of the patient.

It was only used four times; so strictly limited to the very poor classes was the cholera epidemic.

There are in the borough a constant staff of 50 sanitary inspectors, of these eight are constantly employed in going from house to house in the lower districts of the town, and eight in visiting the various courts and alleys; four inspectors are appointed to watch sub-let houses for overcrowding, and four are engaged in carrying out the provisions of the Common Lodging House Act.

I beg to express to you, what I have stated publicly in the Health Committee, my perfect approval of all the arrangements made by the vestry of the parish, and also my humble praise of the wise and liberal spirit which directed those arrangements.

463; 5. Prescot; *Prescot.* Population 12,377. Cholera 7; Diarrhœa 9. Cholera first appeared fatally in Tea-street, on 30th August, two other deaths following at the same address on 3d September. The next three deaths occurred in the workhouse at Whiston on the 8th, 9th, and 19th September, and the last case was in Eccleston-street, also on 19th September. The whole of the seven deaths were certified as of the Asiatic type, and most of the attacks terminated fatally after about 25 hours' illness.

463; 6. Prescot; *St. Helens.* Population 37,961. Cholera 10; Diarrhœa 44. Two fatal cases of cholera occurred on 9th and 19th July, the first in Eccleston and the latter in Sutton; the next two cases were on 22d and 26th August, the one at Parr and the other in St. Helens. During October four deaths occurred in Sutton. On 10th November an adult female died after an attack of only 18 hours, in Arthur-street, Eccleston; and the last case was of a child in Taylor's-row, Sutton, on 19th November. Five of the ten deaths from cholera occurred in Sutton.

464; 5. Ormskirk; *North Meols.* Population 14,661. Cholera 38; Diarrhœa 11. Three fatal cases of cholera (certified as "English") occurred during January, and one on the 30th May. The disease, however, did not appear in an epidemic form until nearly the middle of August. On 10th of that month the widow of a chimney sweep died at Little London, Southport, after only 10 hours' illness. This death was followed by seven others during August, and 22 in September, all in Southport. Nine deaths occurred between 21st and 24th September, both days inclusive; but after the last-mentioned day only two more deaths from cholera occurred in Southport, on 10th and 12th October. The last two deaths, both at North Meols, took place on 30th October and 28th November. Of the whole 38 deaths from cholera 33 were recorded in Southport, a town comprising a part of North Meols township, and containing in 1,681, an enumerated population of 8,940 persons; 17 occurred in Little London, three each in Cemetery-road and at the lime-kilns, and two in Little Ireland. Nearly all the deaths were in the families of the labouring class.

464; 9. Ormskirk; *Lathom.* Population 4,690. Cholera 12; Diarrhœa 10. The first death from cholera occurred in Lathom on 12th August; the next two deaths took place on 28th and 29th of the same month. Three deaths were recorded during September, two in October, all of which occurred in Lathom. During November, however, four deaths were recorded in Skelmersdale, the last of which took place on the 30th. Nearly all the deaths occurred in the families of either boatmen or colliers.

465; 1. Wigan; *Standish.* Population 6,894. Cholera 8; Diarrhœa 11. The first two deaths from cholera occurred at Shevington, in coal miners' families, on 31st August and 4th September respectively. The remaining cases were all recorded at Standish; the first, a boatman's wife, aged 44, on October 11th; the last, a colliery foreman, aged 22, on 11th November. Mr. Price, the

Registrar, states that the water used in the district for drinking purposes is obtained from a spring, and for other purposes from the canal, the river Douglas, or ponds.

465; 2. WIGAN; *Aspull.* Population 8,372. Cholera 17; Diarrhœa 14. Again, as in 1849, the epidemic prevailed most fatally in the families of colliers. The first death was that of a licensed victualler's son, aged six years, at Blackrod, on 23d July. No other death occurred until the end of September; in October 11 deaths occurred; in November, one; and the last a collier's son, aged eight years, died on 23d December, at Aspull. Mr. Clark, the Registrar, states that there are very few wells in the sub-district, and that the people use chiefly surface water drained from the fields and caught in troughs: there is a scarcity of water in dry weather. The mortality from cholera is ascribed to the inadequacy and impurity of the water supply, and to the want of proper drainage.

465; 3. WIGAN; *Wigan.* Population 37,658. Cholera 58; Diarrhœa 110. Diarrhœa prevailed during the months of July, August, September, and October, but it was not until 8th July that the first death from cholera was recorded, when a weaver's daughter, aged one year, died at Spring-gardens. The next death did not take place until 3d September, when the epidemic may be said to have really commenced, for by the middle of the month the deaths from cholera numbered two or three daily, and by the end of the month 31, or more than half the deaths had been recorded. The disease did not abate much in October, 24 deaths being returned. The last case was that of a bobbin-turner's wife, aged 33, at Lowe's-square, off School-lane, on 1st November. With the exception of 13 deaths that took place in yards and courts off Scholes-street, the disease seems to have been generally spread over Wigan. The families of coal miners and weavers were the principal sufferers. Of the 110 deaths from diarrhœa, 81 were those of children under two years of age. Mr. Halliwell, the Registrar, states (November 1867) that the majority of the inhabitants of Wigan are and have been for some time supplied with water from the reservoir belonging to the corporation; but that in some parts of the town prior to the cholera breaking out the people obtained all the water that they required from wells in their immediate neighbourhoods; the waters from these wells were analyzed and condemned, and the wells were then closed. In 1849 the deaths from cholera were 348.

465; 4. WIGAN; *Hindley.* Population 17,654. Cholera 39; Diarrhœa 52. The first death from cholera (which was not certified by a medical attendant) was that of a coal miner's wife, aged 31, on 24th September, at Hindley. The epidemic was very fatal in October, at Ince-in-Mackerfield, in the families of colliers; in November the disease gradually subsided, 13 deaths being recorded in that month, against 23 in October. The last fatal case was that of a schoolmaster's wife, aged 69, on 26th November, at Ince. Mr. Grime, the Registrar, states that the water supply of the sub-district is derived from wells, ponds, and rain-cisterns or tubs. 112 deaths from cholera were recorded during the epidemic of 1849.

465; 5. WIGAN; *Pemberton.* Population 10,435. Cholera 13; Diarrhœa 40. Cholera was fatal to the daughter of a coal miner, aged six years, on 28th September, at Marsh-green, Pemberton. Seven deaths were recorded in October and five in November; the last two were those of colliers, on 25th November, one at Marsh-green the other at New Town. Four of the deaths from cholera took place at Marsh-green and four at Lamberhead-green; with one or two exceptions they were all in the families of coal miners.

465; 6. WIGAN; *Upholland.* Population 6,982. Cholera 2; Diarrhœa 14. Both these deaths from cholera occurred at Billinge Chapel-end; the first a collier, aged 30, on 6th October; the last a quarryman's wife, aged 68, on 17th October. In 1849 the deaths from cholera in the district of Wigan were 563, against 158 in 1854 and 137 in 1866.

468; 1. BOLTON; *Farnworth.* Population 13,723. Cholera 14; Diarrhœa 25. Cholera was fatal to a farm servant (male), aged 64, at Slackey-brow, Kersley, on 5th July; the next case occurred on 5th September. Two members of the same family died in Egerton-street on 14th September. The last death was that of a cotton piecer, aged 22, in the Workhouse, on 22d October.

468; 10. BOLTON: *Little Bolton.* Population 24,942. Cholera 23; Diarrhœa 40. The first death from cholera was that of a cashier, aged 30, in Hampden-street, on 21st July. The next death did not take place until 15th September, and by the end of the month 10 had been recorded, eight males and two females; in October nine were returned; in November two; and December one; the last that of a labourer's wife, aged 50, at Flax-place, on 21st December. The deaths from cholera during the epidemic of 1849 were 24.

468; 11. BOLTON; *Bolton Eastern.* Population 24,996. Cholera 7; Diarrhœa 40. The first death from cholera occurred on 20th September when a cotton spinner's wife, aged 59, died in Thynne-street. The last death was that of a colliery labourer, aged 37, at Stow Hillock on 8th November, after an attack of Asiatic cholera of 17 hours' duration; this labourer also lost his son from Asiatic cholera on 24th October after an illness of 24 hours.

468; 12. BOLTON; *Bolton Western.* Population 18,439. Cholera 11; Diarrhœa 36. A weaver's widow, aged 70, died from cholera on 25th July; no other death occurred until 29th and 30th September, when there was one on each day in Back James-street. The last was that of a collier, aged 60, in Cunliffe court, on 29th October. The deaths from cholera in the district of Wigan were 123 in 1849, 16 in 1854, and 64 in 1866.

470 ; 1. BARTON-UPON-IRWELL ; *Worsley.* Population 14,015. Cholera 10 ; Diarrhœa 14. Cholera was fatal to a canal boatman, aged 68, at Worsley on 1st August ; the next case was on 9th September, the last a coal-miner's daughter, aged nine months, at Worsley, on 26th September Coal-miners' families and persons engaged in the cotton manufacture were the sufferers. Eight of the deaths were of females.

470 ; 2. BARTON-UPON-IRWELL ; *Barton.* Population 14,216. Cholera 5 ; Diarrhœa 9. Four of the deaths from cholera occurred at Barton and one at Patricroft ; the first, on 17th September, a publican, aged 67 ; the last, a blacksmith's son, aged 15, on 24th October.

471 ; 2. CHORLTON ; *Ardwick.* Population 47,752. Cholera 11 ; Diarrhœa 83. First case of cholera on 14th May at Hope-street, Gorton, a surgeon's son, aged 12 ; the last fatal case, a packer, aged 55, in Tonge-street, on 31st October. Diarrhœa was prevalent and very fatal among children during the month of July.

471 ; 3. CHORLTON ; *Chorlton-upon-Medlock.* Population 44,795. Cholera 6 ; Diarrhœa 43. A blacksmith, aged 51, died from cholera in Hall-street, on 14th July ; no other death was recorded until 23d August, when the infant son of a packer died in Leaf-street. In September there were three deaths ; the last fatal case was that of a cotton-spinner, aged 45, in Union-street, on 27th October.

471 ; 4. CHORLTON ; *Hulme.* Population 71,128. Cholera 8 ; Diarrhœa 172. Diarrhœa was very fatal in this sub-district, and prevailed throughout the year, chiefly in July and August ; infant mortality was very great, upwards of two thirds of the deaths occurring amongst children under two years of age. Cholera was fatal on 19th July, at Medlock-street, to a shoemaker, aged 35 ; the next two deaths also occurred in July. Of the other cases two took place in August, and the last on 29th September at Hulme.

472 ; 1. SALFORD ; *Pendleton.* Population 24,448. Cholera 10. Diarrhœa 25. The first death from cholera was that of a worsted dyer, aged 51, in Franchise-street, on 8th September ; two deaths occurred in one family at Croft, Pendlebury, during the same month. The last death was that of a farm-servant, aged 58, at Eccles New-road, on 22d November.

472 ; 3. SALFORD ; *Greengate.* Population 37,534. Cholera 9 ; Diarrhœa 127. The infant son of a lithographic printer died of choleraic diarrhœa in Frederick-street on 16th July ; no other case occurred until 20th September, when it was fatal to a silk-weaver in Lupton's-buildings. The last death was that of a female, aged 59, in Union-street, on 28th October. Diarrhœa was very prevalent and fatal amongst children during the months of July and August.

472 ; 4. SALFORD ; *Regent-road.* Population 33,468. Cholera 9 ; Diarrhœa 88. Cholera was fatal to a joiner's wife, aged 46, in Booth-street, Oldfield-road, on 12th February ; two deaths occurred in July, one in August, three in September, and two in October ; the last being that of an overlooker at a cotton mill, aged 54, on 26th October, in Parsonage-street.

473 ; 1. MANCHESTER ; *Ancoats.* Population 55,983. Cholera 13 ; Diarrhœa 180. Cholera was fatal to a tailor, aged 22, on 17th July, in Three Court Blossom-street, and to his wife, aged 22, on the following day. The other cases occurred at intervals, the last death being that of a tobacco-pipe maker's wife, aged 42, in Pott-street, on 29th October. The majority of the deaths from diarrhœa were those of young children under two years of age, and in most instances they had no medical attendant.

473 ; 2. MANCHESTER ; *Deansgate.* Population 29,029. Cholera 18 ; Diarrhœa 101. Nine of the deaths from cholera occurred in August, three at one house, but not members of the same family, in Fleet-street. The other cases occurred in September, October, November, and December ; the last was that of a porter's wife, aged 26, in Camp-street, on 23d December.

473 ; 3. MANCHESTER ; *London-road.* Population 28,817. Cholera 4 ; Diarrhœa 72. Cholera was first fatal to the wife of a licensed victualler, aged 50, in Mather-street, on 31st July ; the other cases occurred at Great Ancoats street on 7th August, at London-road on 25th September, and at Broome-square on 26th September. Diarrhœa was prevalent during the months of July and August.

473 ; 4. MANCHESTER ; *Market-street.* Population 23,526. Cholera 5 ; Diarrhœa 51. Two deaths from cholera occurred at the same house in Marsden's-court, one that of a female servant, aged 19, on the 23d, and a tailor's wife, aged 27, on the 25th July ; two fatal cases took place in the workhouse, the last a labourer's widow, aged 48, on 26th September.

473 ; 5. MANCHESTER ; *St. George.* Population 48,055. Cholera 8 ; Diarrhœa 138. Four deaths from cholera occurred in July, one in August, one in September, and two in October ; the last, a tailor, aged 31, in Cable-street, on 30th October. Of the 138 deaths from diarrhœa 114 proved fatal to children under two years of age.

473 ; 6. MANCHESTER ; *Newton.* Population 19,311. Cholera 1 ; Diarrhœa 32. The fatal cholera case was that of a sawyer, aged 51, in Church-street, Newton, on 29th August.

473 ; 7. MANCHESTER ; *Cheetham.* Population 21,731. Cholera 5 ; Diarrhœa 20. The first fatal case of cholera occurred at Spinner's-row, Lower Crumpsall, where a child died on 19th September ; the last death was that of a female servant, aged 48, at Frances-street, on 27th October, "cholera (54 hours) after having eaten heartily of mussels and cockles."

473 ; 8. MANCHESTER ; *Failsworth.* Population 6,312. Cholera 2 ; Diarrhœa 7. On 6th May, at Firs Fold, a colliery labourer's wife, aged 39, and at Stakeleech, 25th September, a carter's wife, aged 22, died of cholera.

473; 9. MANCHESTER; *Blackley.* Population 4,939. Cholera 4; Diarrhœa 11. First fatal case of cholera occurred 17th July, at Charles Town, Blackley, to a labourer, aged 58, after an attack of 11 hours; the second to a blacksmith, aged 58, at Market-street. The last two cases occurred at Pleasant-street, Harpurhey, to a silk-warper (male), aged 56, on 31st October, and to a silk-warper (female), aged 36, on 6th November. The deaths from cholera in the three districts, Manchester, Chorlton, and Salford combined, were 1,395 in 1849; in 1866 the deaths were only 113.

474; 2. ASHTON-UNDER-LYNE; *Ashton-town.* Population 33,917. Cholera 10; Diarrhœa 67. Two children of a coal-miner, each aged nine weeks, died of English cholera at York-street—one on 19th July, the other on the 23d; the last death was that of a cotton-twister's wife at Currier-lane, on 29th October. Diarrhœa was prevalent up to the end of October, and six fatal cases were registered as having taken place in the workhouse.

474; 3. ASHTON-UNDER-LYNE; *Audenshaw.* Population 15,125. Cholera 2; Diarrhœa 21. On 14th October the wife of a power-loom weaver, aged 32, and on 24th October a railway porter, aged 32, died in the Township of Droylsden.

474; 6. ASHTON-UNDER-LYNE; *Dukinfield.* Population 29,953. Cholera 5; Diarrhœa 24. The first death from cholera occurred on 17th July, to the infant daughter of a cotton-weaver, at Brierly-street; the next death was not recorded until 6th August. There were none in September, two in October, and the last was that of a fishmonger, aged 52, in Princess-street, on 26th November. The deaths from cholera in 1849 in the district of Ashton were 68 against 12 in 1854, and 21 in 1866.

475; 1. OLDHAM; *Oldham-below-town.* Population 41,770. Cholera 8; Diarrhœa 55. Cholera was fatal on 19th September to a cotton weaver's wife, aged 44, at Cocker Fold; on 27th September, an iron-worker, aged 62, died in Bloom-street of diarrhœa, and on the following day his widow, also aged 62, died of cholera (3 days); the last death took place in the workhouse on 12th October, and was that of a farm labourer, aged 40.

475; 2. OLDHAM; *Oldham-above-town.* Population 30,563. Cholera 7; Diarrhœa 37. First death from cholera occurred on 13th July at Moorside; the next in Waterworks-street on 28th August. Two were recorded in September, two in October, and the last (labourer aged 44), at Breeze Hill on 7th November.

478; 1. BURNLEY; *Burnley.* Population 42,702. Cholera 16; Diarrhœa 35. Cholera was fatal to the wife of a stone quarrier, aged 23, at Extwisle on 8th June; there were one or two deaths in July and August. On 28th September the epidemic broke out at Wood Top, Habergham Eaves, and was fatal to six persons by 18th October; in two instances two members of the same family died. The last case recorded was that of a joiner's infant daughter, in Exmouth-street on 27th October.

478; 2. BURNLEY; *Padiham.* Population 9,906. Cholera 4; Diarrhœa 16. The fatal cases of cholera occurred on 5th July, in Watt-street, Read; on 6th August in the corn market, Huncoat; on 8th September in St. Giles-street, Padiham; and on 9th October at Altham Hall Fold, Altham.

478; 3. BURNLEY; *Colne.* Population 21,203. Cholera 3; Diarrhœa 19. These deaths from cholera took place at Knarr End on 6th May; at Alkincoats on 10th July; and at Spring-lane on 10th August.

480; 4. BLACKBURN; *Blackburn.* Population 63,126. Cholera 7; Diarrhœa 110. Cholera was fatal to a female servant, aged 50, on 15th July, in Cross-street; to a corn miller's son, in Johnson-street, on 25th July. In August there was one death, in September two, and in October two. The last was that of a weaver's daughter, aged three years, in Duckworth-street, on 19th October. Of the 110 deaths from diarrhœa, 82 were of children under two years of age, and the disease was most fatal among the families of those engaged in the cotton manufacture.

480; 6. BLACKBURN; *Darwen.*—Population 21,447. Cholera 17; Diarrhœa 31. The first death from cholera occurred on 18th July to a millwright's wife, aged 57, in Hacking-street, Over Darwen; the second, 31st August, to a labourer's son, at Bartin Houses, Over Darwen; the last, 12th November, to a coal miner, aged 61, at Scholes Fold. Half the deaths from cholera were in the families of coal miners.

481; 4. CHORLEY; *Chorley.* Population 18,027. Cholera 10; Diarrhœa 22. Cholera was fatal to a male, aged 82, in Water-street on 4th August; another death occurred in the same street, on 14th October. There were also two fatal cases in October at Tinkers Barrack. The last death was that of a labourer, aged 69, at Red Banks, on 12th November.

482; 1. PRESTON; *Longton.* Population 6,620. Cholera 5; Diarrhœa 3. The first death from cholera was that of a labourer's son, aged seven years, at Hutton, on 13th August. The remaining four deaths occurred at Farington, in October (the last on the 28th), and were, respectively, a twister in a cotton mill, aged 12, and three sons of cotton weavers, aged one, two, and five years.

482; 2. PRESTON; *Preston.* Population 82,985. Cholera 14; Diarrhœa 166. On 9th March two deaths from cholera occurred, one in Paradise-street, and one in Brewery-street; no other case took place until 14th July when the disease was fatal to the son of an engine feeder in Wilton-street. In the first week of October five deaths were recorded, but in different localities. The last fatal case was that of a brickmaker's labourer, aged 29, at Skeffington Road on 2d November. The

Registrar states that when cholera first made its appearance the authorities adopted the most energetic measures to prevent the disease from spreading, and opened several places where cholera medicine might be obtained gratuitously by all who would apply for it.

486; 4. ULVERSTON; *Dalton.* Population 11,243. Cholera 10; Diarrhœa 16. Eight of the deaths from cholera occurred at Dalton Town, and two at Barrow. Iron miners and their families were the principal sufferers. The first death was recorded on 5th October, of an upholsterer, aged 46, at Barrow; the last on 22d November at Dalton Town. In 1849 there were three deaths from cholera in the district of Ulverston, against one in 1854, and 11 in 1866.

IX.—YORKSHIRE.

35.—WEST RIDING.

495; 2. TODMORDEN; *Todmorden.* Population 20,287. Cholera 10; Diarrhœa 7. The first death from cholera occurred 7th August, to the daughter of a carter, aged three years, at Goshen-terrace, Langfield; the last, 5th November, to the wife of a warehouseman, aged 39, at Dobroyd, Todmorden.

497; 8. HUDDERSFIELD; *Kirkheaton.*—Population 11,923. Cholera 2; Diarrhœa 6. The first fatal case of cholera took place at Moldgreen, Dalton, on 17th June, and the second at Grange Moor, Whitley, on 28th November.

497; 9. HUDDERSFIELD; *Huddersfield.* Population 34,877. Cholera 8; Diarrhœa 32. The first death from cholera took place on 6th June and the last on 29th September.

498; 4. HALIFAX; *Halifax.* Population 36,437. Cholera 7; Diarrhœa 21. First fatal case on 11th February; three deaths during the month of September and three in November, all of adults. Diarrhœa was also fatal to 10 adults and 11 children during the year. In 1849, when the deaths from cholera were 20, the mortality was chiefly amongst clothiers' and cloth dressers' families; in 1866 not one of the persons dying was described as of that occupation.

499; 4. BRADFORD; *Bowling.* Population 14,494. Cholera 3; Diarrhœa 15. The first death from cholera occurred 11th August, to a drab dyer in Bolling-street, aged 53; the last, on 25th November, to the wife of a model maker, aged 55, in Back-lane.

499; 5. BRADFORD; *Bradford East End.* Population 28,579. Cholera 15; Diarrhœa 27. On 15th June, in Irving-street, the first death from cholera was that of a woolcomber's widow, aged 51. No further fatal cases took place until August, when the disease broke out in Warwick-street, where five deaths took place within a few days, the wife of a cartwright, aged 56, dying 28th August, followed by her daughter, aged 19, on the 30th; the daughter of a painter, aged seven years, died on the 30th, his wife, aged 36, on 2d September, and the daughter of a hammerman, aged seven years, on 1st September. With one exception, these cases were registered as Asiatic cholera, the longest duration being 29 hours. The remaining deaths were spread over the sub-district, the last being that of an overlooker in a worsted mill, aged 24, on 27th December in Otley-road. Warwick-street suffered severely during the epidemic of 1849.

499; 6. BRADFORD; *Bradford West End.* Population 20,067. Cholera 2; Diarrhœa 25. First death from cholera on 8th August in Lower West-street; second on 5th September in Sedgwick-street.

500 *c*; 1. HOLBECK; *Holbeck.* Population 15,824. Cholera 8; Diarrhœa 21. The whole of these deaths from cholera were returned as "choleraic diarrhœa," six of them being of children under two years of age. The first death took place on 11th July, at Top Moor Side, and the last in Domestic-street on 24th August.

501; 1. LEEDS; *South East.* Population 29,196. Cholera 4; Diarrhœa 66. The first fatal case of cholera occurred on 20th July and the last on 20th September. Diarrhœa was very prevalent during the month of July, there being 22 deaths from that disease.

501; 2. LEEDS; *North.* Population 41,136. Cholera 6; Diarrhœa 113. One death from cholera was recorded in July, two in August, and three in September.

501; 3. LEEDS; *West.* Population 47,234. Cholera 4; Diarrhœa 67. First fatal case, on 18th August, occurred to the daughter of a carver and gilder, aged seven months, at Alfred-place; second and third cases in Rose-court, on the 24th and 25th August, to an excavator, aged 60, and his daughter aged one; last case, on 25th September, to a packer aged 47, "choleraic diarrhœa," accelerated by intemperate habits. In the district of Leeds, during the epidemic of 1849, 1,439 deaths took place from cholera; in 1854, 48; and in 1866, 14.

The following communication was received on 30th October from M. R. Robinson, Esq., M.D., Medical Officer of Health, in reply to Queries. (*See London Weekly Return, No.* 44.)

1. The Leeds Board of Guardians directed their four medical officers to make house-to-house visitations, and authorized each of them to employ a competent assistant for the same purpose. This

special duty was performed by them for about three months, but in consequence of Asiatic cholera not prevailing in an epidemic form in Leeds, their services in this capacity have been recently dispensed with. They worked in perfect harmony with the officer of health, supplied him with valuable information, and always willingly adopted his recommendations.

The Leeds, Hunslet, and Holbeck Board of Guardians also employed five inspectors of nuisances. They were not under the control of the officer of health.

The Leeds Town Council employ regularly one inspector of nuisances, who has also 20 subordinate officers; the latter, however, perform also police duty. This staff is under the control of the officer of health.

2. The medical officers employed by the guardians have instructions to treat promptly all cases of diarrhœa which are brought to their notice.

3. The medical attendants engaged to treat and take charge of the few cases of Asiatic cholera which have occurred in Leeds have caused the excreta to be immediately disinfected, and the inspectors employed by the Town Council have also freely distributed disinfectants, not only in the middens, drains, or gullies where cholera dejections might have been thrown, but also throughout the town.

4. The officer of health has personally visited every house where a case of cholera has been reported to have occurred, and caused the bedding and linen to be destroyed.

5. The linen and bedding destroyed have been immediately replaced by the Town Council.

6. No deaths from cholera occurred last week in Leeds. The house in which a labourer died on the 22d of September from Asiatic cholera abutted on a row of privies which were undrained, and from which an intolerable stench had been noticed to arise, the fluid filth probably percolated under the house. The privies have been since drained.

502; 1. DEWSBURY; *Morley.* Population 6,840. Cholera 2; Diarrhœa 14. Of the two fatal cases of cholera, one occurred in Commercial-street on 18th June, to the wife of a woollen weaver, aged 58; the other in High-street on 13th July, to the daughter of a quarryman, aged 10 months.

502; 2. DEWSBURY; *Batley.* Population 14,173. Cholera 4; Diarrhœa 21. The first death from cholera occurred on 3d July at Ward's-hill, to a woollen weaver, aged 48; the last at Batley-carr on 25th November, to the son of a coal miner, aged one year.

502; 4. DEWSBURY; *Liversedge.* Population 14,520. Cholera 1; Diarrhœa 16. The only fatal case was that of a female, aged 51, on 16th August, at High Town, after an illness of 14 hours.

502; 6. DEWSBURY; *Dewsbury.* Population 18,148. Cholera 8; Diarrhœa 31. With one exception these cases of cholera occurred to children under two years of age; the first death was on 7th February, the last on 28th October; two of them took place at Daw-green, and two at Batley-carr.

502; 7. DEWSBURY; *Soothill.* Population 6,238. Cholera 1; Diarrhœa 7. On 18th September at Commonside, Earlsheaton, the wife of a blanket-raiser, aged 56, died after 17 hours' illness.

506; 5. WORTLEY; *Ecclesfield.* Population 12,479. Cholera 9; Diarrhœa 14. These deaths from cholera occurred between the 7th and 15th of September (five of them at Greenside). In 1849 there were only three deaths from cholera, neither of which occurred at Greenside.

508; 2. SHEFFIELD; *North.* Population 33,994. Cholera 4; Diarrhœa 57. The first death from cholera occurred on 9th August in Doncaster-street, to the daughter of a turner; the second, to the wife of a labourer, on 11th August, in Club-yard, Mill-sands; the third, to the son of a type founder, on 10th September, in Artizan-street; and the last, to a file hardener in Bellefield-street, on 27th October.

508; 3. SHEFFIELD; *South.* Population 17,680. Cholera 6; Diarrhœa 27. First fatal case of cholera on 22d May in Norfolk-lane; of the other deaths, one took place on 25th July at Union-buildings, Union-street, one on 19th September in Castle-street, two on 26th October, one in Burgess-street, and one in Commercial-street, and the last on 5th November, in Cross Burgess-street.

508; 5. SHEFFIELD; *Brightside.* Population 29,818. Cholera 3; Diarrhœa 52. These deaths from cholera occurred on the 5th, 8th, and 13th of July; the first in Fowler-street, the second in Edward-street; and the last in Greystock-street.

508; 7. SHEFFIELD; *Handsworth.* Population 3,951. Cholera 1; Diarrhœa 1. The death of a dressmaker, aged 56, resulted from cholera on 23d August.

510; 3. DONCASTER; *Doncaster.* Population 16,406. Cholera 36; Diarrhœa 35. A coachman, aged 71, died of cholera on 23d January in Cartwright-street; an optician in July in High-street; a blacksmith in August in Australian-terrace; then the epidemic became very prevalent, and remained so during the month of September, proving fatal to 28 persons, 15 of the deaths taking place in Robinson's-row, Dockin-hill, and seven in St. Ann's-square. The last two cases occurred on 10th November in St. Thomas-street, to the sons of an engine driver, aged respectively 8 and 10 years, after 18 and 13 hours illness. The Registrar states that the water supply of the sub-district is derived from the river and from pumps: the sewers drain into the river.

512; 1. GOOLE; *Swinefleet.* Population 4,042. Cholera 3; Diarrhœa 2. Two of these cases occurred at Swinefleet, and one at Garthorpe; the first on 29th July, the last on 23d September.

512; 2. GOOLE; *Goole.* Population 6,994. Cholera 45; Diarrhœa 15. Cholera was fatal on 29th June, two deaths taking place on that day; four more occurred in July. The epidemic became very severe in August and September; there were 15 deaths during the former and 24 during the latter month. The disease was most fatal in Doyle-street, Foundry-street, and Albert-street. 10 deaths from cholera were recorded as having taken place in the workhouse, Hook. In 1849, when the deaths from cholera were 40, Doyle-street suffered severely.

36. EAST RIDING (*with York*).

516; 3. POCKLINGTON; *Market Weighton.* Population 5,254. Cholera 17; Diarrhœa 8. With the exception of three deaths in the township of Shipton, and one in the parish of Seaton Ross, the whole of the deaths from cholera occurred at Market Weighton. The mortality was greatest amongst agricultural labourers and their families. The first fatal case took place on 11th September; the last on 13th October.

520; 1. HULL; *Humber.* Population 10,690. Cholera 1; Diarrhœa 9. Cholera was fatal to a labourer, aged 61, in Dogger-lane on 20th July.

520; 2. HULL; *St. Mary.* Population 6,132. Cholera 1; Diarrhœa 7. The wife of a shoemaker, aged 36, died from cholera on 20th July in Duke-street.

520; 3. HULL; *Myton.* Population 40,066. Cholera 14; Diarrhœa 44. The first death from cholera occurred on 4th July in Paradise-place; the last on 9th October in English-street.

Mr. Middlemiss, the Registrar, has communicated the following particulars in reference to cholera in this sub-district.

The water supply is now derived almost entirely from natural springs and artesian wells, and is not liable to contamination.

The 14 cases of cholera in the sub-district may be classed as follows: Asiatic cholera 6, English cholera 4, infantile cholera 1, unspecified cholera 3.

Of the six cases of *Asiatic cholera*, one was a sailor who had come direct from Hamburgh and had drank the waters of the Elbe which were contaminated. One was infected while nursing her brother whose wife had died of cholera at Doncaster, the brother being taken ill at Hull while moving his children to the sea side. One is stated by the medical man to have been caused by overwork and want of food. The remaining three were members of the same family; the father, aged 45, a landing surveyor in Her Majesty's Customs, and his two children, aged two and three years respectively, who all died on the same day in Roper-street, which is a long narrow street, 15 ft. wide by 450 ft. in length, with small houses and rooms, some without yards, in a closely built neighbourhood. The house where these deaths occurred has no yard, the watercloset and sink being within the house in the back kitchen, and the smell was often bad. The children were taken ill first, and then the father. Just before the children were taken ill they had been in the house of a neighbour, a woman who lay dead of English cholera in a square behind the house, the kitchen window in fact looking into the square.

Of the four cases of *English cholera*, two are referred by the medical men to the habits of the patients. One was fireman in a steam-boat, who died in the workhouse; he had first been taken to the infirmary and refused admission, and then taken to the workhouse, where he died soon afterwards. Excepting a case of infantile cholera this was the first one in the district. One was an excavator's wife, who died in Lumley's court, Myton-street, adjoining the back of the house in Roper-street where the father and two children died of Asiatic cholera. The house in which the woman died is a small house with no yard, the privy being in the court fronting the window of the house and about 8 feet distant. The woman died on the 8th August 1866, and two days afterwards her husband and another excavator who lodged in the house died, having both been taken ill after the wife. The husband and lodger are returned as cholera only. On the same day that the two men died the three deaths took place in Roper-street also.

Of the three cases of *unspecified cholera*, two are the excavators alluded to under the last head. One was the wife of a ship broker residing in English-street in a wide and airy part of the street.

In the district of Hull, the deaths from cholera during the epidemic of 1849 were 1178, the water supply being derived directly from the river polluted with sewage; in 1854, 15; and in 1866, 16.

X.—NORTHERN COUNTIES.

38. DURHAM.

541 *a*; 1. STOCKTON; *Yarm.* Population 25,079. Cholera 52; Diarrhœa 60. A labourer and his son died from cholera in Cannon-street, Linthorpe; the former on 20th July, the latter on 21st July. There were one or two deaths in August, but the epidemic did not assume any serious form until September, when it broke out with great virulence, and it was not before the end of November that it was finally extinguished. The township of Wolviston suffered most severely,

there being 22 deaths, chiefly amongst labourers and their families; the disease was also very fatal in the parish of Yarm. The last death from cholera was that of a mariner, aged 54, at the Cholera Hospital, Middlesborough, on 25th November.

541*a*; 2. STOCKTON; *Stockton.* Population 20,246. Cholera 11; Diarrhœa 32. There was no death from cholera until 5th October, when a female servant, aged 18, died in Agnes-street, after an illness of eight hours; the last case occurred in Nile-street on 10th November. Labourers and their families were the chief sufferers.

541*b*; 1. HARTLEPOOL; *Hartlepool.* Population 29,153. Cholera 28; Diarrhœa 50. Cholera was prevalent in August, September, and October, the deaths respectively were 9, 13, and 5. The epidemic commenced in Henrietta-street on 29th July, and entirely ceased on 28th October.

545; 3. DURHAM; *St. Oswald.* Population 18,714. Cholera 4; Diarrhœa 24. The first fatal case of cholera was at Framwell-gate on 30th July; the second at Willington on 8th September; the third and fourth in South-street, a carpet weaver and his daughter, the former on 18th September, and the latter on 13th October.

545; 4. DURHAM; *St. Nicholas.* Population 23,748. Cholera 13; Diarrhœa 17. The whole of the deaths from cholera took place at Quarrington-hill. The population of the township of Quarrington in 1861 was 1056. With two exceptions, the deaths were those of coal miners and their families. The first fatal case was on 11th November, and the last on 18th December.

546; 1. EASINGTON; *Easington.* Population 27,293. Cholera 11; Diarrhœa 24. The first death from cholera occurred at the Infirmary, Seaham Harbour, to a seaman, aged 65, on 19th August. Two coal miners died at Murton Colliery on 29th September. With the exception of another fatal case at the Infirmary on 4th November, the whole of the remaining deaths were those of coal miners and their families at Thornley; the last fatal case being that of a coal miner's widow, aged 45, on 16th November.

547; 1. HOUGHTON-LE-SPRING; *Houghton-le-Spring.* Population 11,238. Cholera 21; Diarrhœa 13. The epidemic did not make its appearance until October, when it was fatal to 13 persons of various occupations. The remaining eight cases occurred during the month of November; the last on the 28th. Eight of the deaths took place in Newbottle-lane.

547; 2. HOUGHTON-LE-SPRING; *Hetton-le-Hole.* Population 10,535. Cholera 4; Diarrhœa 8. First fatal case of cholera at Four Lane Ends on 1st September; the last was at the same place, occurring to the widow of a labourer, aged 69, on 18th November. The other two deaths were in Easington-lane; a shoemaker, aged 54, on 15th October, and a labourer, aged 56, on the 16th.

548; 1. CHESTER-LE-STREET; *Chester-le-Street.* Population 14,237. Cholera 3; Diarrhœa 16. At Primrose-hill, Lambton, a coal-miner, aged 45, died from cholera on 16th August; the second death was that of a miner's wife, aged 25, at Great Lumley, on 21st September; and the third a coal-miner, aged 40, on 25th October, at D pit, Bourn-moor.

548; 2. CHESTER-LE-STREET; *Harraton.* Population 13,423. Cholera 30; Diarrhœa 23. There was one death from cholera in July, one in August, and one in September. It was not until October that the epidemic really commenced. During that month it was fatal to 14 persons (coal-miners and their families); it was also very fatal at Waterloo, there being 11 deaths during the month of November amongst coal-miners and their families. The last case was that of a cashier at a colliery, aged 45, at Springwell, Usworth, on 18th December. Mr. Hodgson, the Registrar, states that the water supply of the sub-district is derived principally from wells; but the township of Washington, and Waterloo in the township of Usworth, are supplied with water pumped from the collieries at Washington, and the water in 1866 was at least half a mile from the dwelling houses, and was carried in water barrels and sold to the inhabitants. Since the cholera epidemic the Washington Coal Company have laid pipes to all their cottages, which are now (November 1867) liberally supplied with water from the colliery.

549; 1. SUNDERLAND; *North Bishopwearmouth.* Population 23,749. Cholera 11; Diarrhœa 27. The first death from cholera occurred in Torrington-row, that of an iron-roller, aged 23, on 30th June. Except one or two solitary cases in August, there were no other deaths until October, when there were seven. The last case occurred in West Trindon-street on 4th November.

549; 2. SUNDERLAND; *South Bishopwearmouth.* Population 25,083. Cholera 7; Diarrhœa 23. A painter's daughter, aged 13, died of cholera on 15th August in Lawrence-street. The subsequent cases were spread over the sub-district, the last occuring to the daughter of a trimmer, aged 20, in Back East Woodbine-street, on 28th November.

549; 3. SUNDERLAND; *East Sunderland.* Population 9,915. Cholera 13; Diarrhœa 20. Eight of these deaths from cholera occurred in Robinson's-lane; the first on 2d September; the last on 30th October. Every death that took place was recorded as "Asiatic," and the duration of each case was very short.

549; 4. SUNDERLAND; *West Sunderland.* Population 8,517. Cholera 48; Diarrhœa 8. The first death from cholera occurred on 9th August; another death took place on the 17th. From the 3d September until 21st November the disease was very prevalent and fatal. In Baines-lane there were 14 deaths; in Union-lane 15. The last death was that of a labourer, aged 37, on 21st November, in Baines-lane.

549; 5. SUNDERLAND; *Monkwearmouth.* Population 23,440. Cholera 13; Diarrhœa 33. One death from cholera occurred in Wear-street, to the wife of a shipwright, aged 24, on 3d July; two fatal cases occurred in August, two in September, four in October, and four in November, the last death being that of a packer's wife, at Pottery-yard, on 24th November.

550; 1. SOUTH SHIELDS; *Westoe.* Population 29,382. Cholera 38; Diarrhœa 45. The first death from cholera occurred at the workhouse, Westoe, on 30th June. There were a few cases in July, August, and September. After 3d October the disease extended, and was very fatal until the end of November. Five deaths were recorded in the Cholera Hospital and three in the workhouse. The epidemic was particularly fatal amongst the families of the seafaring population. The last death was that of a coalminer, aged 35, on 27th November, at New Winnings, Boldon.

550; 2. SOUTH SHIELDS; *South Shields.* Population 15,467. Cholera 10; Diarrhœa 30. Six of these fatal cases of cholera occurred in Jarrow. One death occurred on board ship in the river Tyne. The first fatal case was on 17th July; the last on 23d November.

551; 1. GATESHEAD; *Heworth.* Population 10,315. Cholera 2; Diarrhœa 5. First death from cholera, that of a chemical labourer, aged 57, at Low Felling, on 2d September; second, that of the daughter of an engine-worker, aged five years, at Felling Shore, on 18th October.

551; 2. GATESHEAD; *Gateshead.* Population 32,749. Cholera 15; Diarrhœa 34. The first death registered from cholera was that of a seaman on board ship on 10th August. Two deaths occurred at Wreckenton, where the epidemic raged in 1849. Easton-street contributed three deaths. The last case occurred on 11th November, to the daughter of a railway labourer, aged six years, in Grosvenor-street.

39. NORTHUMBERLAND.

552; 1. NEWCASTLE-UPON-TYNE; *Westgate.* Population 37,477. Cholera 13; Diarrhœa 78. With the exception of two deaths from cholera in July, no other case is recorded until 3d October, when a skinner, aged 35, died in Buckingham-street, after an attack of eleven hours' duration. The disease was fatal to seven persons between the 23d and the end of the month; two at one house in John-street. The last death occurred on 26th November, to the daughter of a dyer, aged nine years, in West Blandford-street. Diarrhœa was very prevalent during the months of July and October.

552; 2. NEWCASTLE-UPON-TYNE; *St. Andrew.* Population 17,100. Cholera 4; Diarrhœa 16. One death from cholera in each of the four months of July, August, September, and October. The first occurred to the son of a clerk, in Alexandria-terrace; the last, to the son of a straw-hat maker, in Simpson-street.

552; 3. NEWCASTLE-UPON-TYNE; *St. Nicholas.* Population 16,632. Cholera 3; Diarrhœa 10. On 7th October a hawker (female), aged 60, died of cholera at Denton-chase, St. John; a baker, aged 45, on 12th October, in Newgate-street, St. John; and a hawker (male), aged 57, in Westgate-street, on 28th October.

552; 4. NEWCASTLE-UPON-TYNE; *All Saints.* Population 26,765. Cholera 18; Diarrhœa 32. 12 of the 18 deaths from cholera occurred in October, but the disease does not appear to have been confined to any particular locality or to persons of any particular occupation. The first death was that of a seaman, aged 45, in Stepney-terrace, on 17th July; the last was the son of a labourer, aged three years, at Killing-entry, Pandon, on 6th November.

552; 5. NEWCASTLE-UPON-TYNE; *Byker.* Population 12,994. Cholera 5; Diarrhœa 11. These five deaths from cholera were all of young persons under 20 years of age; two of them died at Stone Cellars, All Saints. The first death occurred on 28th July; the last on 21st October. During the epidemic of 1853–4 cholera was fatal to 1,431 persons in the district of Newcastle-upon-Tyne, while in 1866, when the population had increased by some 20,000 persons, the deaths from cholera were 43.

553; 1. TYNEMOUTH; *Wallsend.* Population 6,715. Cholera 7; Diarrhœa 12. Two of these deaths from cholera occurred at Wallsend and four at Willington; they were mostly preceded by diarrhœa. The first death took place on 21st August and the last on 5th November.

553; 2. TYNEMOUTH; *North Shields.* Population 17,138. Cholera 43; Diarrhœa 23. No death from cholera took place until 29th September, when the wife of a tailor, aged 37, and the wife of a coal-miner, aged 58, died at Chirton. There were no other deaths until 13th October, but from that date until 17th November cholera was fatal nearly every day. The greatest number of deaths which took place in one day was six on 22d October. It was fatal to 24 persons in the township of Chirton and to 18 in the township of North Shields. The remaining death from cholera was at Preston, not one fatal case being registered at Moortown. Mr. Wheldon, the Registrar, states that the town of North Shields is supplied with water principally by the North Shields Water Company by pipes and taps leading into the houses or at public parts; the company have three reservoirs for the collection of water. A large supply is derived from an old quarry, and water is also pumped from the Preston Colliery. Some of the inhabitants have private wells from springs. It is added that there have been complaints against the company's water, which have been taken up by the Tynemouth Corporation, who are making investigations, getting water analysed, &c. The objection seems to fall on the Preston Reservoir on account of a surface drain going into it.

553 ; 3. TYNEMOUTH ; *Tynemouth.* Population 18,266. Cholera 109 ; Diarrhœa 50. 50 males and 59 females died from cholera. The first death occurred on 1st October, when the epidemic commenced, and continued very fatal during the whole of that month, no less than 97 of the 109 deaths being recorded therein. Nine deaths took place on 21st October, 11 on the 22d, 10 on the 25th ; after that date they diminished day by day until the middle of November, when the disease finally disappeared. The following streets and localities suffered the most, in the order named :— Stephenson-street, Churchway, Wellington-street, and Toll-street. Nearly a fourth of the deaths occurred amongst seamen, their wives and families. The last case was the son of a corporal, Royal Artillery, aged two years, at Clifford's Fort, on 13th November. Mr. Irvin, the Registrar, states that the water supply is derived from reservoirs of the North Shields Water Company by pipes laid into the town.

558 ; 1. MORPETH ; *Morpeth.* Population 8,426. Cholera 4 ; Diarrhœa 3. These four deaths from cholera occurred in the County Lunatic Asylum, Morpeth, and were, respectively, those of a gardener, aged 54, on 29th October ; the wife of a labourer, aged 27, on 2d November ; a farm labourer, aged 52, and a female servant, aged 28, on 4th November.

558 ; 2. MORPETH ; *Bedlington.* Population 15,577. Cholera 6 ; Diarrhœa 33. These deaths from cholera took place in the parish of Bedlington ; three of them at Scotland-gate. With one exception, they were amongst the mining population. The first death occurred to the wife of a collier, aged 51, at Barrington Colliery, on 11th July ; the last to the son of a collier, aged 17, at Scotland-gate, on 17th November.

40. CUMBERLAND.

567 ; 2, LONGTOWN ; *Low Longtown.* Population 7,178. Cholera 7 ; Diarrhœa 5. At Blackford, West Linton, a farm-labourer, aged 65, died of cholera on 30th October ; the next death was that of a farm-labourer's daughter, aged one, in Swine-street, on 4th November. The epidemic then broke out in Bridge-street, there being no less than five deaths in that street, all children of farm labourers, who died respectively on 4th, 6th, 8th, 9th, and 10th November.

570 ; 3. COCKERMOUTH ; *Workington.* Population 10,765. Cholera 5 ; Diarrhœa 17. The deaths from cholera, with one exception, were confined to Pow-street. The first was that of the daughter of a farmer, aged three years, on 4th September ; the last, of the wife of a tailor, aged 34, at New-yard, on 5th November.

570 ; 4. COCKERMOUTH ; *Maryport.* Population 13,707. Cholera 2 ; Diarrhœa 5. On 12th October, at the Golden-lion Hotel, Maryport, an hotel-keeper, aged 57, died of "diarrhœa, Asiatic cholera (24 hours)" ; 14th October, at the same hotel, a waitress, aged 45, "Asiatic cholera ($8\frac{3}{4}$ hours)."

571 ; 1. WHITEHAVEN ; *Harrington.* Population 6,765. Cholera 1 ; Diarrhœa 1. A master mariner, aged 41, died at Parton, on 1st September.

571 ; 2. WHITEHAVEN ; *Whitehaven.* Population 14,064. Cholera 9 ; Diarrhœa 9. With one exception (the last death, in Plumblands-lane, Scotch-street, on 13th October,) the whole of these deaths from cholera occurred at the Infirmary, Howgill-street, principally amongst labourers and their families ; the first on 13th September, the last on 7th October.

571 ; 3. WHITEHAVEN ; *St. Bees.* Population 8,681. Cholera 4 ; Diarrhœa 13. First fatal case of cholera occurred on 23d September at 3 Ginns, Whitehaven, to the wife of a collier, aged 55, who died in 13 hours ; the next two deaths on the 24th and 28th. The fourth case was that of the widow of a joiner, aged 51, at Thicket, Preston quarter, on 27th October.

571 ; 4. WHITEHAVEN ; *Egremont.* Population 10,440. Cholera 2 ; Diarrhœa 5. The daughter of a labourer, aged seven years, died at Cleator Moor, on 11th August ; and a factory hand (male), aged 67, on 30th October, at Egremont.

XI.—WELSH DIVISION.

42. MONMOUTHSHIRE.

578*b* ; 1. BEDWELTY ; *Aberystruth.* Population 16,055. Cholera 21 ; Diarrhœa 6. Ebbw Vale suffered severely from cholera, no less than 14 of the deaths taking place there during the month of September, chiefly amongst forge labourers and their families ; the first death was that of an iron baller's helper, aged 24, on 6th September ; and the last in that locality, that of the infant daughter of a seamstress, on 23d September. It was also fatal to two persons at Cwm, and three at Blaina. The last death was that of a collier's son, on 26th November, at Countillwy.

578*b* ; 2. BEDWELTY ; *Tredegar.* Population 28,548. Cholera 101 ; Diarrhœa 23. The deaths from cholera were 13 in September, 29 in October, 29 in November, and 30 in December. It was

particularly fatal at Rumney in October and November, and at Tredegar in December, amongst the mining population. The Registrar states that Rumney, Ebbw Vale, and Sirhowy are supplied with water from wells and surface water; the surface water may be liable to contamination. Tredegar is supplied with water from the Tredegar Waterworks. During the epidemic of 1849 it was observed that the mining population of Tredegar was attacked with cholera at a later period than in other localities. The last death occurred to the widow of a collier, aged 76, at Sirhowy, on 26th December.

579; 1. PONTYPOOL; *Pontypool.* Population 22,633. Cholera 18; Diarrhœa 5. The first fatal case of cholera took place on 16th September, when the son of a labourer, aged five years, died at Trevethin; the last death occurred to the son of a puddler, aged 10 months, at Rock-hill, on 30th October. During the prevalence of the epidemic its presence was most marked at Trevethin, where 12 of the 18 deaths from cholera occurred.

580; 1. NEWPORT; *Caerleon.* Population 7,615. Cholera 4; Diarrhœa 2. A child died of cholera at Christchurch, on 5th July; a farm labourer and the wife of a farm labourer, each aged 50, on 13th September, at the same place; and lastly the daughter of a farm labourer, aged six months, on 26th October, at Penhow.

580; 2. NEWPORT; *Newport.* Population 24,756. Cholera 29; Diarrhœa 21. Cholera was fatal to the infant daughter of a seaman, on 23d July, at Newport; two or three cases occurred in August, but it was not until September that the deaths were numerous; towards the end of that month the epidemic gradually subsided. The last death occurred in Dolphin Street, to the wife of a seaman, aged 52, on 23d October.

580; 3. NEWPORT; *St. Woollos.* Population 8,445. Cholera 12; Diarrhœa 6. The infant daughter of a coal miner died at Risca, on 16th September; the disease continued prevalent during the remainder of that month at Risca, but gradually declined in October. The last death was that of the wife of a labourer in a coal pit, aged 37, on 29th November.

580; 4. NEWPORT; *Mynyddyslwyn.* Population 10,596. Cholera 16; Diarrhœa 4. Cholera was fatal on 28th August to the wife of an innkeeper, aged 78, at Abercarne, where, with one exception, the whole of the deaths from cholera took place. It was prevalent during the month of September, and was particularly fatal amongst the mining population; the last death recorded was that of the daughter of a labourer, aged nine years, on 22d September. In 1849 the deaths from cholera were four.

43. SOUTH WALES.

GLAMORGANSHIRE.

581*a*; 1. CARDIFF; *Whitchurch.* Population 5,739. Cholera 4; Diarrhœa 1. Two fatal cases of cholera occurred at Derry Mill, Whitchurch; one at Pentyrch and one at Glwaclodygarth; the first on 11th September and the last on 20th September.

581*a*; 2. CARDIFF; *Cardiff.* Population 46,954. Cholera 72; Diarrhœa 38. The first death from cholera occurred as early as 17th February; there was no other death until June; two took place in July; then in August they became more frequent, until the epidemic reached its height in September, when 37 deaths were recorded. In October the disease declined, the last death being that of a hatter's infant daughter, on 20th October. 37 of the deaths were recorded at St. Mary, and 10 at St. John, including five in the workhouse.

581*b*; 1. PONTYPRIDD; *Pontypridd.* Population 17,445. Cholera 10; Diarrhœa 11. Cholera was first fatal to a fitter, aged 50, at Walnut-tree-bridge, Eglwysilan, on 21st August; seven deaths were recorded in September and two in November, the last case being that of the daughter of a coal miner, aged seven years, who died at Mountain Ash, on 21st November, after an illness of 10 hours' duration.

581*b*; 2, PONTYPRIDD; *Llantrisaint.* Population 9,907. Cholera 7; Diarrhœa 7. Five of these deaths from cholera occurred at Llantrisaint. Miners and their families were the principal sufferers. First death on 1st September and the last on 31st October.

581*b*; 3. PONTYPRIDD; *Ystradyfodwg.* Population 3,035. Cholera 34; Diarrhœa 7. In this outbreak of cholera the disproportion of sexes to whom the disease proved fatal was very great, the deaths being—males 31; females 3. Miners were the chief sufferers, and the epidemic appears to have been most severe at Treorki, where 17 deaths were recorded, 14 of them being coal miners. It first made its appearance on 12th September, and reached its height towards the end of October, finally disappearing in November; no less than seven deaths occurred in one day, viz., 26th October. It was also very fatal at Treherbert, where nine deaths occurred. Mr. W. Evans, M.R.C.S., states that the supply of water is got from surface wells, and is liable to surface pollution. The last fatal case was that of a coal miner, aged 28, on 10th November, at Treorki.

582; 1. MERTHYR TYDFIL; *Gelligaer.* Population 5,778. Cholera 5; Diarrhœa 4. The first death from cholera was that of a coacher in a plate mill, aged 22, at Pontlottyn, on 28th October; this was followed by three deaths in King-street, Pontlottyn, of two labourers and the widow of an

agricultural labourer, on the 1st, 14th, and 15th of November respectively; the last death took place on 23d December, when the son of a coal miner died at Pantywaun.

582; 2. MERTHYR TYDFIL; *Lower.* Population 25,300. Cholera 61; Diarrhœa 14. The first fatal case of cholera occurred to the wife of an iron puddler, aged 36, at Abercannaid, on 24th August; after this date deaths took place regularly, at the rate of one or two a day, up to the middle of October, when they suddenly ceased, there being no other deaths until November, when a coal miner, aged 51, died on the 1st; and lastly the infant son of an engine cleaner, on the 27th, in Chapel-street. The greatest number of deaths that occurred in one locality was 10, at Caedraw. In 1849 the deaths from cholera were 462.

582; 3. MERTHYR TYDFIL; *Upper.* Population 27,478. Cholera 72; Diarrhœa 4. Cholera broke out on 25th August, causing four deaths, two at Merthyr and two at Dowlais; but it was not until September that the epidemic reached its climax, there being 52 deaths recorded during that month, the greater portion between the 1st and 15th. It was fatal in 36 instances at Merthyr, and 18 at Dowlais. Several deaths occurred in Quarry-row, Merthyr, at Sunny-bank, and in the House of Refuge, Brecon-road. Coal miners, labourers, and their families were the principal sufferers. The last death was that of a metal weigher's infant daughter, at Dowlais, on 11th November. In 1849 the deaths from cholera were 1,005.

Mr. Dyke, the Medical Officer of Health for Merthyr Tydfil, in his report to the Local Board on the sanitary condition of the parish in 1866, states that in many towns (Llanelly, Swansea, Briton Ferry, Aberdare, and Cardiff) with which the inhabitants of Merthyr are in constant communication epidemic cholera prevailed previously to the 22d of August, when the first sickening under the disease seems to have taken place. With regard to the first cases, Mr. Dyke says: "It has been distinctly "proved to my thorough conviction, that no contact with anything infected, nor with any person "affected, nor any communication with each other, could have taken place;" but in the fourth case, that of an aged Irishwoman employed at a rag store in picking and cleaning rags, "it is "very possible that she may have come in contact with clothing brought from Aberdare where "cholera then prevailed." Mr. Dyke further confidently states, that no pollution of the water supply of Merthyr with sewage occurred: "The water used for all domestic purposes by all the "inhabitants of the town * * * * is derived directly from the lesser Taff river, five miles "north of the town, discharged from the main supply pipe into two uncovered receivers at "Penybryn, thence it passed into uncovered filtering basins, and then into the covered reservoirs "from which Merthyr and Dowlais are supplied. It is true the position of these open receivers "and filtering beds on the sloping hill side above Penydarren renders them liable to receive from "the winds that blow over them whatever of the seeds of disease may be conveyed through the "air; yet it is scarcely possible to imagine such should have been the case in this epidemic, when "we remember the sparseness of the first cases, spread over a widely extended surface of hill "and dale."

Mr. Dyke subsequently states that "in August a number of persons used water from wells which, "being situated near old and deep cesspools, were contaminated by sewage. As to the pernicious "influence of such a water Mr. Allday states that he was in attendance upon a tradesman who was "affected with and died of cholera; his wife and son were also ill of the disease, but recovered. "This family used the water of a well which, upon inquiry at the time, Mr. Allday ascertained "became most offensive when kept for 24 hours."

The temperature, both night and day, was higher than usual in the first three weeks of August, and the atmosphere was loaded with moisture. The conclusion arrived at by Mr. Dyke is, that the germs of infection were communicated through the air: "Arrived in the atmosphere of the town, "these germs or seeds would find places where all the necessary elements abounded in which they "could propagate themselves in infinite multitudes, for everywhere human excrements were to be "seen or smelt. The town infected by the epidemic influence, cholera quickly followed its usual "laws; it sought out especially the filthy houses, affected principally the intemperate, the dirty, "and the weak, and increasing the number of its victims up to the fourth week, gradually declined, "and finally ceased in the eleventh week from its commencement."

The epidemic was fatal in 69 different localities, extending over an area of not less than eight square miles, and between the 24th August and 9th November 2178 persons had been attacked out of a population of 53,480, and 136 deaths had occurred. In 163 houses occupied by 824 people 34 deaths from cholera took place.

582; 4. MERTHYR TYDFIL; *Aberdare.* Population 34,452. Cholera 92; Diarrhœa 22. Cholera was fatal to the son of a coal weigher, aged five years, at Cwmbach, on 1st August. The deaths were not very numerous until September, when the disease spread rapidly, and was very fatal during the whole of the month, 56 deaths being recorded, principally amongst the mining population. It was not until October that the epidemic began to decline, and the end of November was reached before it was quite extinct, the last fatal case being that of a labourer's daughter, aged four years, at Hirwain, on 30th November. Dr. Davies, the Medical Officer of Health for Aberdare, states that the water supply was good from the Aberdare Waterworks, but that the drainage was indifferent. In 1849 the deaths from cholera in the district of Merthyr Tydfil were 1,682; in 1854, 445; and in 1866, 230.

583; 1. BRIDGEND; *Maesteg.* Population 8,562. Cholera 29; Diarrhœa 10. The first death from cholera occurred to the wife of a collier, aged 49, in Cross-street, on 25th August; there was no other death until 8th September, when three occurred, two in Shoemaker's-row and one in

Jenkins'-row; after that date deaths took place at intervals of two or three days, until the middle of November, when they ceased for a time, one more fatal case occurring on 5th December, to the daughter of an iron puddler, at Duffryn-row, Maesteg. The greatest number of deaths in one street was eight, in Bethania-street.

583; 2. BRIDGEND; *Cowbridge.* Population 6,486. Cholera 2; Diarrhœa 0. On 15th September a female, aged 59, at Monknash, and an agricultural labourer, at Lantwit Major, on 21st September.

583; 3. BRIDGEND; *Bridgend.* Population 11,417. Cholera 49; Diarrhœa 1. Cholera was fatal to the wife of a tailor, aged 50, on 13th May, in Queen-street; one other death occurred in May, one in July, four in August, and 33 in September. The epidemic was most prevalent at Newcastle; six deaths occurred in the workhouse. The last death was that of a labourer's wife, aged 30, at Aberkenfig, on 15th November. The deaths from cholera in 1849 were 50.

584; 1. NEATH; *Margam.* Population 16,815. Cholera 123; Diarrhœa 21. The first death from cholera occurred on 10th August, at Constant, Margam; it was not, however, until the beginning of September that the disease became prevalent, causing 83 deaths during that month, the greatest number occurring in one day being eight on the 9th, and the same number on the 18th, 16 deaths were registered in October and six in November, the last being that of a coal miner, aged 38, on the 22d, at Lower Michaelstone. A third of the deaths took place amongst coal miners, their wives and families; copper smelters also suffered considerably. The following are the principal localities where the epidemic prevailed: Lower Michaelstone, 55; Aberavon, 38; and Margam 25 deaths. In 1849 the deaths from cholera were 241.

584; 2. NEATH; *Neath.* Population 13,462. Cholera 94; Diarrhœa 16. One death from cholera occurred on 16th July at Briton Ferry; the next case occurred on 5th August; and the epidemic reached its height in September. In October the deaths rapidly declined, the last case being that of a mariner's widow, aged 26, at Briton Ferry, on 1st November. In the parish of Neath 47 deaths were recorded, and 49 in Briton Ferry, the remainder taking place at Lantwit and Higher Baglan.

584; 3. NEATH; *Ystradvelltey.* Population 3,303. Cholera 49; Diarrhœa 3. The first death from cholera occurred on 7th September to the wife of a labourer at Blaengwrach. Deaths took place at intervals of two or three days during September, and then became of daily occurrence up to 24th October, when they ceased for a time, there being no other death from cholera recorded until the 31st; between that date and 9th November it was fatal to nine persons. Coal miners and their families were the principal sufferers, and the epidemic raged most severely in the hamlet of Upper Neath, where 36 of the deaths occurred. In 1849 the deaths from cholera were 38.

584; 4. NEATH; *Ystradgunlais.* Population 12,328. Cholera 163; Diarrhœa 15. Cholera was first fatal on 3d August, to a tin washer, aged 19, at Ystalyfera. The next death occurred on 9th August. The epidemic reached its height at the beginning of September, and continued very fatal during the whole of that month. In October the mortality slowly declined; but it was not until November that the disease was finally extinguished, the last case being that of a haulier's wife, aged 42, at Ystrad Village, Ystradgunlais, on 28th November. The following are some of the localities that suffered severely: Graig-Aru, Cwmtwrch, Pant-teg, Wern, and Ystrad Village. The deaths from cholera in 1849 were 107.

The following description of the local characteristics of Ystalyfera, where cholera was exceedingly fatal, is condensed from a sketch of the outbreak in this village, prepared by Mr. James Rogers, M.R.C.S., of Swansea:—

The epidemic began early in August, and reached its climax on the 27th and 28th of that month, 40 new cases occurring on each of those days. It seems to have subsided by the end of September. Prior to the outbreak there had been a good deal of simple, painless diarrhœa prevailing amongst the people engaged at the Ystalyfera works, but this soon gave place to the more serious disorder.

The water supply was scanty in quantity, and very uncertain in quality, being "little better than surface water percolating through shale tips, and the drainage of coal and mine seams and colliery workings; so scarce was the water in the works that it was a common practice with the men to drink largely of the canal water. *This water received the surface drainage of nearly all the houses in the village.*" Drainage of a proper kind there was none; the village occupying an abrupt hill-side, the cesspool contents of the higher parts percolated to the lower levels, and the pavement of the back premises where the first case of cholera occurred during the epidemic was 'squashy' from this cause. Culverts, badly constructed, carried along close to the back doors of the houses the excreta from the open privies; filthy ash heaps and 'stonds' of putrid pig-wash were in dangerous proximity to doors and windows. Houses built with two stories below the level of the road, and others close under the canal bank, but far below the water level; slaughter-houses, pigsties, cesspools, and wells within a few feet of each other; open gutters and trenches reeking with fœtid miasms; an overcrowded graveyard, whose retaining walls consist in some parts of the back walls of cottages; the soil, rank with the decaying elements of mortality, rising seven or eight feet above the cottage floors—all these elements enter into the local sanitary condition. The disease raged in nearly all the houses built close to and below the canal bank (in some cases the water level was higher than the roof), and in underground tenements generally; in the locality of the noisome graveyard the virulence of the disease was remarkable.

"Why, in the name of common sense," says Mr. Rogers, "this graveyard is not shut up I cannot "imagine." Of the 95 fatal cases of cholera, Mr. Rogers asserts that all died of local circumstances —the effect of avarice or ignorance, or neglect of sanitary precaution: "in short, given a case of cholera in a foul dwelling—*death*; in a healthy dwelling—*recovery*."

In answer to inquiries Mr. Rogers has been good enough to communicate the following information:

"Taking the town of Neath it is only very recently that any comprehensive system of drainage has been adopted; it has been done piecemeal by the Corporation and the Highway Board prior to the passing of the Sanitary Act of 1866, under the direction of Mr. J. B. Campion, the Highway Surveyor and Inspector of Nuisances residing in Neath. With regard to the water supply in the town, I believe the quality is good and the supply abundant, if it is made properly available by distribution.

"As regards the outlying districts I think I may venture to say that there is no system of drainage whatever. Wherever large works are established large villages spring up to the proportion of towns in extent and number of population, and excepting Cwmafon (in the parish of Michaelstone Lower, the works-owners make but as little provision as possible for dwellings, and, as I think, very little or none for the health and social comfort of the people they mass together. The consequence of this is that workmen invest their savings in house property; by this means and by the aid of building societies a large number of houses are built; and in consequence of there being no authorized supervision in their construction the most outrageous mistakes are made, leading to an incalculable amount of mischief, especially in localities where domestic and personal cleanliness is the exception and not the rule. The effect of this in the works district with which I was connected for 16 years (Ystalyfera) was very marked. Whatever the nature of the epidemic it persistently stuck to the place; scarlatina, measles, whooping-cough, small-pox, each in their turn were governed by that cause; the last epidemic of small-pox, about three years since, lasted over 14 months, picking out its victims amongst the unvaccinated, until I firmly believe all who were not so protected had it. So serious are the consequences of neglect in the construction and regulation of the workmen's dwellings that I feel quite sure it would be attended with good as well as economical results if the legislature would take action in the matter, retrospective as well as prospective, and compel owners of property to respect sanitary laws.

"The water supply in these outlying districts in the neighbourhood of large works, and especially of collieries and mines, is very scanty; the deep springs are drained by the colliery operations, and the people have commonly to help themselves from surface wells; in summer and in dry weather this dwindles to a mere nothing, and I have seen crowds of women and children waiting for hours for their 'stem.' Since the cholera epidemic of 1866 this has to a great extent been remedied at Ystalyfera by the damming back of the drain of a disused colliery level, and the water conveyed in pipes the length of the upper half of the village with convenient delivery pipes attached.

"The population of the parish of Llanguick, in one of the hamlets of which (Allt-y-grug) Ystalyfera is situated, was estimated in 1865 at 8,000; the population of the village and immediate neighbourhood of Ystalyfera is about 5,000."

584; 5. NEATH; *Cadoxton*. Population 7,522. Cholera 54; Diarrhœa 0. Cholera was fatal to the wife of a coal miner, aged 21, on 1st August, at Skewen, Coedfrank, where the epidemic was very fatal during the whole of the month among the families of coal miners and copper smelters. In September the disease declined at Skewen, only six deaths occurring, against 25 in August, the last fatal case being that of a tinplate worker's son, aged 12, at Aberdulais, on 18th November. Neath Abbey also suffered, principally in September.

584; 6. NEATH; *Llansamlet*. Population 5,103. Cholera 37; Diarrhœa 2. First death from cholera on 9th August, at Pentre Cawr. The epidemic was chiefly prevalent in September, Higher Llansamlet suffering the worst. Nearly the whole of the mortality was among the mining population. The last death occurred on 31st October.

585*a*; 1. SWANSEA; *Llandilotalybont*. Population 5,114. Cholera 45; Diarrhœa 0. The first fatal case of cholera was at Mynyddbach, on 23d July. The next death occurred on 12th August, and between that date and the end of the month four persons died. The epidemic prevailed chiefly in September, and was most fatal at Clydach. The last death was that of a miller's daughter, at Lliw Mill, on 9th November.

585*a*; 2. SWANSEA; *Llangafelach*. Population 14,553. Cholera 151; Diarrhœa 1. Cholera was fatal on 27th May to a sinker at Morriston. In June there were 11 deaths; in July 8, in August 17, in September 84, in October 28, and in November 2; the last case being that of a haulier, aged 47, at Raven Hill, on 11th November. The epidemic was much more fatal to females than males, and it prevailed principally at Morriston. The mining and metal-working population were the most numerous sufferers, several families losing more than one member.

585*a*; 3. SWANSEA; *Swansea*. Population 31,593. Cholera 326; Diarrhœa 19. Cholera prevailed principally in the months of August and September, the deaths being 109 and 154 respectively; the greatest number occurring in one day was 12, on 21st September, and on several days during August and September the deaths reached 9 and 10 in number. Cholera was first fatal to the wife of a haulier, aged 27, in Fleet-street, on 14th May; the next case was on 9th July; there were no other deaths from cholera until 19th July, after which date they occurred daily throughout that month, increasing in number during August, the disease attaining its height

in September, and gradually declining in fatality towards the end of October. The last case was that of a labourer's daughter, aged nine years, in Brook-street, on 26th October. Cholera was fatal to 152 males and 174 females, as under :—

	Males.	Females.	Total.
Under 15 years - -	68	55	123
15 and under 60 years - -	63	92	155
60 years and upwards - -	21	27	48
Total -	152	174	326

All classes of operatives suffered, and the deaths were most numerous in the subjoined localities: Strand 15, Burrows Lodge Hospital 15, Charles-street 14, Ann-street 11, High-street 10, Llangafelach-street 9, Back-street 9, Fleet-street 8, Queen-street 8, Green-row 6, Recorder-street 5, Rodney-street 5.

In the years 1849, 1854 the deaths from cholera in the district of Swansea (including Gower, now a separate district) were 262 and 17 respectively; in 1866 the deaths in the two districts were 551.

Mr. Ebenezer Davies, M.R.C.S., the Medical Officer of Health for the borough of Swansea, has favoured the Registrar General with the following particulars relating to the cholera epidemic :—

" My district is co-extensive with the municipal borough of Swansea, and is included in three registration sub-districts, but does not cover the whole of either of them. It takes in nearly the whole of the Swansea sub-district, about half of the Llangafelach district, and a part of the Llansamlet district, in the Neath union.

" Cholera appeared in *Llangafelach* on the 27th May, and existed there in an epidemic form during a great part of the month of June, destroying two persons in one house on the 12th, and three in another between the 20th and 23d. It did not at this time make an entrance into the borough of Swansea, although close on the border, but was next heard of at Llanelly, about 10 miles to the west of Morriston. The sanitary condition of the Morriston part of the Llangafelach district, especially the extra-municipal part of it, was very defective. The cesspool system was general, but on the sides of the hill above Morriston, where the epidemic was most severe, there was a great want of even privy accommodation; the houses thinly scattered about, but sometimes in short rows, were of a poor description. Another feature in this district deserving of notice is the almost entire absence of grass vegetation in consequence of copper smoke, and as a result the absence of the compensating advantage it would have afforded when refuse was thrown on the surface of the ground around the dwellings. Within the municipal boundary there was a supply of water from the new Swansea waterworks, and the deaths from cholera within and without the borough boundary in the Llangafelach sub-district were as follows :

Within the borough - - -	51 deaths.
Outside „ - - -	100 „

" *Swansea.*—The death registered (14th May) as from cholera was a sporadic case. Unfortunately it was not seen during life by any medical man, and although the post mortem appearances were not inconsistent with cholera, and the illness was very short, an element of doubt was introduced into the case that renders it, I think, undesirable to connect it with the epidemic of 1866. The death on July 9th was the first, although the outbreak took place on the 23d, when cholera appeared simultaneously in parts of the town widely separated from each other. In reference to *water supply* and *drainage* the following are the facts: All parts of the town proper and much of the Llangafelach district within the jurisdiction of the Board had an abundant supply of pure water. This supply was continuous, and drawn direct from the tubs, under very high pressure, without the intervention of receptacles of any kinds. The use of wells and pumps within the town may be said practically to have been abolished. *Those parts of the town which enjoyed a complete immunity from cholera and those where it raged most virulently were in precisely the same condition as regards water supply.* Cholera was most severe in those localities where there was no deep drainage, or where the inhabitants had not availed themselves of it by neglecting to connect their houses with the sewers. The main drainage in 1866 had not reached the Irish quarter (Ann-street, Llangafelach-street, Brook-street, Charles-street) when the epidemic was most severe. The houses in this part of the town were badly built, overcrowded, and inhabited by the very poorest labouring class. In the lower part of the town (Fleet-street, Recorder-street, Rodney-street) the houses and the people were of a better class, but the houses had only lately been drained into the sewers after using cesspools for three or four years; but here the epidemic, in proportion to population, was not nearly so severe. The only condition common to all parts of the town visited by cholera was the social condition of the inhabitants, the labouring and the very poor being, with only three or four exceptions, the only classes who suffered from cholera. The heavy rain-fall of September (9 inches) had I believe a very prejudicial influence in keeping the houses of the labouring poor (in many cases badly built and unprovided with shoots to carry off water from the roofs) damp and comfortless.

" In the third division of the borough lying within the parish of *Llansamlet* cholera was only slightly felt, — 12 deaths in an estimated population of 3,500; water supply incomplete, and drainage very imperfect; district thinly populated; condition of the people same as in Llangafelach where they are chiefly employed in the copper and tin works.

Drainage.—"In 1857 the main drainage of the town was commenced, and up to July 1866 thirteen miles of sewers had been constructed, principally in the town proper (town and franchise, and hamlet of St. Thomas). The drainage of the new part of the town is pretty complete, but the drainage of the upper part of the town (the Irish quarter before referred to) has only just been completed (1867). The rapid growth of the town, which has increased for the last 17 years at the rate of 150 houses annually, has been in advance of the action of the Board; but, considering that all that has been done has been done since 1857, the drainage has been very satisfactory, and as rapid as the machinery of municipal institutions would permit.

"*Water supply.*—The water supply of Swansea, before the completion of the last reservoir, was obtained from,—

"(*a*) Brynmill reservoir, the first which supplied water to Swansea, and which latterly only supplied a portion of the town just above the sea level. Its water was derived: 1. From a spring rising within half a mile of the reservoir, and conveyed into it by a covered watercourse, and giving a daily supply, in dry weather, of 32,000 gallons, and in winter of 104,000 gallons. 2. From three uncovered streams running through cultivated (principally meadow) land, with houses thinly scattered at a few points in the neighbourhood of their course, free from sewage contamination as far as known, but of course, like all open streams, liable to wilful or accidental fouling. The great objection to this supply was that after rain surface water from gardens and roads which the streams flowed under was liable to get into the streams. Daily supply in dry weather, 109,000 gallons, and as this supply was more than sufficient for the population of the district, the surveyor of the Board, long before cholera was expected, had diverted stream No. 1. from the reservoir, and had taken it direct into the service-pipe after leaving the reservoir.

In this way the mass of water in the reservoir was only used *very occasionally to supplement* the supply from the spring if it fell short, and this reserve *was never turned into the town in July* 1866.

"(*b*) Cwmdonkin reservoir. The supply is derived from: 1. An uncovered stream which rises in a market-garden about a quarter of a mile from the reservoir; in dry weather affording a supply of about 12,000 gallons daily, and in winter reaching 170,000 gallons. This supply passes through the garden of one other inhabited house. 2. A covered stream, rising in an abandoned coal level, which had been disused in consequence of the difficulty of getting rid of the water, and which was free from the possibility of contamination, and is still used. Average daily supply in dry weather, 43,000 gallons.

"(*c*) The Velindre or new reservoir, commenced in 1862, and from which water was first brought into Swansea in 1863. It is formed by an embankment across the valley through which the river supplying it runs. This river is fed by springs rising in a gathering ground of mountain about 1,900 acres in extent, and at a level of from 450 to 800 feet above the sea. The soil of the gathering ground is almost entirely uncultivated, affording pasturage to mountain sheep and a few cattle. There are four or five small holdings on the mountain tenanted by cotter farmers, who besides keeping sheep grow perhaps enough corn to supply their own households. This reservoir for storage is about seven miles to the north of Swansea, the top water 408 feet above mean-tide level. The service reservoir is on the hill above Morriston (in the sub-district of Llangafelach), 291 feet above tide level. After supplying that part of Morriston lying within the borough boundary, it enters the town of Swansea at its highest point, the north-eastern end, and supplying in its course this part of the town, passes through it and empties itself into the Cwmdonkin (*b*) reservoir at the western extremity of Swansea.

"It may be thought that as there was more than one water supply there might have been a difference in purity; the streams supplying the old reservoirs were for a great part of their course uncovered and in the neighbourhood of inhabited houses, and as there was just a possibility of sewage contamination, and as it was very important that the water supply of the town should be above suspicion, the Board, at my suggestion, cut off entirely, on 28th July 1866, the water supply from the old sources, and thenceforward it was wholly drawn from the new reservoir, which was absolutely free from the risk of sewage contamination.

"The heavy mortality from cholera here in 1866—the total deaths from that disease within the borough being 363 (172 of males and 191 of females)—was a grievous disappointment to myself and to those who hoped that after the improvement that had taken place in drainage and water supply we should have fared better than in 1849.

"Undoubtedly our weak point was incomplete drainage; but this reproach, as far as the town is concerned, is being rapidly removed."

585*b*; 1. GOWER; *Eastern.* Population 4,962. Cholera 26; Diarrhœa 5. Cholera was fatal to a labourer on 19th May; the last case was that of a mariner's wife, aged 28, on 11th November. It was most fatal at Penclawdd and Oystermouth, chiefly in the families of labourers and colliers.

585*b*; 2. GOWER; *Western.* Population 3,354. Cholera 3; Diarrhœa 2. The three deaths from cholera occurred at Burry's Green, Llangennith, and were those of a farmer on 12th September, his widow on the 15th, and a shipwright on the 16th.

CARMARTHENSHIRE.

586; 1. LLANELLY; *Loughor.* Population 3,970. Cholera 21; Diarrhœa 3. Cholera was fatal to 6 males and 15 females; the first case was that of a coal-miner, aged 21, at Llwynhendy, on 11th July; the last was that of a labourer's wife, aged 63, on 2d October at Penygraig, Llanelly.

The epidemic was most fatal at Llwynhendy and Loughor Borough, and it prevailed chiefly in July and September, there being but two deaths recorded in August.

586; 2. LLANELLY; *Llanelly.* Population 14,619. Cholera 167; Diarrhœa 24. The first death from cholera occurred on 8th July in Ann-street, Llanelly; the last on 30th October at Llwyncaefarthwch. The disease was chiefly prevalent in July (84 deaths) and August (65 deaths), the deaths visibly declining in September; the last three cases occurred respectively on 9th, 20th, and 30th October; 10 were recorded in the workhouse, 20 at Felinfoel, 11 at Wern, 10 at New Dock, and 9 at Custom House Bank; coal-miners, labourers, and their families were the principal sufferers.

586; 3. LLANELLY; *Pembrey.* Population 5,797. Cholera 32; Diarrhœa 22. On 15th July a case of cholera proved fatal in 32 hours, at Penllech, Pembrey, to a coal-miner, aged 54 years; the next death occurred on 18th July, and by the end of August seven more had occurred, chiefly of miners, labourers, and their families. Diarrhœa was very fatal in September, 11 deaths occurring from that disease, while only four cases of cholera were registered. In October the epidemic again prevailed, and was fatal to 11 persons, in some instances to more than one member of the same family; the last death was that of a farmer, aged 46, on 18th November. In 1849 the deaths from cholera were 16, diarrhœa one.

586; 4. LLANELLY; *Llannon.* Population 3,593. Cholera 8; Diarrhœa 0. The first death from cholera occurred on 15th July at Llanech, the last on 7th December at Tynewydd; four were recorded in September and one in each of the months of July, October, November, and December. In every instance the deaths were uncertified by a medical practitioner.

Dr. Thomas, the Medical Officer of the Llanelly district, has obligingly supplied the following particulars:

"The water supply in Loughor borough at the time of the cholera epidemic was from two wells, one within a few yards of several privies, which must have in some measure drained into it, the other in close proximity to a burial ground.

"At Llwynhendy the water supply was also from two wells and a colliery pump, in neither of which could I find any source of impurity.

"At Felin Foel the people obtained their water from the river in part, and partly from a well and a small running stream. The two former were suspected of being contaminated.

"The Wern, New Dock, and the Custom House Bank were supplied from the town reservoir, which is very insufficient for the supply of the town, and open to pollution from four cottages with 22 inhabitants without a privy to either, but having a pigsty each, overhanging the little stream that supplies the reservoir, as well as from a farmyard.

"In Pembrey parish the disease was very much scattered, Pembrey proper escaping. The water supply was chiefly from small wells, some of them open to grave suspicion of being contaminated.

"At Morlais, where the complaint prevailed most severely in this district, the water was got from a small running stream largely polluted.

"In Llannon parish the disease was also very much scattered, the village escaping. The water supply here also was obtained from small wells, most of which would appear to be removed from any source of impurity, except at Pontyberem where the water was had from the river and from the canal, both of which sources were bad.

"There was a general scarcity of water through the district during the greater portion of the time that cholera prevailed.

"The only special causes present in all the localities were decomposing animal and vegetable matters, the evacuations of man and animals, polluting the air and the water too. To the neglect of a systematic and thorough removal of these manures into the earth, particularly the excrements of man, I am disposed to attribute the heavy epidemic of cholera that visited this place, and to the same causes the common presence of typhoid fever over the whole district.

"The river water was suspected as a cause in the attacks at Felin Foel, as well as at Penygar, a small place containing about 50 inhabitants, who also up to this time had used the river water; and to prevent the people using it several cart loads of lime were thrown into it above the village; whether from this circumstance or not I cannot say, but the attacks sensibly decreased in number and severity immediatelythereon."

589; 1. CARMARTHEN; *Llangendeirne.* Population 9,034. Cholera 27; Diarrhœa 3. Cholera was fatal to a labourer on the 26th August at Croesyceilog. The epidemic prevailed throughout September and October, and ceased on 14th November. Labourers and their families were the principal sufferers, and the greatest number of deaths occurred in the parish of St. Ishmaels.

589; 2. CARMARTHEN; *St. Clears.* Population 6,862. Cholera 30; Diarrhœa 2. Between 25th August and the end of the month cholera was fatal to 13 persons, or more than a third of the whole mortality from that disease. It was principally fatal among labourers, farmers, and their families. In September the deaths recorded were 15, in October one, and the last on 9th November. The water supply is derived from open wells and rivulets. In 1849 the deaths from cholera were 13.

589; 3. CARMARTHEN; *Carmarthen.* Population 12,583. Cholera 80; Diarrhœa 6. Cholera was fatal on 28th March to the wife of a mason, aged 29, at Blaenwain, Abergwilly; no other

death occurred until 17th August, when three persons died in Dame-street. The epidemic continued very fatal until the end of November, and the last death was that of a labourer's son, in Grove-street, on 9th December. It was most fatal among females, and in the following localities : Dame-street, Lammas-street and Village, Abergwilly. The deaths from cholera in 1849 were 102.

589 ; 4. CARMARTHEN ; *Conwil.* Population 8,196. Cholera 6 ; Diarrhœa 0. With one exception, the deaths from cholera were those of persons above 60 years of age. The first case was that of a female aged 74, on 24th August ; the last was that of a shoemaker's wife, aged 64, on 18th September.

PEMBROKESHIRE.

590 ; 5. NARBERTH ; *Slebech.* Population 3,171. Cholera 2 ; Diarrhœa 0. Both the deaths from cholera occurred at Old Mill, Narberth ; a female, aged 47, died on 13th September, and a labourer, aged 60, on the following day.

590 ; 6. NARBERTH ; *Begelly.* Population 4,313 ; Cholera 14. Diarrhœa 2. Excepting one death on 29th August, the whole of the cases occurred in September, the last on the 26th. Coal-miners and their families were the principal sufferers.

591 ; 1. PEMBROKE ; *Tenby.* Population 9,219. Cholera 5 ; Diarrhœa 3. First death from cholera occurred on 13th September, at Carew, to a lighterman, aged 47, and the last on 5th October, to the infant son of a farm labourer, at Holyland Gate.

591 ; 2. PEMBROKE ; *Pembroke.* Population 16,559. Cholera 33 ; Diarrhœa 13. Cholera was first fatal in this sub-district on 26th August, when a messenger's wife, aged 43, died at New Pennar. It was very prevalent in September, especially at New Pennar, St. Mary, where the greater part of the deaths took place. The last case was that of a labourer's son, aged 14, at Pennar, on 7th October.

591 ; 3. PEMBROKE ; *Roose.* Population 3,225. Cholera 4 ; Diarrhœa 4. Three of the deaths from cholera were those of a fisherman, his wife, and son, who died at Langum Ferry, Burton, the son on the 21st of September, the wife on the following day, and the father on the 24th ; not one of these deaths was certified by a medical practitioner. The last case was that of a railway porter, aged 18, at Neyland, Llanstadwell, on 10th October.

592 ; 1. HAVERFORDWEST ; *Milford.* Population 9,771. Cholera 15 ; Diarrhœa 5. These deaths from cholera all occurred in September, the first on the 2d and the last on the 26th ; it prevailed chiefly in the parishes of Hubberston and Walwinscastle.

592 ; 2. HAVERFORDWEST ; *Haverfordwest.* Population 12,330. Cholera 24 ; Diarrhœa 8. 19 of the deaths from cholera took place in September ; it prevailed among the poorer class, and was particularly fatal among females, 20 of the deaths being recorded as females, and only four of males. The last fatal case was that of a shoemaker's widow, aged 70, in Quay-street, on 29th October.

CARDIGANSHIRE.

597 ; 2. ABERYSTWITH ; *Aberystwith.* Population 8,772. Cholera 12 ; Diarrhœa 1. Cholera was fatal on 28th October, to the wife of a mariner, aged 30. In Mill-street-court there was one death in October, three in November, and seven in December. In Fountain-court there were six deaths, one man, a labourer, losing his wife and two children, but he appears to have escaped himself. In High-street three deaths occurred. During the epidemic of 1849 not a single fatal case of cholera occurred in Aberystwith.

BRECKNOCKSHIRE.

601 ; 2. CRICKHOWELL ; *Llangunider.* Population 3,594. Cholera 12 ; Diarrhœa 1. With two exceptions, the deaths from cholera took place at Tafannambach among coal and iron miners and their families. The first death occurred on 21st October, and the last on 18th December. In 1849 the deaths from cholera were nine.

601 ; 3. CRICKHOWELL ; *Llangattock.* Population 5,759. Cholera 2 ; Diarrhœa 9. On 7th September cholera was fatal to the wife of a coal miner, aged 66, at Beaufort Hill, and on 15th September to the daughter of a coal miner at Williams-row, Beaufort. Of the nine deaths from diarrhœa, eight were of children under two years of age.

601 ; 4. CRICKHOWELL ; *Llanelly.* Population 9,603. Cholera 3 ; Diarrhœa 8. Cholera was fatal to the son and daughter of a quarrier at Llanelly Common on 29th August, and to a coal miner on 8th September at Brynmawr.

44. NORTH WALES.

FLINTSHIRE.

610 ; 2. HOLYWELL ; *Holywell.* Population 12,100. Cholera 38 ; Diarrhœa 2. There was no death from cholera until 3d October, when a coal carter, aged 38, died at Penybal. There were 26 deaths in October, seven in November, and five in December, the last case being that of a coal

miner's wife, aged 42, on 9th December. The epidemic prevailed principally amongst the mining population, and was very fatal at Bagillt (11 deaths), Greenfield (9 deaths), and Penybal (7 deaths).

The following particulars have been communicated by Mr. James Williams, M.R.C.S., Medical Officer of the Holywell Union and Registrar of Births and Deaths for the Holywell sub-district:

Pen-y-bal.—The fatal cases occurred in four houses only, closely adjoining each other; three or four of the patients were ill fed and badly clothed, the others not so. Drainage deficient, but the situation being hilly there was no stagnant filth, with the exception of privy cesspools, which certainly were in a very neglected condition. Privy accommodation very bad, practically *nil.* Water plentiful, but one open well only (in use from time immemorial) supplied all the inhabitants. From the position of this well, below the foundation of the houses, I considered it to be in danger of sewage contamination by percolation, and I accordingly reported it to the authorities, upon which it was immediately closed up.

Greenfield.—The cases occurred chiefly in two rows of houses about a quarter of a mile apart. Drainage and privy accommodation very deficient. One row lies low and flat, and has its privies overhanging a large reservoir of water, the stream of which works several mills. This water is not used for domestic purposes, but two wells which supply the inhabitants are situated close to the water and below the level of the houses. I could not satisfactorily trace any contamination, but their position is suspicious. These wells being beyond the precincts of the local government district could not be peremptorily closed, but I cautioned the inhabitants against using the water, though I believe my advice was very little regarded owing to the trouble and expense of procuring water elsewhere. These wells are also open to the ground, and must receive any surface impurities.

Bagillt.—The cases all occurred in a very circumscribed length of space, probably 300 yards. This locality is very flat, and below the level of high-water mark in the River Dee. Drainage consequently very bad; much stagnant water, into which privy contents, &c. find their way. Open wells also situated below the houses, though no direct pollution could be traced. The inhabitants of the infected district made use of one well. All the others were isolated cases, and were traceable to contagion, nursing, washing clothes, &c.; also some imported from other infected districts.

610; 3. Holywell; *Flint.*—Population 8,079. Cholera 40; Diarrhœa 4. The first death from cholera occurred on 12th September. No other death is recorded till the 23d; but by the end of the month there were 17 fatal cases; 15 in October, and eight in November; the last on the 30th. Chemical labourers and their families suffered considerably. In 1849 the deaths from cholera were 35.

610; 4. Holywell; *Mold.* Population 11,719. Cholera 10; Diarrhœa 4. First death from cholera, occurred to the wife of a labourer, aged 31, at Leeswood, on 17th September; the last was that of a tailor, aged 23, in New-street, on 28th November. Two deaths in one family occurred on 22d September in High-street.

Denbighshire.

611; 3. Wrexham; *Ruabon.* Population 14,680. Cholera 3; Diarrhœa 8. Cholera was fatal to the wife of a tinker at Mountain, Ruabon, on 18th November; whose son had previously died of diarrhœa. The last case was that of a coal miner, aged 32, at Campbell-street, on 14th December.

611; 4. Wrexham; *Wrexham.* Population 17,546. Cholera 11; Diarrhœa 11. On 1st August the wife of an accountant died of cholera at Wern, Minera. A death occurred on 23d September at Vicarage-hill, and another on 10th November. The last case was that of a labourer's wife, aged 21, on 26th November; the disease was fatal to nine persons during that month.

Carnarvonshire.

620; 1. Carnarvon; *Llandwrog.* Population 8,518. Cholera 1; Diarrhœa 3. The only person to whom cholera was fatal was that of the Registrar of Births and Deaths for this sub-district, who died on 26th November at Groeslon, Llandwrog, after an illness of 20 hours.

620; 2. Carnarvon; *Llanrug.* Population 10,404. Cholera 2; Diarrhœa 2. The wife of a solicitor, aged 56, died of cholera at an hotel in Llanebris, after an attack of Asiatic cholera of 17 hours' duration; the other fatal case, that of a female, aged 23, at Brymafawnog, did not occur until 29th December.

620; 3. Carnarvon; *Carnarvon.* Population 10,190. Cholera 70; Diarrhœa 11. The first fatal case of cholera occurred on 17th October, to the son of a chemist at Turf-square. 15 deaths were recorded in November, and 54 in December, the last case being that of a slate quarrier, aged 56, who died at Mount Pleasant, 27th December, on which day there were three deaths. The greatest number of deaths that occurred in one day was five on the 13th, and five on the 18th of December; on several other days there were three and four deaths. With the exception of Pool-street, where eight deaths occurred, the epidemic seems to have been generally spread over Carnarvon; nor can it be said that it was confined to any particular occupation, all classes suffering alike. In 1849 the deaths from cholera were 16, of which several cases occurred in High-street; while in 1866, when the disease was much more fatal, not one death is recorded as having occurred there.

620 ; 4. CARNARVON ; *Llanidan.* Population 3,313. Cholera 2 ; Diarrhœa 0. Both these deaths from cholera occured at Brynshenkin, the first being that of a labourer's wife, aged 36, on 23d December, and the other that of a labourer's widow, aged 75, on Christmas Day.

621 ; 2. BANGOR ; *Bangor.* Population 14,043. Cholera 3 ; Diarrhœa 5. Two of the deaths from cholera occurred in one family at Kyffin-square, where the wife of a joiner died on 22d August, and his daughter on 2d September ; the last case was that of a stonemason's wife, aged 67, on 7th December.

621 ; 3. BANGOR ; *Llanllechid.* Population 9,127. Cholera 10; Diarrhœa 5. The first fatal case of cholera occurred on 15th September at Bethesda. There was no other death until 5th October, when the son of a shoemaker, aged 13, died at Alma-terrace, Llanfairfechan ; and on the 8th, another son, an infant, died of choleraic diarrhœa. On 6th October the wife of a stonemason died in the same terrace, and on the 16th a daughter, after illnesses of 14 hours and 10 hours respectively, making four deaths in Alma-terrace in less than a fortnight. The last two cases occurred on 21st December at Elnsenden, the widow (aged 21) and the daughter (aged one) of a schoolmaster having both died from Asiatic cholera on the same day.

ANGLESEY.

623 ; 6. ANGLESEY ; *Holyhead.* Population 9,235. Cholera 26 ; Diarrhœa 1. 22 of the deaths from cholera occurred in October, and four in November, the first being that of a stoker on board a steam vessel, who died at Swift-square on 8th October, and the three last on 6th November, being respectively those of a labourer and two children, not members of the same family. The majority of the deaths were registered as Asiatic cholera, and in those cases where the duration is mentioned death appears to have followed a few hours after first attack. In 1849 the deaths from cholera were 42, extending from July until the end of October.

VII.—METEOROLOGICAL ELEMENTS OF THE PERIOD OF CHOLERA EPIDEMIC IN LONDON, 1866.

(Extracted from the Weekly Returns of the Royal Observatory, Greenwich.)

EXPLANATION OF SIGNS IN COLUMNS 17 AND 18:—

ELECTRICITY.—Positive, p; Negative, n; Very strong negative, nn; Very strong positive, pp; Sparks, s; None, o.

WEATHER.—Very fine, ff; Fine, f; Cloudy, c; Very cloudy, cc; Cloudless, —c; Overcast, o; Rain, r; Heavy rain, rr; Showers, s; Thunder, t; Lightning, l; Blue mist, bm.

DATE.	BAROMETER.	THERMOMETERS.								Difference between mean temperature of the day and mean temperature of the same day on an average of 50 years.	Degree of Humidity, complete Saturation being represented by 100.	GENERAL DIRECTION OF WIND, as deduced from Osler's Anemometer.		Amount of Horizontal Movement of Air each day, as given by Robinson's Anemometer.	Rainfall in inches, read at 9h. p.m., collected on the ground.	Ozone.	Electricity.	Weather.	Deaths by Cholera in London.
		DRY.			Dew Point.	Highest in sun, as shown by a self-registering Thermometer, read at 9h. p.m.	Lowest on grass, as shown by a self-registering Thermometer, read at 9h. a.m.	In Water of Thames at Greenwich, by self-registering Thermometers, read at 9 o'clock next morning.											
	Mean daily reading (corrected and reduced to 32 degrees Fahrenheit).	Highest.	Lowest.	Mean daily value.	Mean daily value.			Highest.	Lowest.			A.M.	P.M.						
Cols.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	in.	°	°	°	°	°	°	°	°	°				Miles.					
June 1	29·529	68·2	49·4	56·4	51·7	144·0	48·0	58·8	57·7	− 0·6	84	E. & SE.	E. by S.	164	0·67	3	n, p	c, r	1
2	29·722	75·0	52·2	62·5	49·9	131·1	48·6	58·8	57·7	+ 5·2	64	SE. & SW.	SE. & E. by N.	183	0·00	1	p	f	1
3	29·673	78·7	53·3	62·7	56·2	121·5	48·1	60·8	59·7	+ 5·3	79	E. by N.	E. & Variable	161	0·00	3	p	l, c	0
4	29·689	71·6	54·6	60·4	56·6	126·5	50·0	61·1	60·0	+ 3·1	87	Variable	W. & SW.	258	1·34	0	p	o, rr	0
5	29·750	64·4	51·4	55·3	49·4	114·2	49·7	61·8	61·8	− 1·9	81	SW. & SSW.	S. & S. by W.	326	0·10	4	o	o, s	0
6	29·912	64·7	51·3	55·4	49·7	106·8	50·0	62·3	61·7	− 1·6	81	SSW. & SW.	SW.	232	0·04	1	p	f, c, s	1
7	29·991	70·9	52·5	60·3	55·2	121·5	49·5	62·8	61·7	+ 3·3	83	SW.	SW.	202	0·00	2	p	ff, c	0
8	30·083	77·8	52·8	64·8	55·5	150·5	47·5	63·3	62·2	+ 7·5	72	S. & SW.	SW.	147	0·00	2	p	ff	0
9	30·048	84·7	50·7	67·8	56·0	157·6	48·0	—	—	+10·1	66	SW.	SW. & S.	132	0·00	0	p	f, c, o	0
10	29·892	83·8	54·6	68·5	58·6	145·0	50·0	64·8	62·7	+10·5	71	S. & SW.	SW. & W.	304	0·00	0	p	f, c	0
11	29·866	72·1	48·2	59·0	49·6	143·1	42·4	65·8	63·7	+ 0·7	71	WSW.	SW.	276	0·00	3	p	f, c	0
12	29·475	63·4	52·6	56·8	52·1	92·8	47·9	65·8	63·7	− 1·8	84	SSW. & SW.	SW.	361	0·00	2	p	o	2
13	29·631	63·2	49·8	53·4	50·0	100·9	43·0	64·8	62·7	− 5·4	88	SW. & WSW.	W. & SW.	174	0·10	1	n, s	o, r	1
14	29·826	70·8	48·0	57·7	51·4	140·5	38·9	63·2	62·2	− 1·3	79	WSW.	W. & WSW.	245	0·00	0	p	f, c	0
15	29·768	66·1	47·6	56·3	54·4	101·0	40·0	62·5	61·8	− 2·7	93	WSW.	SW. & W. by S.	298	0·04	2	o	o, r	0
16	29·511	69·5	50·7	57·9	44·8	146·2	45·0	62·6	62·0	− 1·1	62	NW. & W. by S.	WSW. & SW.	518	0·00	0	o	f, c, l	0
17	29·545	64·6	42·2	50·7	40·9	128·2	40·0	62·0	61·0	− 8·3	69	W. & NW.	NW. & WSW.	334	0·15	—	—	c, s	0
18	29·418	59·2	44·1	50·6	49·6	74·5	35·1	60·8	59·7	− 8·5	96	SW.	SW.	459	0·09	—	—	o, r	0
19	29·564	67·7	53·0	57·2	49·3	138·1	51·5	60·6	59·6	− 2·0	75	SW.	WSW. & W.	371	0·01	—	—	f, c, r	0
20	29·896	69·8	45·2	56·4	52·4	121·9	37·1	58·8	58·7	− 3·1	86	SW.	SW. & S.	232	0·01	—	—	o, s	0
21	29·729	79·2	56·9	66·7	57·3	153·4	53·1	61·3	59·7	+ 6·8	72	S. & SW.	SW.	200	0·64	0	—	f, c, t, l, r	2
22	29·795	75·3	57·7	63·8	53·2	144·0	55·0	62·0	61·6	+ 3·5	69	NW., Calm, & WSW.	W.	193	0·22	0	—	r, ff	1
23	29·990	75·8	49·3	61·2	55·1	145·5	48·0	63·8	62·7	+ 0·5	80	WSW. & NE.	ESE.	167	0·09	1	p	ff, c	0
24	30·036	72·7	52·6	62·3	50·8	149·0	49·0	64·4	63·7	+ 1·1	66	E. & NE.	E. & ESE.	203	0·00	0	p	f, f, −c	0
25	29·942	76·1	48·6	61·2	58·6	144·7	48·4	64·8	62·7	− 0·4	91	NE.	NE. & Calm	177	0·00	0	o	f, c	3
26	29·886	80·1	54·5	67·7	56·1	156·0	51·1	65·8	63·7	+ 6·0	67	NNE. & NE.	E. by N. & NE.	220	0·00	2	p	ff, −c	0
27	29·766	86·5	56·1	69·6	60·7	162·9	53·5	66·8	64·7	+ 8·0	73	NNE. & NE.	E., SE., & Calm	146	0·00	0	o	f, c, l	2
28	29·808	83·0	61·7	69·7	59·9	118·0	56·9	67·9	65·9	+ 8·2	71	Calm	Variable	174	0·06	0	p	f, c, r, t, l	1
29	29·822	77·3	59·5	65·1	59·3	116·9	—	68·0	66·7	+ 3·7	81	Calm & N.	NNE.	110	0·00	0	o	o, c, f	3
30	29·648	83·3	57·8	68·4	61·4	149·4	51·4	68·3	67·0	+ 7·3	79	Calm & WSW.	SW. & WSW.	300	0·15	0	n, s, p	f, cc, t, r	3

Date.	Barometer.	Thermometers.								Difference between mean temperature of the day and mean temperature of the same day on an average of 50 years.	Degree of Humidity, complete Saturation being represented by 100.	General Direction of Wind, as deduced from Osler's Anemometer.		Amount of Horizontal Movement of Air each day, as given by Robinson's Anemometer.	Rainfall in inches, read at 9h. p.m., collected on the ground.	Ozone.	Electricity.	Weather.	Deaths by Cholera in London.
	Mean daily reading (corrected and reduced to 32 degrees Fahrenheit).	Dry.			Dew Point.	Highest in sun, as shown by a self-registering Thermometer, read at 9h. p.m.	Lowest on grass, as shown by a self-registering Thermometer, read at 9h. a.m.	In Water of Thames at Greenwich, by self-registering Thermometers, read at 9 o'clock next morning.											
		Highest.	Lowest.	Mean daily value.	Mean daily value.			Highest.	Lowest.			A.M.	P.M.						
	in.	°	°	°	°	°	°	°	°	°				Miles.					
July 1	29·365	70·3	54·6	57·6	52·1	135·9	54·6	67·8	66·7	− 3·3	82	WSW.	WSW.	367	0·35	2	n, p	o, f, r, l	3
2	29·235	67·8	50·2	57·6	48·4	129·1	42·6	66·8	65·7	− 3·5	72	SW. & WSW.	SW. & WSW.	362	0·02	3	o	f, c, r	2
3	29·207	64·6	49·7	54·7	51·4	127·2	43·1	67·1	66·7	− 6·6	89	WSW.	WSW. & SW.	290	0·43	2	n, p, s	o, s	0
4	29·337	67·3	50·8	54·9	52·1	123·6	50·8	65·8	64·7	− 6·6	90	WNW., W., & WSW.	WSW. & SW.	413	0·07	0	—	o, c, f, s	0
5	29·369	69·0	50·4	57·1	49·5	147·2	49·7	65·3	64·2	− 4·6	76	W. & SW.	WSW.	200	0·27	0	—	f, c, r	3
6	29·495	68·6	50·1	56·6	50·7	135·7	47·8	64·8	63·7	− 5·2	81	WSW, SW, & NNW.	WSW. & Var.	236	0·04	0	—	f, c, s, t, l	1
7	29·862	67·1	46·4	55·7	47·6	135·0	38·9	65·3	64·2	− 6·2	74	WNW. & W.	W. & WSW.	279	0·00	0	o	f, c	2
8	29·908	66·8	48·7	57·6	54·4	84·7	39·1	64·1	63·2	− 4·1	89	WSW.	WSW.	373	0·00	—	—	o	3
9	30·041	79·2	57·9	66·1	60·2	147·0	56·0	63·8	63·7	+ 4·4	81	WSW. & W.	W.	338	0·00	—	—	ff, c	5
10	30·141	82·7	58·9	70·6	60·4	142·0	53·4	64·8	64·7	+ 8·8	70	WSW.	W. & NW.	160	0·00	—	—	f, −c	0
11	30·143	82·0	56·9	69·4	60·0	152·0	51·3	65·8	65·2	+ 7·6	72	Calm & NE.	NE. & SE.	88	0·00	—	—	f, c	5
12	30·029	86·2	55·4	70·8	62·2	152·9	54·2	66·8	63·7	+ 8·8	74	Calm & SE.	SSE. & ESE.	120	0·00	—	—	f, c	11
13	29·926	87·2	59·1	73·4	63·9	163·5	58·5	67·8	66·7	+11·1	72	SE. & SW.	WSW. & W.	170	0·00	—	o	f, c	20
14	29·985	82·2	58·8	69·7	62·4	139·4	58·0	68·8	68·2	+ 7·2	78	Calm & NNE.	SW. & NE.	71	0·00	—	p	f, c	15
15	29·992	83·3	58·5	69·5	61·9	132·0	54·6	70·3	68·7	+ 7·0	77	Calm & NE.	NE. & E.	162	0·00	—	p	c, f	14
16	29·945	75·8	56·9	64·0	56·6	139·7	51·0	68·8	67·7	+ 1·6	77	ENE.	ENE. & E.	293	0·00	—	—	c, f	29
17	29·884	71·9	59·0	63·3	53·4	118·4	57·0	68·3	67·5	+ 1·1	70	ENE.	ENE., ESE., & E.	202	0·00	—	—	o	56
18	29·829	75·0	47·2	60·5	50·8	150·0	44·2	67·8	66·7	− 1·4	70	NE.	NE. & E.	157	0·00	—	—	c, f	63
19	29·764	72·3	50·4	59·5	52·3	131·2	47·8	68·3	67·2	− 2·1	77	Calm & N.	NE. & NNE.	232	0·00	—	o	c, f	88
20	29·910	67·6	48·0	56·2	48·0	120·0	45·0	66·3	65·4	− 5·2	74	N. by W.	N. & Calm.	125	0·00	—	p	o, c	79
21	29·934	78·0	47·2	62·2	55·7	120·0	39·1	66·8	65·7	+ 0·7	79	Calm	NW. & ENE.	164	0·00	—	p	ff, −c	105
22	29·973	70·7	52·2	59·3	50·3	139·0	45·8	66·3	65·7	− 2·2	72	NE.	NE.	148	0·00	—	o	f, c	104
23	29·864	72·2	46·5	57·7	48·5	148·7	44·8	—	—	− 3·9	72	NE. & NNE.	NNW. & N.	243	0·00	—	o	f, o, c	130
24	29·907	67·2	54·2	59·4	48·3	110·6	48·3	65·8	64·7	− 2·3	67	NNW.	NNW.	270	0·00	—	p	o	139
25	30·067	67·2	53·2	58·3	50·9	102·8	52·5	64·8	64·2	− 3·5	77	N. by W.	NNW.	142	0·00	—	p	o	172
26	29·950	74·4	49·1	60·4	53·1	133·0	—	65·3	64·7	− 1·5	77	Calm & SW.	SW. & SSW.	176	0·00	—	o	f, c, o	146
27	29·630	64·9	55·2	59·0	57·9	75·0	51·7	64·8	63·7	− 3·0	96	Calm	SSW. & S.	130	0·09	—	p	o, s	133
28	29·504	68·4	54·2	61·2	57·1	117·0	52·8	63·8	63·7	− 1·0	86	Calm & NE.	ENE. & E.	203	0·00	—	p	o	152
29	29·426	71·5	54·0	60·2	53·9	119·2	52·8	63·3	63·2	− 2·1	80	SE., SW., & W.	W. & WNW.	439	0·21	—	nn, s	o, r, c	152
30	29·643	70·2	49·1	58·2	47·3	129·4	44·2	62·8	62·7	− 4·2	67	WNW. & NW.	W. & WNW.	309	0·00	—	—	f, c, b m	142
31	29·526	58·8	46·0	51·3	50·4	77·2	42·0	63·8	—	−11·1	97	W. & SW.	WSW, NW, & N by W.	368	0·14	—	—	o, r, b m	192

Meteorological Elements of the Period of Cholera Epidemic in London, 1866—*continued*.

Date.	Barometer.	Thermometers.								Difference between mean temperature of the day and mean temperature of the same day on an average of 50 years.	Degree of Humidity, complete Saturation being represented by 100.	General Direction of Wind, as deduced from Osler's Anemometer.		Amount of Horizontal Movement of Air each day, as given by Robinson's Anemometer.	Rainfall in inches, read at 9h. p.m., collected on the ground.	Ozone.	Electricity.	Weather.	Deaths by Cholera in London.
		Dry.			Dew Point.	Highest in sun, as shown by a self-registering Thermometer, read at 9h. p.m.	Lowest on grass, as shown by a self-registering Thermometer, read at 9h. a.m.	In Water of Thames at Greenwich, by self-registering Thermometers, read at 9 o'clock next morning.				A.M.	P.M.						
	Mean daily reading (corrected and reduced to 32 degrees Fahrenheit).	Highest.	Lowest.	Mean daily value.	Mean daily value.			Highest.	Lowest.										
	in.	°	°	°	°	°	°	°	°	°				Miles.					
Aug. 1	29·720	69·8	51·7	57·8	51·0	121·8	49·0	62·3	60·7	− 4·6	78	N. by W.	SW. & W.	221	0·01	—	—	c, r, b m	186
2	29·421	72·8	56·1	63·7	60·2	108·8	53·5	62·3	61·7	+ 1·3	88	W.	NW.	315	0·15	—	—	c, s, b m	158
3	29·607	72·9	54·6	61·4	55·4	116·1	52·4	61·8	61·7	− 1·0	81	WNW.	W. & WNW.	436	0·00	—	—	c, b m	132
4	29·552	69·8	50·4	58·8	46·3	137·0	49·8	61·8	61·7	− 3·5	64	W.	WNW. & W.	471	0·00	2	—	c, l, b m	113
5	29·613	68·3	50·3	57·1	46·7	130·7	42·4	60·7	59·0	− 5·1	68	W. & WNW.	NW. & W.	331	0·00	1	—	o, c, f, b m	134
6	29·537	61·0	49·3	55·2	52·4	83·4	44·1	61·1	60·4	− 6·9	90	W. & WSW.	SW. & SSW.	462	0·21	4	—	o, r, b m	122
7	29·322	70·0	55·5	60·6	51·4	130·2	54·5	60·8	59·3	− 1·4	72	SSW.	SSW.	505	0·15	3	—	c, s, b m	94
8	29·509	68·2	50·4	59·6	50·3	123·8	43·6	60·5	58·2	− 2·4	71	SSW.	SSW.	414	0·07	3	—	c, o, r, b m	109
9	29·430	68·9	51·1	58·6	47·7	130·0	45·3	60·8	60·2	− 3·5	67	SW. & WSW.	WSW.	283	0·14	2	—	c, r, b m	98
10	29·586	63·5	48·2	55·5	49·2	115·5	41·4	60·3	59·7	− 6·6	80	WSW, WNW, & NNW.	NW. & W.	255	0·02	0	—	c, r, b m	77
11	29·927	69·3	48·2	57·5	49·5	116·5	41·5	60·7	60·2	− 4·6	75	NW. & N.	NW., W., & WSW.	187	0·00	0	o	c, b, m	73
12	29·552	68·5	51·2	58·8	55·4	123·6	49·7	60·8	59·7	− 3·2	89	SE. & NE.	N., SSE., & SW.	113	0·26	0	p	c, r, b m	77
13	29·767	71·0	55·5	61·4	52·7	128·0	54·1	61·8	60·7	− 0·5	73	NE.	SE.	250	0·07	0	p	c, o, s, b m	56
14	29·634	66·8	55·5	58·9	54·1	86·0	52·1	62·8	61·2	− 2·8	84	SSW.	NW.	196	0·20	3	p	o, − c, r, b m	47
15	29·797	65·3	53·9	57·7	49·2	95·9	47·9	60·8	60·7	− 3·8	74	WNW.	W.	211	0·00	0	p	o, b m	69
16	29·566	63·0	51·6	55·1	48·2	89·0	47·8	61·8	61·0	− 6·2	78	WSW.	WSW. & W. by N.	423	0·09	0	o	o, c, s, l, b m	61
17	29·642	66·7	49·4	56·2	46·3	111·0	42·4	61·3	59·7	− 4·9	70	WSW.	W.	280	0·00	0	p	f, c, b m	49
18	29·800	72·2	46·9	57·7	48·7	138·0	41·1	60·5	59·6	− 3·3	72	WSW.	SW. & S.	173	0·00	0	o	c, f, b m	49
19	29·662	73·2	45·0	60·7	53·1	132·8	42·0	60·1	58·9	− 0·2	76	Calm & SE.	SE. & ENE.	129	0·00	3	o	f, c, b m	32
20	29·561	72·5	54·8	61·6	58·3	109·5	54·8	60·8	59·7	+ 0·8	89	N.	NE.	102	0·10	0	o	c, r, b m	40
21	29·690	68·9	53·5	59·8	56·7	102·0	51·9	60·6	59·4	− 0·9	90	N. & NNW.	NNW.	186	0·16	0	o	c, r, b m	32
22	29·832	67·0	56·7	60·4	56·1	87·4	54·8	61·3	59·7	− 0·3	86	NNW. & N.	Calm	69	0·00	0	o	c, b m	36
23	29·879	74·3	50·5	60·2	57·6	122·4	48·2	61·8	61·7	− 0·4	91	Calm	E.	167	0·00	3	p	f, c	33
24	29·866	73·4	56·6	63·4	59·6	94·9	51·5	62·8	62·4	+ 2·9	88	E. & Calm	WSW. & S.	136	0·05	3	—	o, r	27
25	29·919	73·2	52·6	62·3	57·9	129·0	44·5	63·0	62·7	+ 1·8	85	SW.	SW. & S. by E.	154	0·01	0	—	c, r	24
26	29·830	78·5	55·4	66·0	56·3	155·9	55·2	63·8	63·7	+ 5·7	71	SSE. & SW.	SSW.	235	0·00	0	—	c, o, ff, l	35
27	29·673	74·2	57·7	64·3	54·5	133·8	54·0	64·1	63·9	+ 4·2	71	SW.	SW.	234	0·00	2	p	ff, c	33
28	29·371	69·9	55·1	60·7	54·5	110·5	48·4	64·3	64·1	+ 0·8	80	S. & SE.	SE. & Calm	121	0·00	3	p	c	23
29	29·169	59·0	53·8	55·0	53·8	74·2	48·8	64·8	64·7	− 4·7	96	Calm & SW.	NW., WSW., & W.	361	0·60	0	p, s	o, rr	32
30	29·594	67·3	52·5	58·1	48·8	121·4	50·8	63·8	63·7	− 1·3	72	NW.	SW.	213	0·12	0	o	c, r	24
31	29·720	70·2	49·9	58·2	50·2	130·5	47·4	63·8	63·8	− 1·3	82	SW.	SW. & S. & W.	207	0·03	1	—	f, c	23

Date.	Meter. Mean daily reading (corrected and reduced to 32 degrees Fahrenheit).	Thermometers. Dry. Highest.	Dry. Lowest.	Dry. Mean daily value.	Dew Point. Mean daily value.	Highest in sun, as shown by a self-registering Thermometer, read at 9h. p.m.	Lowest on grass, as shown by a self-registering Thermometer, read at 9h. a.m.	In Water of Thames at Greenwich, by self-registering Thermometers, read at 9 o'clock next morning. Highest.	In Water of Thames at Greenwich, by self-registering Thermometers, read at 9 o'clock next morning. Lowest.	Difference between mean temperature of the day and mean temperature of the same day on an average of 50 years.	Degree of Humidity, complete Saturation being represented by 100.	General Direction of Wind, as deduced from Osler's Anemometer. A.M.	General Direction of Wind, as deduced from Osler's Anemometer. P.M.	Amount of Horizontal Movement of Air each day, as given by Robinson's Anemometer.	Rainfall in inches, read at 9h. p.m., collected on the ground.	Ozone.	Electricity.	Weather.	Deaths by Cholera in London.
	in.	°	°	°	°	°	°	°	°	°				Miles.					
Sept. 1	29·735	70·7	52·2	59·1	51·6	131·6	44·7	63·3	62·2	+ 0·1	76	S. by W. & SW.	SW. & SSW.	351	0·00	2	o	c	25
2	29·393	65·6	48·8	54·5	50·5	123·0	45·5	62·4	62·4	− 4·2	86	SSW. & SW.	WSW.	366	0·90	3	p	o, rr, f, t, l, b m	22
3	29·707	66·3	45·8	55·6	47·2	130·0	33·8	59·8	58·7	− 2·8	73	WSW. & W.	W. & SW.	312	0·00	1	—	f, c, b m	27
4	29·482	68·5	52·8	59·7	58·9	83·0	47·0	—	—	+ 1·5	97	SW., SSE., & SSW.	SW.	378	0·24	2	—	o, r	23
5	29·287	69·3	58·8	61·7	56·2	122·5	54·6	60·8	60·2	+ 3·7	82	SW. & SSW.	SW.	389	0·14	3	—	o, s	25
6	29·438	68·2	55·1	60·0	54·7	106·1	48·3	62·0	61·6	+ 2·1	83	SW. & SSW.	S. & SSW.	464	0·18	1	—	f, c, o, s	26
7	29·463	69·3	54·8	60·4	55·1	114·8	53·3	60·8	60·7	+ 2·6	83	SW. & WSW.	SW.	178	0·00	1	—	f, c, s, b m	21
8	29·556	60·9	55·7	57·4	53·8	78·8	54·9	60·8	60·6	− 0·4	88	Calm & NE.	NNE. & N.	88	0·45	0	o	o, rr, b m	27
9	29·588	67·2	53·2	58·5	53·2	118·0	48·4	60·8	60·7	+ 0·8	83	Variable	S. & SSE.	221	0·17	4	o	f, c, o, r	22
10	29·398	70·2	54·8	59·9	52·8	125·3	52·9	61·7	60·9	+ 2·2	78	S. & SW.	SW.	319	0·03	3	pp,nn,p	o, r, c, f	30
11	29·430	63·6	52·3	56·2	49·2	121·1	48·0	60·8	60·4	− 1·4	77	SW. & SSW.	WSW. & W.	410	0·15	3	—	r	25
12	29·756	59·9	49·7	52·8	47·3	88·1	43·5	59·8	59·7	− 4·7	82	W. & WNW.	SW., SSE., & SSW.	214	0·01	1	—	o, r, b m	31
13	29·648	64·9	52·4	57·3	50·6	101·2	50·7	59·8	58·4	0·0	79	SW. & W.	WSW. & SSW.	271	0·00	0	—	o, c, f	22
14	29·411	64·6	52·0	56·1	48·0	112·0	52·2	59·0	58·7	− 1·1	74	S. & SW.	SW.	308	0·44	3	—	o, rr, f, −c	17
15	29·574	67·2	47·4	56·1	49·6	135·0	43·9	59·3	58·6	− 1·0	79	SW.	SW.	289	0·07	1	pp,nn,p	f, c, s, b m	22
16	29·243	63·2	47·0	53·1	49·2	124·5	41·5	58·3	56·7	− 3·8	87	SW.	S. & SW.	307	0·16	6	—	o, c, f, s	18
17	29·608	64·8	46·9	53·5	46·0	111·6	—	57·8	56·7	− 3·2	76	W. & WNW.	NW. & WSW.	161	0·03	0	—	f, c, r, b m	24
18	29·896	64·0	42·4	53·9	50·0	112·0	39·7	58·3	57·3	− 2·6	87	SW.	SSW.	342	0·00	2	p	f, c, o	24
19	29·801	66·9	53·5	58·0	51·9	118·9	50·4	57·8	57·7	+ 1·8	80	SW.	SW.	273	0·01	1	o	c, r	24
20	29·776	60·8	48·5	54·8	49·3	96·0	41·4	58·1	56·9	− 1·2	82	SW.	SW.	350	0·00	2	o	o	29
21	29·471	64·3	49·6	53·9	46·3	119·8	48·7	56·8	56·2	− 1·9	76	SW. & WSW.	WSW. & SW.	269	0·19	1	—	o, r, c, f	23
22	29·150	55·0	46·2	49·0	46·7	69·0	46·2	56·6	56·4	− 6·5	92	SW., SE., & NE.	NW., SW., & S.	164	0·49	2	—	o, r, c	22
23	29·281	59·8	45·0	51·2	48·4	91·2	—	56·4	—	− 4·0	90	Calm	ESE. & SE.	110	0·00	3	—	f, c	24
24	29·594	63·8	47·9	53·7	49·3	123·7	40·0	55·8	54·7	− 1·3	85	SE.	SW.	216	0·02	4	—	c, s	26
25	29·843	64·3	41·3	53·4	46·6	126·8	33·1	55·8	55·7	− 1·4	78	S.	S. by W. & SSE.	216	0·00	2	p	ff, −c	26
26	29·803	62·0	51·7	56·3	55·9	78·0	51·7	55·8	54·7	+ 1·7	98	SSE. & S.	SW.	106	0·05	1	o	o, r, b m	29
27	29·793	62·8	50·0	54·4	51·0	79·2	42·2	56·0	54·7	0·0	88	SE.	Calm	57	0·16	1	p	o, r	14
28	29·673	71·0	48·9	58·1	57·4	114·0	42·3	54·8	54·6	+ 3·9	98	Calm & E.	E. & Calm	123	0·00	0	p	o, c, b m	19
29	29·755	67·1	57·3	61·2	58·0	95·2	48·0	54·5	53·7	+ 7·1	89	S. & Calm	Calm	66	0·00	1	p	o, f, c	21
30	29·884	67·1	57·3	61·0	60·0	74·0	54·2	55·8	54·7	+ 7·0	96	NE.	N., W. by S., & N.	199	0·00	0	o	o	29

Meteorological Elements of the Period of Cholera Epidemic in London, 1866—*continued.*

Date.	Barometer.	Thermometers.								Difference between mean temperature of the day and mean temperature of the same day on an average of 50 years.	Degree of Humidity, complete Saturation being represented by 100.	General Direction of Wind, as deduced from Osler's Anemometer.		Amount of Horizontal Movement of Air each day, as given by Robinson's Anemometer.	Rainfall in inches, read at 9h. p.m., collected on the ground.	Ozone.	Electricity.	Weather.	Deaths by Cholera in London.
	Mean daily reading (corrected and reduced to 32 degrees Fahrenheit).	Dry.			Dew Point.	Highest in sun, as shown by a self-registering Thermometer, read at 9h. p.m.	Lowest on grass, as shown by a self-registering Thermometer, read at 9h. a.m.	In Water of Thames at Greenwich, by self-registering Thermometers, read at 9 o'clock next morning.											
		Highest.	Lowest.	Mean daily value.	Mean daily value.			Highest.	Lowest.			A.M.	P.M.						
	in.	°	°	°	°	°	°	°	°	°				Miles.					
Oct. 1	29·919	60·2	53·4	56·1	54·3	79·6	52·0	56·8	56·7	+ 2·2	94	N. & NNE.	N.	208	0·00	0	o	o, b m	18
2	29·848	62·6	53 7	56·9	56·5	71·2	52·9	58·7	57·7	+ 3·1	98	N.	NE. & Calm	51	0·00	0	o	o	30
3	29·920	68·1	57·2	61·8	57·8	110·0	54·3	58·7	58·7	+ 8·1	87	Calm	NE. & E.	108	0·00	2	o	o, f, c	28
4	29·959	61·6	55·6	57·5	56·8	74·5	54·2	59·3	58·7	+ 4·0	98	NNE.	Calm	99	0·00	0	o	o, b m	20
5	30·146	56·8	54·1	55·0	53·1	61·9	54·1	59·3	59·1	+ 1·7	93	N.	N. & NNE.	196	0·00	0	p	o	41
6	30·311	62·8	53·6	56·7	54·9	77·1	52·5	57·8	57·2	+ 3·8	93	N.E.	N. & E.	124	0·02	0	p	o, r, f, b m	31
7	30·313	61·8	50·4	55·0	53·1	93·1	44·6	59·1	58·2	+ 2·5	93	Calm and NE.	NE.	166	0·00	3	p	f, c	29
8	30·209	66·0	50·1	56·4	51·5	116·8	48·3	59·1	58·0	+ 4·3	84	NE.	E. & ENE.	170	0·00	0	p	b m, o, ff	27
9	30·055	59·2	49·1	53·8	49·4	85·1	43·0	58·0	57·7	+ 2·0	85	NE.	NE.	211	0·00	2	p	f, c	33
10	29·900	60·2	49·6	53·6	48·1	89·8	43·7	57·8	57·0	+ 2·0	82	NE.	NE.	286	0·00	1	p	c	31
11	29·892	56·4	46·7	51·7	47·0	74·1	39·3	56·8	55·7	+ 0·3	84	ENE.	ENE.	184	0·00	2	o	o	24
12	29·844	59·2	42·6	50·4	46·6	111·8	36·9	56·4	55·7	− 0·8	87	Calm & ENE.	E.	122	0·00	0	p	ff, c	33
13	29·776	55·9	35·6	45·9	44·7	78·8	35·1	55·8	54·7	− 5·0	96	SW.	SW.	112	0·00	0	p	c, f	30
14	29·813	54·6	44·8	48·4	45·5	75·0	41·9	55·8	54·7	− 2·2	90	SW.	N. & NE.	169	0·01	0	o	o, c, r	24
15	30·016	54·0	34·0	44·3	38·4	94·2	31·2	54·8	53·9	− 6·0	79	N.	NNW.	112	0·00	0	p	f, −c	17
16	30·058	54·6	33·0	43·9	38·2	101·7	24·8	54·8	52·7	− 6·1	80	SW. & Calm	NE. & ESE.	161	0·00	0	p	f, −c	21
17	29·890	56·3	40·8	48·2	40·9	110·4	32·1	53·8	52·2	− 1·6	76	ESE.	E.	243	0·00	1	p	f, −c	23
18	29·736	52·9	44·8	49·0	49·0	54·0	38·2	52·8	51·7	− 0·6	100	E.	SE.	208	0·79	1	p	o, r	10
19	29·916	63·5	52·6	57·5	57·2	79·5	50·2	51·8	51·6	+ 8·2	99	SE. & S.	SSE. & S.	130	0·03	1	p	c, r	12
20	30·036	62·2	52·3	56·0	55·8	73·2	45·1	52·8	51·7	+ 6·9	99	Calm	E.	147	0·02	0	p	o, r	23
21	29·865	65·1	53·1	56·9	53·3	101·0	52·6	53·8	52·7	+ 8·0	88	SE.	SSE.	156	0·07	4	o	c, f, r	11
22	29·799	59·8	41·4	50·7	50·6	66·0	32·0	53·8	51·7	+ 2·0	100	SSE.	SW, WNW, & WSW.	228	0·19	1	pp, s, n	o, −c, r	8
23	29·992	58·9	40·5	50·5	48·9	78·4	32·2	54·3	52·7	+ 2·0	94	SW.	SW. & SSW.	196	0·00	0	o	f, c	11
24	29·715	60·8	48·2	52·4	46·6	94·2	47·0	54·5	53·7	+ 4·2	81	SSW.	SSW. & SSE.	202	0·00	1	p	f, c	19
25	29·524	50·9	43·3	44·6	43·4	61·0	41·6	53·4	52·7	− 3·3	95	SW. & SE.	N.	208	0·87	2	n, p	o, rr	21
26	29·779	54·0	40·7	45·9	41·4	96·0	32·2	52·8	—	− 1·7	84	NE.	N.	140	0·00	0	p	ff, c	15
27	29·861	52·3	31·0	42·6	39·1	82·0	25·1	51·8	—	− 4·7	87	Calm & SW.	SW. & S.	166	0·00	0	p	f, c, o	11
28	29·987	54·8	44·0	48·6	42·0	94·5	40·0	—	—	+ 1·6	78	SW, WSW, & NNW.	NNW.	309	0·05	0	o	c, r, f	7
29	30·199	51·5	33·7	43·6	39·6	94·4	26·5	—	—	− 3·2	86	WSW.	SW.	396	0·00	0	p	f, c	19
30	29·692	55·6	46·6	51·0	49·0	62·0	41·8	—	—	+ 4·4	93	SW.	WSW. & WNW.	310	0·04	1	—	o, r	11
												WNW. & WSW.	SW.	250	0·00	0	—	c, f	8

VIII.—PROFESSOR FRANKLAND'S REPORT ON THE QUALITY OF THE LONDON WATER SUPPLY IN 1866.

[*Reprinted from the Registrar General's Annual Summary of the Weekly Returns of* 1866.]

Royal College of Chemistry,
February 20th, 1867.

SIR,

I have the honour to lay before you a summary of the results obtained in my analyses of the metropolitan waters during the year 1866. These results are contained in the accompanying five tables, marked respectively A., B., C., D., and E.

Table A. records the amount of solid impurity left on evaporation and desiccation at 120°—130° C, (248°—266° F.) of 100,000 parts by weight of water. Table B. the loss which this solid matter suffered on incineration. Table C. the amount of oxygen required to oxidize the organic matter contained in 100,000 parts of the water; and Table D. the degrees of hardness, or parts of carbonate of lime (or its equivalent of other hardening salts) contained in the same weight of water. Thus in January 1866 we find, on referring to Table A., that 100,000 lbs. of the water delivered to consumers by the Chelsea company contained 30·12 lbs. of solid impurity, of which, as shown by Table B., 1·44 lb. was driven off by incineration. From Table C. we learn that ·1184 lb. of oxygen was required to oxidize the organic matter in 100,000 lbs. of the said Chelsea water; whilst from Table D. we find that 21·4 lbs. out of the 30·12 lbs. of total solid impurity consisted of carbonate of lime or other soap-destroying material, which communicates to all the water delivered in London its excessive hardness.

Table E. exhibits a comparison between the years 1865 and 1866 as regards the composition and properties of the waters supplied to the metropolis. From this table it will be seen that, with two exceptions, the New River and South Essex, all the waters were harder, and contained more solid impurity in 1866 than in 1865. The water delivered by the New River Company was softer, and contained less solid impurity, whilst the South Essex Company's water contained less solid impurity but was harder in 1866 than in 1865. With one exception the organic and other volatile matter was in every case markedly less in 1866 than in 1865. The exception is the water of the New River Company, which exhibits a very slight excess of this matter in 1866 as compared with the previous year. The amount of oxygen required to oxidize the organic matter contained in the waters was also less in 1866 than in 1865, with two exceptions, viz., in the New River and South Essex Company's waters. It must be remarked, however, that in this respect the Kent, South Essex, and New River Company's waters are greatly superior to those of all the other companies in both years.

I have, &c.

E. FRANKLAND.

The Registrar General,
&c. &c. &c.

Table A.

Solid Matter in 100,000 parts of the Waters.

Names of Companies.	1866.												
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
Thames.													
Chelsea	30·12	31·14	28·55	28·64	26·78	25·25	25·40	24·89	24·63	27·54	30·46	31·72	27·92
West Middlesex	32·02	30·40	28·50	27·69	26·85	24·82	24·72	23·62	24·15	26·38	30·01	29·90	27·42
Southwark	29·90	30·90	29·20	29·49	27·32	24·74	25·25	23·66	24·09	28·18	30·71	31·18	27·88
Grand Junction	30·70	31·40	29·60	29·38	27·06	24·82	25·14	25·00	25·21	28·97	30·74	30·74	28·23
Lambeth	27·10	31·16	27·98	28·62	27·13	26·63	25·25	25·51	25·00	28·58	30·84	30·13	27·82
Other Sources.													
Kent	37·70	37·92	39·80	39·02	39·98	39·28	40·42	38·88	38·60	39·28	39·59	37·99	39·03
New River	29·92	29·50	29·85	27·28	25·39	21·55	20·58	20·20	20·37	26·50	29·09	17·92	24·85
East London	35·15	32·78	33·60	30·45	35·09	26·22	24·38	26·14	26·25	30·20	31·18	34·34	30·48
South Essex	40·59	40·60	40·40	39·66	39·68	38·52	40·94	38·04	38·46	38·94	38·11	31·32	38·77
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13

Table B.

Organic and other Volatile Matter in 100,000 parts of the Waters.

Names of Companies.	1866.												
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
Thames.													
Chelsea	1·44	2·59	1·25	1·02	0·74	0·85	1·57	1·29	0·66	0·70	1·32	1·08	1·21
West Middlesex	1·80	2·00	1·40	1·23	0·86	0·97	1·58	1·16	0·88	0·72	1·32	1·24	1·26
Southwark	1·85	2·40	1·40	1·59	1·55	0·93	1·55	0·98	0·63	1·30	1·03	1·10	1·36
Grand Junction	1·65	1·60	1·55	1·77	0·84	0·91	1·26	1·09	0·56	0·79	1·48	0·87	1·19
Lambeth	1·94	1·65	1·33	1·96	0·90	1·01	1·71	1·53	0·91	1·70	1·30	1·19	1·43
Other Sources.													
Kent	1·26	1·80	1·40	0·88	1·08	1·50	1·58	1·80	0·64	1·40	1·63	1·11	1·34
New River	1·30	1·68	1·92	1·79	0·53	0·91	0·58	0·89	0·78	0·71	0·71	0·88	1·05
East London	2·24	1·68	1·20	2·26	0·63	1·26	1·94	1·44	0·55	1·25	0·98	1·63	1·42
South Essex	1·69	1·36	2·10	1·40	1·98	1·66	1·96	1·80	1·21	0·98	1·00	1·48	1·55
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13

Table C.

Amount of Oxygen required to oxidize Organic Matter in 100,000 parts of the Waters.

Names of Companies.	1866.												
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
Thames.													
Chelsea	·1184	·0912	·0564	·0608	·0372	·0360	·0504	·0344	·0340	·0834	·0589	·0543	·0596
West Middlesex	·0336	·0739	·0684	·0404	·0344	·0360	·0516	·0304	·0373	·0730	·0748	·0599	·0511
Southwark	·0568	·0643	·0496	·0628	·0600	·0420	·0596	·0336	·0315	·0670	·0866	·0629	·0564
Grand Junction	·0627	·0555	·0484	·0620	·0404	·0368	·0548	·0368	·0323	·0761	·0790	·0540	·0532
Lambeth	·1288	·0592	·0992	·0548	·0452	·0424	·0560	·0368	·0467	·0804	·0760	·0599	·0654
Other Sources.													
Kent	·0096	·0104	·0092	·0070	·0072	·0076	·0097	·0084	·0073	·0082	·0110	·0199	·0096
New River	·0152	·0576	·0392	·0308	·0280	·0252	·0212	·0133	·0128	·0258	·0228	·0299	·0268
East London	·0291	·0636	·0548	·0624	·0328	·0264	·0344	·0328	·0262	·0425	·0657	·0987	·0474
South Essex	·0096	·0086	·0108	·0070	·0114	·0080	·0120	·0108	·0587	·0098	·0083	·0111	·0138
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13

TABLE D.

DEGREES of HARDNESS (1 deg. = 1 part of carbonate of lime, or its equivalent,) in 100,000 parts of the WATERS.

NAMES OF COMPANIES.	1866.												
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
THAMES.													
Chelsea	21·4	21·1	19·4	21·9	21·1	16·5	16·5	17·4	18·0	18·5	21·1	18·5	19·3
West Middlesex	21·4	19·8	19·7	21·4	21·7	16·2	16·2	16·2	17·2	19·1	21·4	19·1	19·1
Southwark	20·2	20·7	21·0	22·6	21·4	15·7	16·5	16·2	16·8	20·0	21·4	19·4	19·3
Grand Junction	21·1	22·2	20·7	22·8	20·8	16·2	17·1	16·8	18·0	20·2	21·7	19·1	19·7
Lambeth	15·4	21·0	18·5	20·5	21·1	16·8	16·2	17·2	17·4	20·0	22·0	18·2	18·7
OTHER SOURCES.													
Kent	26·5	27·4	27·7	28·5	29·7	25·4	24·5	24·8	26·5	27·4	26·2	23·4	26·5
New River	23·7	22·0	22·5	22·7	21·4	13·7	13·4	13·7	14·0	18·5	20·8	14·2	18·4
East London	24·8	23·1	25·1	22·8	20·8	15·7	16·0	17·7	17·1	20·2	21·7	20·0	20·4
South Essex	25·7	26·5	27·4	27·4	28·5	23·1	23·4	22·2	24·8	25·8	23·7	22·5	25·1
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13

TABLE E.

COMPARATIVE RESULTS in Years 1865 and 1866.

NAMES OF COMPANIES.	Year.	TOTAL SOLID IMPURITY.			ORGANIC and other Volatile Matter.			OXYGEN required to oxidize organic Matter.			HARDNESS.		
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
THAMES.													
Chelsea	1865	31·72	23·58	26·44	3·05	·72	1·50	·1942	·0328	·0794	18·1	14·5	16·3
	1866	31·72	24·63	27·92	2·59	·70	1·21	·1184	·0340	·0596	21·4	16·5	19·3
West Middlesex	1865	30·63	22·42	26·43	3·07	·96	1·57	·1076	·0304	·0581	18·7	17·1	17·7
	1866	32·02	23·62	27·42	2·00	·72	1·26	·0748	·0304	·0511	21·7	16·2	19·1
Southwark	1865	32·62	18·78	26·89	3·40	·84	1·77	·1972	·0408	·0791	18·9	16·4	17·7
	1866	31·18	23·66	27·88	2·40	·63	1·36	·0866	·0315	0564	22·6	15·7	19·3
Grand Junction	1865	32·11	22·94	26·97	2·72	·81	1·54	·1722	·0352	·0636	18·4	16·4	17·7
	1866	31·40	24·82	28·23	1·77	·56	1·19	·0790	·0323	·0532	22·8	16·2	19·7
Lambeth	1865	31·36	22·76	26·41	2·70	·97	1·61	·1950	·0392	·0818	18·8	16·4	17·6
	1866	31·16	25·25	27·82	1·96	·99	1·43	·1288	·0368	·0654	22·0	15·4	18·7
OTHER SOURCES.													
Kent	1865	39·60	34·92	37·79	2·66	·61	1·65	·0692	·0048	·0149	27·4	23·7	25·6
	1866	40·42	37·70	39·03	1·80	·64	1·34	·0199	·0070	·0096	29·7	23·4	26·5
New River	1865	30·02	19·40	25·24	2·00	·54	·98	·0496	·0096	·0251	21·1	17·2	19·3
	1866	29·92	20·20	24·85	1·92	·53	1·05	·0576	·0128	·0268	23·7	13·4	18·4
East London	1865	34·62	22·17	27·98	3·30	·86	1·62	·1341	·0188	·0504	22·2	17·4	20·2
	1866	35·15	24·38	30·48	2·26	·55	1·42	·0987	·0262	·0474	25·1	15·7	20·4
South Essex	1865	43·36	37·68	40·28	2·70	·84	1·82	·0160	·0048	·0103	26·5	21·1	24·2
	1866	40·94	31·32	38·77	2·10	·98	1·55	·0587	·0070	·0138	28·5	22·2	25·1

IX.—WATER SUPPLY

1. The **Water Companies** of **London**; their **Sources** of **Supply**, and the Particulars

WATER COMPANY.	SOURCE OF SUPPLY.			RESERVOIRS.	
	1850.	1856.	1866.	1850.	1856.
New River - [The Hampstead Company was amalgamated with the New River Company in 1856.]	Chadwell Spring; River Lea, at a point between Hertford and Ware 21 miles above Lea Bridge; Springs; 4 Wells at Cheshunt, Amwell, and Hampstead Road. [*Also Thames below Blackfriars Bridge.*]	Same as in 1849, with addition of the Hampstead Company's sources, which consisted of springs at Hampstead and Highgate, and one deep chalk well. The springs used only for street, sewer, and similar purposes. [*Also Thames below Blackfriars Bridge.*]	Same as in 1856, including power of draught from the Thames below Blackfriars Bridge for sewer and street purposes, and one additional deep well. Of the average daily supply about 18 million gallons were drawn from the Lea; the remaining 4 million gallons from other sources.	2 at Cheshunt (18 acres); 2 at Stoke Newington (42 acres); 1 at New River Head (5 acres); 1 in Hampstead Road (200 feet in diameter), built with brick sides.	2 at Cheshunt, su sidence; 2 at Sto Newington, subs dence; New Riv Head; Hampste Road; Claremo Square (for filter water), covere holds 3½ million g lons; 2 at Maid Lane, covered, million gallons ea 1 at Stoke Newin ton, covered, million gallons. The large subsi ing reservoirs Stoke Newingt were formerly equ to 10 days' suppl but now only to 5
East London -	River Lea at Lea Bridge.	River Lea at Tottenham Mills, 2 miles above Lea Bridge.	River Lea at Higham Hill, 3 miles above Lea Bridge; local drainage being excluded from the river as far as Ponders End, which is 6 miles from Lea Bridge.	Six open reservoirs; capacity 35 million gallons, viz., 2 at Old Ford, 2 on east side of River Lea, 1 at Lea Bridge, and 1 at Stamford Hill.	2 covered reservoi at Old Ford (f merly open), acres in extent. [In their Repo of 1856 the Boa of Health En neers state th "the other res voirs at Old Fo and Stamford B are now throw out of use."]
Chelsea - -	Thames at Battersea	Thames at Seething Wells, two miles above Teddington Lock. Water from this source used first in 1856. Works at Chelsea disused and connections severed in 1856, the land being sold to Railway Companies.	Same as in 1856 -	4 subsiding reservoirs (at Chelsea?) (3½ acres); 2 open service reservoirs for filtered water, 1 in Green Park (1½ acres) and 1 in Hyde Park (¾ acre).	2 subsiding res voirs at Seethi Wells; 2 cover reservoirs at Putn Heath (2¼ acre 170 feet abo Trinity high-wa mark; 1 adjoini open reservoir (h an acre) for supp of unfiltered wat for roads, stree and flushing.
West Middlesex	Thames at Barnes, 8½ miles below Teddington Lock.	Thames at Hampton, 5½ miles above Teddington Lock. First used in 1855.	Same as in 1856 -	2 subsiding reservoirs at Barnes (16 acres); 1 service reservoir at Kensington, capacity 3,450,000 gallons, elevation 111 feet; 1 service reservoir at Barrow Hill, capacity 4,752,000 gallons, elevation 177 feet.	2 subsiding res voirs at Barn and service res voirs as in 1850.

F LONDON.

heir WORKS for **Storage** and **Filtration**, in **1850, 1856,** and **1866.**

	FILTRATION.			AVERAGE DAILY QUANTITY OF WATER SUPPLIED.		
1866.	1850.	1856.	1866.	1849.	1856.	1866.
				Gallons.	Gallons.	Gallons.
iding reservoirs at eshunt, Hornsey, ke Newington, and w River Head; al- ether about 70 es. Ponds at Hamp- d and Highgate acres). vered service re- voirs at Claremont are, Maiden Lane, ghgate, and Hamp- d; joint capacity million gallons.	None; subsidence only	Filter beds at Stoke Newington and New River Head. The filtering medium is 5 feet in thickness, 2 of which consist of sand and the rest of gravel, in layers increasing in coarseness towards the bottom. The supply of filtered water to part of the district was commenced at Christmas 1855. Pipe supplying unfiltered water from tank at New River Head retained for supply during periods of frost. The Board of Health Report states that it would be more satisfactory that this means of supplying unfiltered water should be removed.	3 filter beds at Hornsey, 5 at Stoke Newington, and 3 at New River Head; total area 9¼ acres.	14,576,783	23,396,400	22,898,769
reservoirs at Wal- mstow; capacity million gallons. en dissevered re- voirs of 9 acres at Ford, one of which incidentally wn upon in 1864, 5, and 1866, pre- is to the comple- n of the above- ntioned reservoirs Walthamstow G.] vered reservoir at Ford as in 1856.	None; subsidence only	13 filter beds at Lea Bridge, 12 acres in extent. The filtering medium is 3½ feet of sand. Filtered water first delivered in November 1855.	Same as in 1856 -	8,829,462	14,562,684	19,380,739
as in 1856 - -	90,000 superficial feet of filtering area at Chelsea; the medium being gravel, shells, and sand, 8 feet thick.	2 filter beds at Seething Wells, area 2 acres; filtering medium as before.	Same as in 1856	3,940,730	5,532,000	8,000,000
siding reservoirs arnes; service re- oirs as in 1850.	None; subsidence only	3 filter beds at Barnes; medium, sand and gravel. Filtered water first supplied in March 1854; but connection between main and subsiding reservoirs still maintained.	5 filter beds at Barnes; the connection alluded to in preceding column has been severed.	3,334,054	6,005,293	8,208,168

THE **Water Companies** of **London**; their **Sources** of **Supply**, and the PARTICULA

WATER COMPANY.	SOURCE OF SUPPLY.			RESERVOIRS.	
	1850.	1856.	1866.	1850.	1856.
GRAND JUNCTION	Thames at Kew, 6 miles below Teddington Lock.	Thames at Hampton, 5¼ miles above Teddington Lock.	Same as in 1856 -	Depositing reservoirs at Kew Bridge, capacity 5 million gallons; store reservoir at Campden Hill (6 million gallons); store reservoir at Paddington, capacity 3,400,000 gallons, elevation 89 feet.	Subsidence reservoirs at Kew. Op service reserv at Campden Hi Paddington res voir abolished.
SOUTHWARK AND VAUXHALL.	Thames at Battersea (Red House).	Thames at Hampton, 5¼ miles above Teddington Lock. Water from this source first supplied in 1855. Connection with the River at Battersea not yet removed.	Same as in 1856 -	2 depositing reservoirs at Battersea (32 million gallons).	2 subsiding res voirs at Hampt Depositing res voirs at Batters
LAMBETH - -	Thames at Lambeth (near Hungerford Bridge).	Thames at Long Ditton (since 1852).	Same as in 1856 -	2 open reservoirs at Brixton (capacity 12 million gallons); 1 open reservoir at Streatham (capacity 3,750,000 gallons).	2 covered reservoi at Brixton; 1 unc vered at Streatha
KENT - - - [The Plumstead, Woolwich, and Charlton Company was established in 1854 for the supply of water derived from artesian wells sunk in the chalk, and softened by Dr. Clark's process. After the failure of the Company the works were purchased by the Kent Company in 1861.]	Ravensbourne at Deptford.	Same as in 1850 -	Artesian wells at Deptford, Charlton, Plumstead, Bromley, and Crayford, sunk in the chalk.	2 impounding reservoirs at Deptford. Service reservoirs in Greenwich Park, Woolwich Common, and Woolwich.	Same as in 1850

The foregoing particulars have been chiefly derived from Returns supplied by the London Water Companies to the Select Committee of the House of Commons on "East London Water Bills (Session 1867)" and from the Report of Messrs. Austin, Ranger, and Dickens to the General Board of Health on the Metropolis Water Supply, 1856; but to ensure correctness of description the facts were submitted in proof to the several Companies for revision before publication.

The Registrar General, desiring further to ascertain the state and nature of the works for water supply at the latest date, addressed the following inquiries to each of the London Water Companies, who have obligingly and promptly furnished the information required:—

I.—RESERVOIRS. State, for each Reservoir: (1) its name or situation; (2) whether for unfiltered or filtered water; (3) whether covered or uncovered; (4) its elevation above Trinity high-water mark or above intake; (5) its superficial area and contents (*in gallons*) when full; (6) how often its contents are changed in the ordinary way; (7) how often it is cleansed?

eir Works for **Storage** and **Filtration**, in **1850, 1856,** and **1866**—*continued.*

	FILTRATION.			Average Daily Quantity of Water supplied.		
1866.	1850.	1856.	1866.	1849.	1856.	1866.
				Gallons.	Gallons.	Gallons.
lence reservoirs ampton and Kew. red reservoir at pden Hill, eleva- 120 feet.	Filter beds at Kew, through 4 ft. of gravel, shells, and sand.	Same as in 1850 - -	Same as in 1850 -	3,532,013	5,478,361	9,317,055
as in 1856 - -	2 filter beds at Battersea, 5½ feet; river sand and gravel.	Filter beds at Battersea; 2 feet additional filtering medium, and Harwich sand chiefly used.	Same as in 1856 -	6,013,716	10,331,122	12,502,000
as in 1850; with ional ones at Sel- and Rock Hill.	Entire supply filtered through 7 ft. of gravel and sand.	Same as in 1850 - -	Same as in 1850 -	3,077,260	5,391,000	8,950,000
d reservoirs at wich Common, stead Common, Chiselhurst Com- total capacity 000 gallons. overed reser- at Greenwich and Woolwich non; capacity 000 gallons.	2 filter beds at Deptford; gravel, shells, and sand.	Same as in 1850 - -	Filters and deposit reservoirs abandoned on change of supply from Ravensbourne to chalk springs.	1,079,111	2,680,000	6,150,000

II.—Filtration. State for each filter-bed: (1) its name or situation; (2) its elevation above intake; (3) its superficial area; (4) its structure; (5) the number of gallons it will filter daily when in full operation; (6) how often cleansed; (7) whether subject to obstruction from confervæ or other causes?

II.—Working. (1) How is the water taken to the filter-beds—by pumping, gravitation, in open channels, or in pipes; (2) how is it taken from the filter-beds and stored; (3) how is it delivered to the consumers—by constant, intermittent, daily supply; for what hours; to each house; or by stand-pipes?

(*For Replies to these Questions see following pages* 264 *to* 271.)

NEW RIVER WATER COMPANY.

I.—Reservoirs.

Situation of Reservoirs.	Number.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark.	Joint superficial Area.	Contents available for Service when full (Gallons).	Average Quantity drawn out daily (in Gallons).	How often cleansed.	Remarks.
New River Head, Clerkenwell -	1	Unfiltered	Uncovered	ft. in. 82 0	About— ¾ acre	About— 700,000	About— 6,000,000	Cleared of weeds, &c. at least twice a year, as the River channel also is.	The unfiltered water reservoirs have further capacity, making their whole cubic contents about double the fore-named amounts.
Stoke Newington - - - - -	2	"	"	86 6	42½ "	90,000,000	21,400,000	"	
Hornsey - - - - - - -	2	"	"	90 0	8 "	8,500,000	600,000	"	
Ponds at Hampstead and Highgate	13	"	"	196 to 300	30 "	30,000,000	180,000	"	Water from these reservoirs used for streets, sewers, and similar purposes only.
Camden Park Road - - - -	1	"	"	159 0	½ "	900,000	56,500	"	
Cheshunt - - - - - -	2	"	"	104 0	18½ "	50,000,000	Occasionally used	"	
Claremont-square, Pentonvillle -	1	Filtered	Covered	126 6	⅝ "	3,500,000	12,000,000	At average intervals of four years,	Although these filtered water reservoirs have been washed out at the intervals named, they have been found on those occasions to have had little need of cleansing,
Maiden-lane, Upper Holloway -	2	"	"	219 6	2¼ "	15,000,000	6,000,000	At average intervals of three years.	
Highgate - - - - - -	1	"	"	420 0	⅜ "	1,000,000	250,000	"	
Hampstead - - - - - -	1	"	"	435 0	1/16 "	500,000	250,000	"	

II.—Filtration.

Situation of Filter Beds.	Number of Beds.	Elevation above Trinity High-water Mark.	Joint superficial Area.	Structure.	Number of Gallons filtered daily, when Beds are in full operation.	How often cleansed.	Whether subject to Obstruction.	Remarks.
New River Head -	3	ft. in. 82 0	2¼ acres	Between 2 and 3 feet of fine sand, supported by 3 feet of gravel, increasing in coarseness towards the bottom.	5,500,000	The surface sand of each bed is scraped off at intervals, which vary with the rate of the beds' delivery. Such cleansing is generally required every 3 or 4 weeks.	None of the beds are ever left so long without cleansing as to become stopped by confervæ or other cause.	At Stoke Newington are two additional beds not yet used, having an area of one acre each.
Stoke Newington -	5	86 5	5 "		13,000,000			
Hornsey - -	3	87 0	2 "		600,000			

III.—Working.

The water is supplied to the filtering beds by gravitation through pipes; it is pumped from beneath the beds through covered channels and pipes into covered service reservoirs. In general, water is delivered by an intermittent daily service to each house for sufficient time to fill provided cisterns. In cases where consumers have desired constant supply, and have provided themselves with apparatus to take water without waste, service has been made constant. Some of the houses of the very poor have supply by stand-posts, and these, where waste-preventing apparatus has been provided, have direct connection with the company's mains.

The New River Company being most anxious to be kept constantly informed of the quality of the water derived from their wells and springs, and supplied to the public, have, for many years past, requested Dr. Letheby to make two analyses of the water every month. These analyses have been at all times, without a single exception, most satisfactory. The presence of decomposing organic matter having never been discovered either in the form of past or present sewage matter. The fluctuations in the amount of solid matter have been slight, and have been dependent, as is the case everywhere, on the rain-fall.

New River Office, 13th January 1868.

I.—Reservoirs.

Situation of Reservoirs.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark or above In-take.	Superficial Area and Contents (in Gallons) when full.	How often Contents are changed in the ordinary way.	How often cleansed.
The Company's only reservoirs now in work are one in the parish of Walthamstow about 10 furlongs from their Lea Bridge filter beds and pumping station, and a second at Old Ford in connexion with their pumping establishment there. Any others heretofore in use have been some time disused and abandoned, and others authorized by Parliament in 1867 are not yet completed.	The Walthamstow reservoir is for unfiltered, and the Old Ford reservoir for filtered water.	The Old Ford reservoir is covered. The Walthamstow reservoir is uncovered.	The water which fills the Walthamstow reservoir flows into it from the natural (protected) River Lea by gravitation. Its level (when full) is 6 feet above that of the filter beds with which it is connected by a special private canal. The level (when full) of the Old Ford reservoir is 2 feet above Trinity High-water mark.	The superficial area of the Walthamstow reservoir is 110 acres; its contents when full 220 million gallons. The superficial area of the Old Ford reservoir is 2½ acres; its contents when full 7 million gallons.	Both reservoirs are arranged for complete and continuous circulation.	The Walthamstow reservoir was only completed in 1866 and has not as yet needed cleansing. The sides and slopes of Old Ford reservoir are cleansed as occasion requires.

II.—Filtration.

Situation of Filter Beds.	Elevation.	Superficial Area.	Structure.	Number of Gallons filtered daily when the Beds are in full Operation.	How often cleansed.	Whether subject to Obstruction from Confervæ or other Causes.
All the Company's present filter beds are situate at Lea Bridge, the water passing into them from the Walthamstow reservoir. The set of beds is in two series and comprises 13 beds. An extension of them authorized by Parliament in 1867 will immediately be in course of construction, the land for the purpose having been acquired.	The level of the water in the filter beds (full) is 5 feet above the highest in-take of the engines employed at Lea Bridge in pumping the supply for consumption, and is of the same elevation above the level of the main which conveys the filtered water from them to the Old Ford reservoir and pumps.	12 acres on the sand.	Sand in layers	40,000,000	Ten times annually.	To a limited extent; but the filter beds retain on their surface until they are cleansed all that is extracted from the water whether living, dormant, or mineral matter.

III.—Working.

The water flows into the filter beds from the reservoir under ordinary circumstances by gravitation; but of the 220 million gallons which the Walthamstow reservoir will contain, 170 millions will so flow, and the other 50 millions must when necessary be pumped out of the reservoir. The channel of communication between the reservoir and the filter beds is partly covered and partly open. So much of the filtered water as is pumped at Lea Bridge flows to the pumps from the filtered beds in a covered brick channel, and the filtered water pumped at Old Ford flows in a close iron main to the Old Ford reservoir, and through it to the pumps. There is no intermediate storage except so far as the water in the covered Old Ford reservoir (which holds considerably less than the day's consumption through it) may be considered as stored. The whole of the supply is pumped. The detail of supply is various; that of "large consumers" and "trades" is constant; whilst of 93,329 houses supplied about one third have a constant supply, and the remaining two thirds an intermittent one, for 20 minutes to each house every day but Sunday. There are some supplies by stand-pipe.

The East London Company at present derive their entire supply from the River Lea, and on the recommendation of the Royal Commission on the Pollution of Rivers and of the above-mentioned Committee a Bill will next session be introduced into Parliament by the Government for further securing the waters of the Lea from pollution.

It may be added that there was passed in the last session an Act for authorizing the East London Water Company to take water from the Thames at Sunbury above the in-take of the several Metropolitan Companies drawing water from the Thames. The works necessary for this purpose including storage reservoirs and filter beds will be immediately in course of construction.

East London Waterworks, 23d January 1868.

CHELSEA WATER COMPANY.

I.—Reservoirs.

Situation of Reservoirs.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark, or above Intake.	Superficial Area.	Contents (in Gallons) when full.	How often Contents changed in ordinary way.	How often cleansed.
Subsiding Reservoirs at Seething Wells, near Kingston.	Unfiltered water	Uncovered	Level with intake from river.	1½ acres	3,500,000	Daily	About every two months.
„	„	„	„	1½ acres	3,500,000	„	„
Putney Heath	Filtered water	Covered	170 feet above Trinity high-water mark.	1¼ acres	5,000,000	From one to two days	Ordinarily annually.
„	„	„	„	1¼ acres	5,000,000	„	„
„	Unfiltered water	Uncovered	„	½ an acre	1,000,000	Daily in summer months.	„
	An additional subsiding Reservoir is in course of construction at Seething Wells, similar to the foregoing.						

II.—Filtration.

Situation of Filter Beds.	Elevation above Intake.	Superficial Area.	Structure.	Number of Gallons filtered daily when the Beds are in full Operation.	How often cleansed.	Whether subject to Obstruction from Confervæ or other Causes.
At Seething Wells, near Kingston.	About six feet below intake from river.	One acre	Gravel, shells, and sand, 8 feet thick.	10,000,000	Monthly, or oftener when necessary.	Slight obstructions are experienced from confervæ in the autumn.
„	„	„	„	10,000,000	„	„

III.—Working.

The water is taken to the filter beds, by gravitation, from the subsiding reservoirs through iron pipes. It is pumped from the filter beds to and stored in the reservoirs on Putney Heath. The delivery to the consumers is by intermittent supply, from 2 to 4 hours daily to each house. There are very few stand-pipes in the district.

Chelsea Waterworks. 10*th January* 1868.

I.—Reservoirs.

Situation of Reservoir.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark.	Superficial Area.	Contents (in Gallons) when full.	How often Contents changed in the ordinary Way.	How often cleansed.
Barnes: Eastern	Unfiltered	Uncovered	4 feet	6 acres	16,000,000	About 7,000,000 gallons changed daily.	Last cleaned out in November 1865
Western	"	"	9 "	8 "	22,250,000	" 7,000,000 " "	" " May 1862 — These reservoirs, being supplied with the pure water pumped from Hampton, will not require emptying for the purpose of cleaning out for a considerable time, but the slopes are cleaned occasionally, and if any weeds appear they are removed before they decay.
Southern	"	"	9 "	6½ "	18,700,000	" 2,000,000 " "	" " May 1862
Kensington: Campden Hill	Filtered	Covered	112 "	1 "	3,672,000	" 718,000 " "	Do not require cleaning out except at rare intervals.
Primrose Hill: Barrow Hill	"	"	177½ "	1½ "	4,750,000	" 1,979,000 " "	Do not require cleaning out except at rare intervals.
Hampstead: Kidderpore (New Finchley Road).	"	"	310½ "	¾ "	2,500,000	" 66,125 " "	First used in June 1867, and will not need cleansing for a considerable time.

II.—Filtration.

Situation of Filter Beds.	Elevation above Intake.	Superficial Area.	Structure.	Number of Gallons filtered when Beds are in full Operation.	How often cleansed.	Whether subject to Obstruction.
Barnes: No. 1	The top water-line is 4 feet above the supply pipe or intake, and the usual working depth on the sand surface is about 4 feet	About 1½ acre	Concrete floor and brick sides slightly battered, and on the concrete floor brick tunnels and stoneware pipes are placed; on these washed gravel and sand are laid, the gravel being taken from the Company's land at Barnes, and screened into five sizes, the larger stones 12 inches deep, the others gradually reducing in size, and 1 foot 3 inches deep, and on the fine stones 12 inches depth of sand, sifted from the Barnes gravel is laid, upon this a layer of Harwich sand is laid, varying from 1 foot 9 inches to 2 feet in depth.	About 175,000 per hour.	Varying from one to three weeks, according to the season of the year.	A slight coating of clay is mostly found on the sand when shut off to be cleaned; but sometimes in the months of May, June, and July a very fine coating of a vegetable substance, like woven cloth, is found on the sand, which, however, does not obstruct the filter beds, which yield their full supply for a much longer time than when the clay is on the sand.
" No. 2		"		"		
" No. 3		"		"		
" No. 4		About 2¼ acres		About 295,000 per hour.		
" No. 5		About 1½ acre	Concrete floor and sides, or slopes; other details same as above.	About 196,000 per hour.		

III.—Working.

The subsiding reservoirs are supplied from the Thames at Hampton, above the village, through a 36 inch cast-iron main pipe, about 8¾ miles in length, and the water is conveyed thence to the filter beds by gravitation through cast-iron pipes. From the filter beds it passes by gravitation through cast-iron pipes to a brick shaft, 20 feet diameter, and from thence through a 36 inch cast-iron pipe under the River Thames to the engine wells at Hammersmith, and without seeing daylight is pumped by the Hammersmith engines direct through large iron mains into covered reservoirs.

The supply to the consumers is intermittent, daily, with an extra or Sunday supply to many portions of the district. Poor localities always have a Sunday supply.

The length of time the water is turned on varies from one to two hours, according to the requirements of the locality.

No supplies are given by stand-pipes.

West Middlesex Waterworks, 17th January 1868.

GRAND JUNCTION WATER COMPANY.

I.—Reservoirs.

Situation of Reservoirs.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark.	Joint Superficial Area.	Contents (in Gallons) when full.	How often Contents changed in the ordinary Way.	How often cleansed.
Two at Hampton	Unfiltered	Uncovered	12 feet	2 acres	10,000,000	On an average every two days	About once a year.
Two near Kew Bridge	"	"	20 "	5¾ acres	16,000,000	On an average four times a week.	
One at Campden Hill, Kensington.	Filtered	Covered	120 "	46,800 super. feet.	6,000,000	About four times a week	Very rarely, as it is covered, and contains only filtered water.

II.—Filtration.

Situation of Filter Beds.	Elevation above Trinity High-water Mark.	Superficial Area.	Structure.	Number of Gallons filtered daily when Beds are in full Operation.	How often cleansed.	Whether subject to Obstruction from Confervæ or other Causes.
Three at Kew Bridge	20 feet	225,000 feet	On the concrete bottom of each filter bed tunnels are formed leading the filtered water to the engine wells; above these tunnels the filtering medium is laid in the following order, viz.:— 1 foot of coarse gravel. 9 inches of rough-screened gravel. 9 inches of fine " " 1 foot of fine gravel. 3 feet of Harwich sand.	18,000,000	From 12 to 14 times a year.	No.

III.—Working.

The water is conveyed by gravitation from the reservoirs through pipes to the filter beds; thence through a culvert direct to the engine wells, whence it is pumped to the district and the Campden Hill reservoir. The water is supplied daily (including Sundays wherever required); it is kept on to each service from one to two hours; the supply is given to each house and not in any case by stand-pipes.

The joint Report of Drs. Letheby, Odling, and Abel to the Select Committee of the House of Commons on the East London Water Bills (1867) contains full information as to the quality of the water supplied.

Grand Junction Waterworks, 4th January 1868.

SOUTHWARK AND VAUXHALL WATER COMPANY.

I.—Reservoirs.

Situation of Reservoirs.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark.	Joint superficial Area.	Contents (in Gallons) when full.	How often Contents are changed in the ordinary Way.	How often cleansed.
2 at Hampton	Unfiltered	Uncovered	12 feet	2 acres	10,000,000	Once in 24 hours	About once a year.
2 at Battersea	Unfiltered	Uncovered	5 feet	6½ acres	22,000,000	5 times a week	

II.—Filtration.

Situation of Filter Beds.	Elevation above Trinity High-water Mark.	Joint Superficial Area.	Structure.	Number of Gallons filtered daily when Beds are in full Operation.	How often cleansed.	Whether subject to Obstruction from Confervæ or other Causes.
5 at Battersea	5 feet	8 acres	On the concrete bottom of each filter bed tunnels are formed leading the filtered water to the engine wells; above these tunnels the filtering medium is laid in the following order, viz.— 1 foot of coarse gravel. 9 ins. of rough screened gravel. 9 ins. of fine do. do. 1 foot of fine gravel. 3 feet of Harwich sand.	28,000,000	12 to 14 times a year.	No.

III.—Working.

The water is conveyed by gravitation from the reservoirs through iron pipes to the filter beds, thence through a culvert direct to the engine wells, whence it is pumped direct to the Company's district. The water is supplied daily (including Sundays wherever required); it is kept on to each service from one to two hours; the supply is given to each house, with the exception of one or two cases where stand-pipes are used.

The joint Report of Drs. Letheby, Odling, and Abel to the Select Committee of the House of Commons on the East London Water Bills (1867) contains full information as to the quality of the water supplied.

Southwark and Vauxhall Waterworks, 4th January 1868.

LAMBETH WATER COMPANY.

I.—Reservoirs.

Situation of Reservoirs.	Whether for filtered or unfiltered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark or above Intake.	Superficial Area.	Contents in Gallons when full.	How often Contents are changed in the ordinary Way.	How often cleansed.
Subsiding Reservoir at Long Ditton, near Kingston-on-Thames, No. 1.	Unfiltered water	Uncovered	The water level is the same as that in the river.	1 acre	2,500,000		
„ No. 2.	„	„	„	1 acre	2,500,000		
„ No. 3.	„	„	„	1 acre	2,500,000		
Brixton, No. 1.	Filtered water	Covered	103 feet above Trinity high-water mark.	1½ acre	6,000,000		
„ No. 2.	„	„	103 „	1½ acre	6,000,000	Daily	Annually.
Streatham	„	Uncovered	185 „	1¼ acre	3,750,000		
Rock Hill, Sydenham, No. 1.	„	Covered	350 „	5,400 square feet	500,000		
„ No. 2.	„	„	373 „	1,600 square feet	115,000		
Selhurst	„	„	206 „	¾ acre	2,500,000		
Combe	„	„	180 „	12,000 square feet	1,150,000		

II.—Filtration.

Situation of Filter Beds.	Elevation above Intake.	Superficial Area.	Structure.	Number of Gallons it will filter daily when in full Operation.	How often cleansed.	Whether subject to Obstruction from Confervæ or other Causes.
Long Ditton, near Kingston-on-Thames, No. 1.	4 feet *below* intake from river.	17,000 square feet	7 feet of gravel and sand.	5,000,000		
„ „ No. 2.	„	17,000 „	„	5,000,000	Average fortnightly	Slight obstructions are experienced from confervæ in the autumn.
„ „ No. 3.	„	17,000 „		5,000,000		
„ „ No. 4.	„	17,000 „	„	5,000,000		

III.—Working.

The water is taken to the filter beds by gravitation through iron pipes from the subsiding reservoirs. It runs from the filters to the pumping wells, and is pumped to the various store reservoirs. It is delivered to the consumers by intermittent supply from 2 to 4 hours daily to each house. There are very few stand-pipes in the district.

Lambeth Waterworks, 15th January 1868.

KENT WATER COMPANY.

I.—Reservoirs.

Situation.	Whether for unfiltered or filtered Water.	Whether covered or uncovered.	Elevation above Trinity High-water Mark.	Superficial Area.	Contents (in Gallons) when full.	How often Contents are changed in the ordinary Way.	How often cleansed.
Greenwich Park - - -	Spring water	Uncovered; brick bottom and sides.	140 feet	28,098 feet	1,255,000	These two reservoirs were constructed by Government to protect from fire the Victualling Yard and Dockyard at Deptford, Greenwich Hospital, the Woolwich Dockyard, and the whole of the military establishments at Woolwich, with the exception of the Arsenal. The Company have the use of these reservoirs under conditions.	Four or five times annually.
Woolwich Common - - -	„	Uncovered; constructed with a sand filter at base, through which all water must pass, except to fire mains.	250 feet	39,412 feet	1,600,000		About twice a year.
Plumstead Common - -	„	Covered - - - - -	157 feet	10,121 feet	750,000	The whole capacity of the reservoirs is not equal to more than half a summer day's supply of the districts; they are at all times in free communication with the mains, and are not intended so much for storage of water as to maintain equalization of pressure on the engines and mains. The water is constantly in motion, either flowing out of or into the reservoirs as the demand for water in the district is either less or more than the engines are supplying.	
Plumstead, Constitution Hill -	„	Covered - - - - -	311 feet	3,918 feet	325,000		Annually.
Chislehurst Common - -	„	Covered - - - - -	320 feet	5,800 feet	450,000		

II.—Filtration.

No details under this head applicable to the Company.

III.—Working.

The supply is constant where meters are used, or otherwise intermittent daily. In the case of intermittent supply there is no limit to time or quantity; the supply on a service is always continued until the last cistern is filled. Stand-pipes are not used, except for road watering and for hydrants for extinguishing fires.

The water supplied by this Company has been analyzed twice in each month for some years by Dr. Letheby, and monthly by Dr. Frankland, and the results have been made public.

The Company have recently extended their works for the improvement of the water supply to the smaller towns forming the boundaries of the Company's district.

Kent Waterworks, 1st January 1868.

2. Water Supply of London in each of the Three Years 1849, 1856, and 1866.

Water Company.	Average Daily Quantity supplied in Gallons.		
	1849.*	1856.†	1866†.
New River	14,576,783	23,396,400	22,898,769
East London	8,829,462	14,562,684	19,380,739
Chelsea	3,940,730	5,532,000	8,000,000
West Middlesex	3,334,054	6,005,293	8,208,168
Grand Junction	3,532,013	5,478,361	9,317,055
Southwark and Vauxhall	6,013,716	10,331,122	12,502,000
Lambeth	3,077,260	5,391,000	8,950,000
Kent	1,079,111	2,680,000	6,150,000
Total	44,383,129	73,376,860	95,406,731

* *See* Report to General Board of Health on the Supply of Water to the Metropolis, 1850, p. 6.

† *See* Returns from Water Companies (Question 18.) in Appendix No. 1. to Report of Select Committee of the House of Commons on "East London Water Bills, 1867."

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3. London Water Companies. Amount of Capital and Rate of Dividend in the Years **1850** and **1866.** [*See Appendix No. 5. to Report of Select Committee on East London Water Bills*, 1867, *p.* 318.]

Water Company.	1850.		1866.	
	Capital in Shares or Stock.	Dividend per cent.	Capital in Shares or Stock.	Dividend per cent.
	£	£	£	£
New River (*a*)	1,491,671	4·06	1,519,958	6·11
East London (*b*)	500,000	8·00	1,247,560	6·81
Chelsea	300,000	2·13	615,600 (*c*)	5·50
West Middlesex	506,300	9·80	794,367 (*d*)	9·40
Grand Junction (*Share Capital*)	331,000	8·00	546,000 54,000 34,280	8·50 7·50 4·00
Southwark and Vauxhall (*Shares*)	303,218	5·00	377,870 126,500 125,160	6·50 5·00 4·50
Lambeth (*Shares*)	211,881	5·00	532,130	6·00
Kent	229,500	3·75	428,945	6·00
	3,873,570		6,402,370	

(*a*) In 1854 the Company formed a reserve fund, by setting aside a portion of the half-yearly profits, in order to guard against the result of accident to the extensive works carried out under the provisions of the 1852 Act and subsequent Acts. In 1866 it was considered that time had consolidated these works, and that the danger, to guard against which this fund was created, had in a great measure passed away. The directors, therefore, determined to restore to the proprietors a portion of the profits which in previous years had been withheld from them, and a distribution of 1,400*l.* per share, or 6*l.* 11*s.* 6¾*d.* per cent. upon the capital, was made, which reduced the fund to 21,417*l.* 9*s.* 5*d.* It is to be observed, that the increase in dividends in 1865 and 1866 is chiefly the result of the Company having ceased to make the usual additions to this fund.

(*b*) Three bonuses, of 1 per cent. each, on ordinary stock, were declared between 1850 and 1866.

(*c*) In addition to the capital of 615,600*l.* the Company have expended on permanent works 170,000*l.* (raised on existing bonds at interest), and 103,500*l.*, produced on sale of surplus lands.

(*d*) An addition of 4,204*l.* has been made to the capital since Christmas 1866.

4. London Water Companies. CAPITAL, RECEIPTS, and HOUSES SUPPLIED by each COMPANY in the Year **1866.** [*See Answers of Companies to Questions* 2, 5, 6, *and* 14, *in Appendix No.* 1. *to Report of Select Committee on East London Water Bills,* 1867.]

WATER COMPANY.	Aggregate Capital in Shares and Loans.	RECEIPTS.		HOUSES SUPPLIED IN 1866.		
		Gross.	Water Rents.	Number.	Rateable Value.	Population.
	Q. 2.	Q. 14.	Q. 14.	Q. 5.	Q. 6.	Q. 5.
	£	£	£		£	
New River - - -	2,600,418	281,389	232,607	112,964	4,054,400	800,000
East London - - -	1,400,000	135,554	129,318	91,975	1,870,760	672,000
Chelsea - - - -	785,600	65,251	64,251	26,900	1,228,000	170,000
West Middlesex - -	798,571	101,115	100,546	36,500(*a*)	2,044,000(*a*)	255,500(*a*)
Grand Junction - -	850,000	112,695	75,575	26,902	1,918,730	242,118
Southwark and Vauxhall	1,100,440	192,734	80,311	73,980	1,413,540	468,540
Lambeth - - - -	736,245	72,755	72,343	37,203	1,240,822	225,000
Kent - - - - -	489,240	62,789	44,585	33,864	675,329	237,068
	8,769,514	1,044,282	799,536	440,288	14,445,581	3,070,226

Note.—The houses and population given in this Table will be found to differ slightly from those derived from another Return as given in the Table on the next page.

(*a*) The total number of houses in the Company's district is stated at 39,500, their rateable value being 2,212,000*l.* and their inhabitants 276,500. The numbers in the Table refer only to the 36,500 houses actually supplied by the Company, the rateable value and population being proportionately reduced.

5. LONDON WATER COMPANIES.—Distribution of Supply in 1866. (See Return in Appendix 4. to Report of Select Committee on East London Water Bills, 1867, p. 317.)

Water Company.	Average Daily Quantity supplied for all Purposes.	Quantity for other than House Supply.	Quantity for House Supply.	Number of Houses. *	Quantity for House Supply per House.	Population (Estimated). *	Quantity for House Supply per Head of Population.
	Gallons.	Gallons.	Gallons.		Gallons.		Gallons.
Total - -	95,406,731	16,997,373	78,409,358	431,269	182	3,064,728	26
Total drawn from the Thames.	46,977,223	7,269,408	39,707,815	198,033	200	1,369,090	29
Total drawn from the Lea and Wells of the New River Company.	42,279,508	9,361,965	32,917,543	199,372	165	1,458,570	23
Total drawn from the Wells of the Kent Company.	6,150,000	366,000	5,784,000	33,864	171	237,068	24
Chelsea [a] - - -	8,000,000	1,193,000	6,807,000	26,900	253	201,000	34
West Middlesex [b] -	8,208,168	556,000	7,652,168	36,500	210	255,500	30
Grand Junction [c] -	9,317,055 [d]	1,192,696 [d]	8,124,359	26,450	307	238,050	34
Southwark and Vauxhall [e].	12,502,000	3,076,712	9,425,288	70,980	133	449,540	21
Lambeth [f] - - -	8,950,000	1,251,000	7,699,000	37,203	207	225,000	34
New River [g] - -	22,898,769	4,361,965	18,536,804	109,198 [h]	170	800,000	23
East London [i] - -	19,380,739	5,000,000	14,380,739	90,174	160	658,570	22
Kent - - - - -	6,150,000	366,000	5,784,000	33,864	171	237,068	24

* *Note.*—The houses and population given in the Return from which this Table is derived differ slightly from those given in the Returns from which the preceding Table is derived.

[a] *Chelsea Company.* The House supply includes stables. About one-fourth of the houses are of the largest class. The population is based on the official returns.

[b] *West Middlesex Company* have no sufficient knowledge of the character and requirements of other Water Companies' districts to enable them to account for any differences in the quantities of water supplied per house or per head which may appear between their own returns and those of the other Companies.

[c] *Grand Junction Company's* district contains a large proportion of first-class houses and many nobleman's mansions, having a considerable number of waterclosets, many fixed baths, heating apparatus, &c.

[d] Includes 538,850 gallons used for sand washing, condensing, &c. at the Company's works.

[e] *Southwark and Vauxhall Company.* In districts where a better class of houses exists than in this Company's district, large quantities of water are consumed for baths, hot-water apparatus, waterclosets, kitchen boilers, and for general purposes.

[f] *Lambeth Company* supply about 5,000 houses in the country districts which take large quantities of water for gardens, small fountains, &c.

[g] *New River Company.* The average rate of consumption may be higher in some districts than in others, because of the generally larger size of the houses supplied, the prevalence of baths, &c., the amount of trade demands, and the degree to which waste may go on unchecked.

[h] Excluding trade and business premises and buildings.

[i] *East London Company* say that the return they make is the best approximation in their power.

X.—WATER SUPPLY OF PARIS.

INFORMATION RESPECTING THE WATER SUPPLY OF PARIS, FURNISHED BY THE INSPECTOR GENERAL TO THE REGISTRAR GENERAL OF ENGLAND.

Water Carriers.

This branch of industry is gradually disappearing. Whereas in 1830 the only means of distributing water to the houses of Paris was by water carriers, at the present time not more than 2,237 cubic meters (or nearly 500,000 gallons) per day is thus distributed. The carriers draw their supply from 30 fountains called "*marchandes*," that is, where the water is purchased and is filtered, and from 60 public fountains in which the water is not previously filtered.

The daily supply of water in those houses supplied by the Paris Company is as follows :—

Water of the Ourcq - -	66,000	cubic meters.	
Water of the Seine, or springs -	40,000	„ „	
Total - -	106,000	„ „	= 23,330,281 galls.

The quantity of water, therefore, supplied through the water carriers is quite insignificant. Although the quantity of water supplied by this means is ascertainable, because it is derived principally from the two sources above mentioned, it is quite impossible to estimate the number of the inhabitants of Paris who are thus supplied. The figures in the final resumé will show the rapid decrease in the number of water carriers between 1862 and the present time.

The System of the Water Supply of Paris.

The water supply of Paris is in the hands of a company, which bears the name of the "General Water Company." This company acts under the control of the Director General of the Water Service, and in fact its duties consist in distributing the water furnished by the city, and in collecting the water rates.

Formerly this company held a concession for the supply of water to the suburbs, since annexed to Paris ; through an arrangement with the municipal government, this concession has become the property of the city.

The company pays the whole of the receipts into the municipal treasury, which reimburses in 12 payments the sum total of the net profit realized by the company up to 31st December 1861, and 25 per cent. of the new rates, when the gross receipt shall exceed 3,600,000 francs.

The company bears certain expenses of management which are gradually decreasing, and will be extinguished in 1873.

Water Supply by means of Street Fountains ("Borne-fontaines").

The city has established 131 street fountains (taps) where inhabitants can, at will, draw water gratuitously at any hour of the day or night. There are, moreover, 580 other similar fountains where water may be gratuitously drawn during the four hours of each day that they are open for the purpose of sluicing the gutters.

Generally speaking it is the working classes who avail themselves of this gratuitous distribution of water. The quantity of water thus consumed probably does not exceed 4,000 cubic meters per day.

Distribution of the Water to the Ratepayers of the Water Company.

From a subsequent table it appears that the number of inhabitants supplied by the water company certainly exceeds 1,000,000; the quantity of water consumed daily being 106,000,000 litres, or rather more than 100 litres (equal to 22 gallons) per head.

The number of persons who obtain their water, either through the water carriers or from the free fountains, is certainly less than 825,000; the amount of water consumed by these persons is at most 6,000,000 litres a day, which gives a daily consumption per head of only just over seven litres (about a gallon and a half).

This enormous inequality in consumption is easily explained. The subscribers to the water company belong for the most part to the well-to-do classes; moreover, water to them is cheap and does not cost so much as 15 centimes the cubic meter [1½*d.* a ton], they therefore use it liberally; those who employ the water carriers pay as high a price as 5 francs the cubic meter [4*s.* 2*d.* a ton]; and those who draw their water from the free fountains have the trouble of carrying the water home. The consumption is kept within the smallest limits on account either of the expense or of the labour.

Half of the population of Paris, therefore, is abundantly supplied; the remainder, on the contrary, consuming a minimum quantity, although the city is in a position to furnish an abundant supply to all the inhabitants.

Three reasons prevent the supply of the company's water to the entire city. The first is the size of the houses and the large number of occupiers in each house. The tenant cannot get a separate supply inasmuch as the owner pays the water rate for the whole house. Many house proprietors are unwilling to bear this expense, although the water rate does not amount to one per cent. on the rent.

The cesspool system in Paris is opposed to the development of the water supply. Cesspools are in almost general use, and the proprietors of houses seek to discourage the use of water in order that these cesspools may not be filled too rapidly, as the cost of emptying is from 7 to 8 francs per cubic meter.

But the principal reason which prevents a more universal use of the company's water is the liberality of the city in allowing water to be drawn gratuitously in the public streets. The proprietors of houses in the neighbourhoods principally occupied by workmen take advantage of this liberality, and refusing to have the company's water laid on, send their tenants to the free fountains.

Evidently, if the drawing of water in the public streets were forbidden, all the houses would use the company's water, for the well water in Paris is not drinkable.

Quality of the Water.

The 106,000 cubic meters of water daily consumed in Paris are derived from the following sources :—

River water unfiltered.	Ourcq	66,000	80,800 cubic meters.	
	Seine	14,800		
Water from springs, and filtered water.	Springs of Dhuis (average)	22,000	25,200 „ „	
	„ d'Arcueil	1,000		
	Wells at Grenelle	600		
	Filtered water from the "fontaines marchandes"	1,600		
	Total	106,000	„ „	

The waters of the Ourcq and the Seine are not filtered, but in the course of three years it is hoped that the Vanne and the Dhuis aqueducts will be completed, when the daily amount of spring water will be increased to 140,000 cubic meters. These waters do not require filtration as they are fresh and clear in all seasons, and consequently pleasant to the taste.

The greater part of the ratepayers supplied from the Ourcq and Seine filter the water in their own houses. The Seine water is drawn from above Paris, and when filtered is better and more pleasant to drink than the water drawn from the Thames

above London. I have kept for a time filtered Thames water, and it very soon became undrinkable.* The water of the Seine, on the contrary, does not change. There is, however, no doubt that in a few years the water of the Seine will be completely spoiled by the increase of the factories on its banks.

The Amount of Water consumed for all purposes.

The quantity of water consumed in Paris both for private and public service had risen in 1867 to the following amount :—

River water unfiltered.	Ourcq - - -	34,971,120	
	Seine - - -	18,486,313	
	Marne - -	10,265,542	
Spring water naturally limpid.	Springs de la Dhuis -	7,904,699	
	„ du Midi - -	945,259	
	„ du Nord -	187,962	
Artesian wells.	Wells at Passy - -	3,066,000	
	„ Grenelle - -	241,775	
	Total -	76,068,671	cubic meters = to 16,742 millions of gallons.

This gives an average of 208,000 cubic metres per day.

The largest consumption took place in August, and showed an average of 228,000 cubic meters per day. It is estimated that the largest daily consumption in the summer was about 250,000 cubic meters.

The smallest monthly consumption was in February, and showed a daily mean of 196,000 cubic meters.

In 1868 the daily quantity of water can be increased 80,000 cubic meters by means of the hydraulic machines of Tribardon and D'Isles-les-Meldeuses, and in three years time another 90,000 cubic meters by the Vanne aqueduct, by which time it is expected that 420,000 cubic metres per day may be distributed in the hot weather, equal to rather less than 100,000,000 gallons.

The population of Paris being 1,825,000, the consumption of water for both public and private purposes was at the rate of 114 litres (about 25 gallons) per head per day in 1867. During the hot weather of July and August this average rose to 125, while in winter it did not exceed 107 per head.

It is estimated that a daily distribution of 420,000 cubic meters will supply a population of 2,000,000 at the liberal daily rate of 210 litres (46 gallons) per head.

Included with the water supplied for domestic purposes is the supply to 216 bath establishments and 195 lavatories.

The public water service includes the supply of the parks of the Bois-de-Boulogne, of Vincennes, of Buttes Chaumont, of Monceaux, of 15 squares in different parts of the city, of 61 monumental fountains, the watering of the streets, the sluicing of the gutters, the supply of 507 urinals, and all the public establishments and public offices which receive a gratuitous daily supply of about 8,000 cubic meters.

Hydraulic establishments of the City of Paris.

The following is a list of the conduits and of the plant employed in the water service of the city :—

Canals and aqueducts :

The Ourcq canal - - - -	96,000	metres in length.
The river Ourcq (canalled) - - -	11,000	„ „
The Dhuis aqueduct - - -	131,044	„ „
That portion of the aqueduct from Arcueil to the fortifications - - -	10,506	„ „
	248,550	metres.

* This was the case formerly, but the water usually delivered by the London companies can now be kept unchanged.—W.F.

Machines for raising Water:

Hydraulic wheels. The establishment of St. Maur, 8 wheels or turbines of	-	680 horse power.
Steam machines:		
Two machines of 50 horse power	-	100 „
The Alfort houses (two machines)	-	100 „
Austerlitz („)	-	240 „
Chaillot („)	-	350 „
Neuilly („)	-	65 „

The reserve machines at Villeneuf, of the Place de l'Ourcq, and of Ménilmontant are not included, neither are those of Auteuil and of St. Ouen, which are going to be suppressed.

During this year four hydraulic wheels, those of Tribardon and D'Isles-les-Meldeuses will give an additional force of 200 horse power; thus raising the total horse power of those engines to 1,735.

The length of the water-mains	1,300,000 meters.* (about 808 miles).
Monumental fountains	61
Public ditto	60
Fountains for the sale of water	30
Street fountains "à repoussoir"	131
Other street fountains	580
Tanks beneath the footway (?) (bouches sous trottoir)	3,465
Hose for throwing water	3,228
Posts for watering purposes (stand-pipes)	84
Water urinals	507
Water service of carriage stands	69

All the street fountains and the tanks under the footway are constantly at the disposal of the firemen, and are furnished with suitable apparatus in case of fire.

The foregoing explanations were necessary to a full comprehension of the following replies to the questions relating to the water supply of Paris:—

1*st. The number of water carriers.*

At 30 fountains for the sale of water	1862 -	1,420
	1868 -	1,029
At 60 public fountains (carriers with a yoke)	1868 (about) -	500

2*nd. The daily amount of water distributed by water carriers.*

At the fountains for the sale of water	in 1862 -	2,000 cubic meters.
	in 1868 -	1,637 „
At the public fountains	in 1868 -	600 „

3*rd. Source of water distributed by water carriers.*

The fountains for the sale of water are supplied from the Seine, and from springs; of the public fountains, 10 in the higher parts of the city are supplied from the Seine, and the other 50 in the lower parts of the city from the Ourcq.

4*th. Price of water sold to the public by the water carriers.*

At the average price of 10 centimes the 20 litres (about one penny for four gallons), the daily amount would be—

Water taken from the fountains for the sale of water	in 1862 -	10,000 francs.
	in 1868 -	8,125 „
Water from the public fountains	in 1868 -	3,000 „

* This total is only an approximation, the length of pipes laid in 1867 not having been yet ascertained; to the end of 1866 the length was 1,213,018 meters.

5th. Net profit of water carriers.

This profit arises from the difference in the price paid for the water and the price charged to customers, making an allowance for the expense of carriage. The price paid at the fountains is 10 centimes the hectolitre (100 litres, and 22 gallons), and the water is resold at 10 centimes the 20 litres by the water carriers. These carriers for the most part use a barrel and horse and cart. The water carriers, with a yoke, who draw from the public fountains, do not pay for their water.

6th. The daily amount of waters furnished to ratepayers of the water company.

Ourcq water	according to the terms of subscription	33,118	cubic meters.
	actually delivered	66,000	„ „
Seine and spring water.	according to the terms of subscription	26,676	„ „
	actually delivered	40,000	„ „

This difference between the amount subscribed for and the quantity actually consumed arises from the fact that the whole of the Ourcq water is delivered from open taps, and as regards the Seine water this mode of distribution is rapidly increasing. The subscribers avail themselves of this liberality, and consume considerably more water than they pay for.

The above figures do not include the quantity of water sold by the city of Paris in the Department of the Seine, which is—

Subscribed for	3,225	cubic meters.
Actually consumed	5,800	„

7th. Number of houses with water laid on.

On 31st December 1867 the number in the city was 30,109, and those outside, in the Department of the Seine, 2,476. The number of houses in Paris is about 60,000; therefore the number paying water rates to the City Water Company scarcely exceeds one half.

8th. The number of persons living in these ratepaying houses.

According to the census of January 1867 the population of Paris was 1,825,000. Allowing an equal distribution of inhabitants in the 60,000 houses, the 30,109 houses furnished with the company's water would show 913,000 inhabitants; but, in fact, these houses which subscribe to the Company include all the largest and those containing most inhabitants. It must be estimated, therefore, that these subscribing houses are inhabited by at least 1,000,000 persons.

9th. The number of persons supplied with water in other ways.

The number of persons supplied either through water carriers or directly from the street fountains is difficult to estimate, but is certainly less than 825,000.

The amount of water drawn directly from the Seine and from the canals is almost *nil*. Two of the railway companies, however, draw from the Seine about 2,000 cubic meters per day.

NOTE.—Dr. Vacher, in his interesting paper "Des Maladies populaires," writing of the year 1866, says that the greater part of the lifting-pumps on the Seine are below Paris; and observes that in 1865 the volume of water flowing down the Seine was reduced from its normal flow of 130 cubic metres to 26 cubic metres a second. Now the sewage of Paris, according to the estimate of Professor Dumas, is *one* metre a second; and consequently one twenty-sixth part of the water supply taken from the Seine then was sewage. One quarter of Paris obtained its water exclusively from the Seine, and there precisely in that year the ravages of cholera were most severe. It was the same in Montmartre and Batignolles; the mortality was high also at Clichy, Puteaux, and St. Denis, drinking the Seine water below Paris; while on the Seine above Paris the deaths from cholera in Alfort, Choisy, and Charenton were few. (Pages 79–80).

XI.—LETTER FROM DR. PETTENKOFER ON CHOLERA IN BAVARIA.

München, den 10ten October 1867.

Mein theurer Dr. Farr,

Von einer Ferienreise zurückgekehrt, finde ich Ihr sehr werthes Schreiben vom 5ten Septb. und beeile mich nun, es zu beantworten.

München hat verschiedene Wasserversorgung. Sie finden eine Studie hierüber, die Cholera 1854 betreffend, in meinem Buche "Verbreitungsart der Cholera," 1855, Seite 50 bis 61. Dem dort Gesagten habe ich nichts wesentlich neues beizufügen, nur meine Anschauung über den Einfluss der Isar auf den Stand der Brunnen und Quellen am linken Ufer (Seite 50, Zeile 3, von unten, "Die erste Möglichkeit anlangend," bis Seite 51, Zeile 18) habe ich geändert: meine 13 jährigen Beobachtungen ihres Standes haben mich gelehrt, dass sie viel unabhängiger davon sind, als ich damals dachte. Aus demselben Grunde kann ich den Satz Seite 55, Zeile 17 bis 19: Die Quellen des linken Isarufers liegen sämmtlich im Bereich des Wasserspiegels der Isar, wesshalb sie mit diesem steigen und fallen," nicht mehr aufrecht erhalten. Ich hatte damals noch keine Idee von den Grundwasserverhältnissen Münchens, und glaubte desshalb, was mir Ingenieure und Brunnenmeister hierüber sagten, was sich durch fortgesetzte genaue Beochachtung aber grossentheils irrig erwiesen hat.

Für den Schluss, den ich aus dem Verlauf der Cholera 1854 in München im Vergleich mit der Wasserversorgung gezogen habe, sprechen auch die Thatsachen an vielen andern Orten; es kommen die heftigsten Choleraepidemien ohne Einfluss des Trinkwassers vor (z. b. Irrenanstalt in Devon, Pfrundneranstalt in Würzburg, Irrenanstalt in Halle). Namentlich der letzte von Delbrück veröffentlichte Fall ist höchst interressant, weil in derselben Anstalt bei gleichem Wassergenusse und gleicher Kost auch das Wechselfieber vor mehreren Jahren nur die Bewohner derjenigen Abtheilung ergriff, welche 1866 ausschliesslich von Cholera ergriffen wurde.

Ich glaube nicht, dass der Einfluss des Grundwassers darin zu suchen sey, ob dieses als Trinkwasser benutzt wird, oder nicht, d. i., ob der Cholerakeim (Cholerastoff) einen längern oder kürzern Weg zu machen hat, bis er von der Oberfläche indas Grund-(Trink) Wasser gelangt. Ich glaube überhaupt nicht, dass das Wasser die Keimstätte für den eigentlichen Infectionsstoff sey—sondern ein feuchter Boden. Wenn es anders wäre und das Wasser für sich die Hauptgrundlage der Epidemien bildete, könnten sie nicht so in den örtlichen und zeitlichen Gränzen erscheinen, welche sie thatsächlich und oft in höchst auffallender Weise einhalten; es könnte, z. b., in Indien nicht die heisse und trockne Jahreszeit die Blüthezeit der Cholera seyn, sondern die heisse und nasse, zu welcher Zeit es aber gerade die geringste Cholera-giebt.

Das Verhalten der Cholera in Ostlondon 1866 ist von grossem Interesse und ich bin sehr gespannt auf die weitere Entwicklung der Forschung. Wenn auch die Wasserleitung zur Verbreitung eines wesentlichen Momentes gedient hat, so hat sich doch auch in diesem Falle der Localeinfluss (örtliche und zeitliche Disposition) in auffallender Weise geltend gemacht. Ich bin überzeugt, dass Ihre Formel über den Einfluss der Elevation auf den epidemisch ergriffenen Theil wieder ganz gut passt. Warum andere niedrig gelegene Theile (z. b. Silvertown und Northwoolwich) nicht auch ergriffen wurden, auf diese Frage steht die Antwort wieder in einem anderen Capitel.

Ich fühle in mir die volle Sicherheit, dass man in der Erkenntniss des Cholera processes keine Fortschritte mehr machen kann, wenn man die Bodenverhältnisse nicht zugleich mit dem Cholera Keim, welchen der Verkehr verbreitet, ins Auge fasst,

und erforscht, wie diese beiden Faktoren zusammenhängen. Hierüber habe ich allerdings noch gar keine bestimmte Idee. Kommt das x des Verkehrs zum y des Bodens durch die Kloaken ? kommt das y aus dem Boden zum x in die Kloaken, oder begegnen sich x und y erst in uns, um das z zu erzeugen, was uns Cholera-anfälle machen kann ? Das ist vorläufig nicht zu sagen.

Ich freue mich sehr auf fernere gütige Mittheilungen. Mit aller Hochachtung Ihr ergebenster,

PETTENKOFER.

Im letzten Heft der Zeitschrift für Biologie steht eine Arbeit von Dr. Pfeiffer über die Cholera 1866 in Thüringen, mit interessanten Resultaten.

XII.—CHOLERA IN ALBANO.

After the meeting of the International Statistical Congress at Florence was over, I proceeded in October to Rome, where I hoped to get some information about the epidemic of cholera, which had been excessively fatal, and was then subsiding. But I found that at that time nothing official had been published on the subject; and through an accident I was prevented from visiting Albano. It had been the scene of a violent outbreak, and appeared to offer facilities, within a circumscribed area, for analysing the phenomena. The medical men in Rome were most willing to supply all the information in their power; and Mr. H. Hely (himself not a medical man, but in Albano at the time,) has given a faithful picture of the fatal events which he witnessed or heard described, with such an account of the circumstances as leaves no doubt that the fatality was there, as it is in India, due to the extraordinary diffusion of the cholera matter in water, air, and food. Since Mr. Hely's paper was received the Marchese Ermenegildo de Cinque Quintili has been good enough to supply not only the statistics but also a description of the epidemic in the following interesting paper.—W. F.

CHOLERA IN ALBANO IN 1867.

Account of the Outbreak of Cholera in Albano by the Marchese Cinque Quintili.

The little town of Albano is situated about 15 miles S.E. of Rome, at an elevation of 381 metres above the level of the sea.

The most recent and authentic statistics (1853) give it a population of 6,265 inhabitants, to which we may add about 3,000 strangers, composed of the nobility and the richer citizens of the capital, who spend the summer there.

This city is situated on the southern declivity of the Alban Hills, which are portions of a cluster of lazuli mountains formed by volcanic eruptions; they are perfectly isolated in the Roman Campagna.

The Appian Way passes through the centre of the city.

The hills are formed entirely of volcanic materials of recent aerial eruption.

Large beds of basaltine lava flow from their flanks in many places; some of these reach as far as Rome, to the tomb of Cecilia Metella.

The greater part of these hills is composed of scoria, tufo or sandstone, peperino and pebbles. The stratification observed in the Alban Hills is simply the result of the stratum of rain water and of volcanic ashes. Some materials, more or less altered by the influence of the air, must of course be found, but all are of a volcanic nature, and none proceed from fluviatile or marine agencies.

The peculiar materials are puzzolana or Roman cement, calcined stones, black mica, granites, auphigima, &c. Black granites are found in abundance a few

miles further on towards Tusculum on the Hills of Grottaferrata. The waters flow down their sides in several streams, some of them very abundant, and supply the Lakes of Albano, Castel Gandolfo, and Nemi. The water is of excellent quality, but the inhabitants do not preserve the aqueducts in repair, so that the supply is insufficient. The overflow canal of the lakes is not used to fill the cisterns.

These geological conditions are by no means favourable to the development of contagious disease, because they produce ferruginous waters, and a rich vegetation.

But to neutralize these gifts of nature every precaution for preserving the purity of the air by public and private sewers has been entirely neglected, owing perhaps to an excessive confidence in the mildness of the climate and the fertility of the soil.

The historians of our city, principally desirous to record those events which participate in the past grandeur of the Roman Empire, and to expatiate on the remnants of antiquity, have neglected to register the sufferings of the unfortunate people.

However it is a fact that Albano, although decorated at a remote period with a suburban episcopal palace, in the midst of a most fertile soil, and in a position which could easily be defended, for many centuries has had a population far inferior to that of the neighbouring villages, which were also, like Albano, subject to baronial sway. Thus in 1594, an epoch comparatively modern, it only counted 730 inhabitants. From this date to our days, the inhabitants have gradually increased. In fact from the middle of the 17th century up to the approach of the Asiatic cholera amongst us, the town was never visited by war or famine, or any of those evils which counteract the increase of population. One meets, however, with indications of contagious diseases in the old chronicles of the principal towns situated on the Latin and Alban Hills, as also in the erection of churches and chapels dedicated to St. Sebastian or St. Roch, whom we Catholics venerate as special intercessors against contagious diseases. Even in Albano there is a church dedicated to God in honour of St. Roch.

The town of Albano was visited by the cholera in 1837, from the 5th of August to the 16th of September, and there fell 170 victims.

From the latest and most exact statistics, which I send you at the end of this paper, it appears that the cholera epidemic of 1867 lasted 39 days in Albano; viz. from the 6th of August to the 13th of September, a period almost equal to that of 1837. Out of 677 who were attacked by the disease 443 died, which gives to 100 attacked of each sex, 67 deaths of males, 64 of females. This proportion is increased if we reckon at least 50 individuals who died during their flight, or in the neighbouring villages and towns where they had taken refuge. In Rome alone the number amounted to 20. This number is considerable, if one remembers the small number of the inhabitants, which after the third day of the epidemic hardly amounted to 3,500 persons. The greatest proportion of deaths was amongst males, although there was a greater number of females attacked by the epidemic.

With respect to age, the disease was most fatal to children and aged persons, and the smallest number of deaths was amongst persons of from 15 to 25 years of age; their mortality was only at the rate of about 42 per cent. The greater number of those attacked by the epidemic were between 35 and 45 years of age.

Although the greater number of deaths was amongst the middle and lower classes of society, still the highest class had its many and illustrious victims.

One may, however, attribute this, perhaps, to the panic terror which seized upon every one, especially in the very beginning, when during the short period of 48 hours the deaths amounted to 125. It is a recognized fact that terror has a most powerful effect in almost every contagious disease.

There remains a weighty consideration concerning the chronological progress of the cholera at Albano, namely, its having increased suddenly from 2 cases to 63. One reasonable manner of explaining this singularity is, that there were several well-known cases of cholera in various parts of the town (but principally in the neighbourhood of St. Roch) as far back as the last week of July. These cases were concealed by the townspeople for fear of losing the profit which they drew

from the very unusual number of persons who were spending the summer there. Another element to be taken into consideration is the miasma produced from the cholera flux in a place where public and private sewers are perfectly unknown. As also the evaporations of the stagnant waters employed in the tan pits situated in the neighbourhood of St. Roch, from which there often resulted malignant and dangerous fevers at the same season in preceding years. To the foregoing may be added the unusual lowering of the temperature of the air which took place at the time, and the contempt of the commonest precautions as to food and cleanliness on the part of the inhabitants, in spite of the many warnings of the Government, as they were only a few miles distant from Rome (where the epidemic was known to have prevailed more or less for the last three months), and in continual contact with its inhabitants.

The decrease of cholera in Albano is evidently coincident with the precautions most prudently and energetically enforced by the Papal Government. In fact, immediately after the lamented death of Cardinal Louis Altieri, who fell a martyr to his zeal for the care of his flock, the Roman prelate Monsignore Achillus Appoloni was sent to Albano, invested with full authority as Extraordinary Delegate. In the first place, as prudence suggested, he set about completely extinguishing the causes which favoured and extended the contagion. To attain this object he superintended the necessary precautions in the burial of the dead, causing the graves to be made separate, about 10 hands deep, with about three hands high of earth above each grave, and also placing in immediate contact with the corpse a sufficient quantity of quicklime.

He also caused the public sewers to be covered over, destroyed all the reservoirs of putrid water and pernicious matter; he transported the tan pits far from the inhabited parts of the town, and caused the public wards and courtyards of the houses to be thoroughly cleaned out. Besides this he caused both the one and the other to be watered twice a day with sulphate of iron diluted in water. He caused the interior of the houses to be well fumigated, and fires to be lighted at sunset at the corners of the streets to purify the air.

To these general precautions the papal delegate joined the most diligent and intelligent attendance on the sick, in which he was assisted by the medical body and the different religious orders of the neighbourhood, who hastened to offer their service wherever it might be useful.

He availed himself of this opportunity to ventilate some of the narrow streets of the town, which were still built after the narrow fashion of the feudal times; throwing down houses and piercing openings towards the west so as to facilitate ventilation. He also transferred the public cemetery to a more elevated position, where it would be less prejudicial to the health of the city.

To face the expenses of these public and private improvements, as also to procure nourishment and remedies for the sick, he spent above 40,000 francs, of which the Holy Father furnished 8000 from his private purse; the remainder was furnished by the town.

According to the reports of the medical men, the symptoms of the disease in Albano were pretty similar to those observed at the same moment in Rome.

The fury with which it broke out in Albano must therefore be attributed to the causes above mentioned.

It is impossible to describe the cruelty engendered in mankind by the fear of an impending and mysterious death, especially when there is little of that habit of self-possession which usually results from a cultivated mind joined to a deep sense of religion. The moment it was announced that the cholera had broken out in Albano *all the surrounding villages and towns (of their own authority) cut off all communication with the persons and objects coming from the infected town; they even stationed armed guards to secure the observation of this precaution. They appointed commissioners, they drew sanitary cordons, and rigorously repulsed all those who sought to penetrate their villages.* In addition to all the recent investigations about the contagious nature of the cholera, it may not be useless to observe that these measures, joined also to other precautions, have effectually confined the influence of the cholera to the sole territory of Albano, thus offering a fresh proof of the very evident efficacy of the system of isolation.

It has also been practised with success on other occasions, especially in 1656 and 1657, when the Plague in Rome carried off above 14,000 victims in the sole region of Transtevere, whilst the remainder of the city was entirely free from its ravages. This result was principally owing to their having completely isolated the infected region, by walling up the gates and bridges, and severely guarding the necessary intercourse; the penalty of death was incurred by crossing the boundaries. So much rigour may seem excessive and even barbarous in this age of milder civilization, but the legislators of those days preferred the salvation of the greater number of citizens to every other consideration.

And they obtained what they sought, since Rome had only to weep for the desolation of a fourteenth portion of its population, whereas the most flourishing cities of Italy remained almost deserted.

Such are the main precautions taken during this last disastrous epidemic. The adjoined statistical Tables will exhibit the particulars.

ERMENEGILDO DI CINQUE QUINTILI,
Segretario Generale della Commissione degli Ospedali di Roma
Direttore della Statistica presso la medesima Commissione.

Roma, 20 *Febbraio* 1868.

CHRONOLOGICAL PROGRESS of the CHOLERA DEATHS in ALBANO in 1867.

DATE.	DEATHS.			DATE.	DEATHS.			DATE.	DEATHS.			DATE.	DEATHS.		
	Males.	Females.	Total.		Males.	Females.	Total.		Males.	Females.	Total.		Males.	Females.	Total.
6 August -	1	1	2	16 August -	3	5	8	26 August -	3	5	8	5 Sept. -	..	..	..
7 „ -	34	29	63	17 „ -	3	4	7	27 „ -	2	5	7	6 „ -	..	1	1
8 „ -	33	29	62	18 „ -	8	6	14	28 „ -	2	2	4	7 „ -	1	..	1
9 „ -	21	11	32	19 „ -	..	4	4	29 „ -	2	2	4	8 „ -	..	..	..
10 „ -	19	13	32	20 „ -	5	2	7	30 „ -	..	..	..	13 „ -	1	..	1
11 „ -	11	18	29	21 „ -	2	1	3	31 „ -	1	1	2	Uncertain -	5	..	5
12 „ -	16	13	29	22 „ -	7	3	10	1 Sept. -	..	..	..	Out-doors -	7	8	15
13 „ -	12	13	25	23 „ -	2	10	12	2 „ -	..	1	1				
14 „ -	8	12	20	24 „ -	5	2	7	3 „ -	..	1	1	Total -	223	220	443
15 „ -	7	8	15	25 „ -	1	10	11	4 „ -	1	..	1				

AGES of those who were ATTACKED, CURED, and DIED of CHOLERA, with the PROPORTION of DEATHS to 100 ATTACKS.

AGE.	ATTACKED.			CURED.			DIED.			DEATHS TO 100 ATTACKS.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
Under 5 Years -	24	23	47	2	1	3	22	22	44	92	96	94
5 to 10 „ -	12	17	29	2	7	9	10	10	20	83	59	69
10 to 15 „ -	15	15	30	6	11	17	9	4	13	60	27	43
15 to 25 „ -	47	37	84	25	24	49	22	13	35	47	35	42
25 to 35 „ -	46	53	99	14	16	30	32	37	69	70	70	70
35 to 45 „ -	91	68	159	30	32	62	61	36	97	67	53	61
45 to 55 „ -	41	50	91	18	13	31	23	37	60	56	74	66
55 to 65 „ -	33	49	82	7	12	19	26	37	63	79	76	77
65 to 75 „ -	21	19	40	6	6	12	15	13	28	71	68	70
75 to 85 „ -	3	12	15	..	2	2	3	10	13	100	83	87
Above 85 „ -	..	1	1	..	..	..	..	1	1	..	100	100
Total - -	333	344	677	110	124	234	223	220	443	67	64	65

The following extracts are from Mr. Hely's paper.

Albano is a mile long from the "Porta Romana" to the Carmelite convent of "La Stella." Castelgandolfo is on a hill a mile northward from Albano, Ariccia half a mile south-east, passing over the bridge of arches, which is one of the most magnificent specimens of architecture of our time. Palazzuola is a convent inhabited by Augustine hermits, also commanding the lake, and erected on part of the site once occupied by the city of Alba Longa, about two miles eastward; and the Albano Mount, or Monte Cave, due east, soars above the last-named spots.

Albano itself is almost surrounded by hills from north to south-east, and quite exposed in front from south to west; hence the coast of the Mediterranean is seen for an extent of many leagues, and the winds that blow from those two points and the intermediate naturally strike the town without the slightest impediment.

For a distance of about four miles from the town to the commencement of the plain the land is cultivated with vineyards, fruit trees, corn, maize, &c.; but immediately close under Albano are several kitchen gardens and orchards, in which all kinds of herbs and vegetables are grown for the market.

Between the limits of the town and the said orchards up to the 20th of August had been built several enormous cisterns, all supplied by the refuse of the fountains, &c. One of these cisterns served for the purposes of the public slaughter-house; two others were used to soak hides in, to prepare them for tanning, the process of which was carried on in a building contiguous to the habitations; while others were first let out for washing dirty clothes and such purposes, and after they had been full of these filthy stagnant waters for weeks were emptied, and the mass of putrefaction they contained was used by the proprietors of the above kitchen gardens for watering the vegetables and salads eaten by the inhabitants of Albano. The stench, even at a distance, was positively nauseous!

Towards the south-west, attached to the church of La Stella, at the farther extremity of the town, and close to the tomb once thought to be that of the Horatii and Curatii, but now recognized to be the sepulchre of Aruns, son of Porsenna, lies the public cemetery in a very low situation beneath the above-mentioned bridge of Ariccia, which, if it be a classical and silent spot for the dead, is certainly not beneficial to the living.

There are but two public fountains supplied with water in the whole town; one of these is placed in the most central spot, but the other is almost useless, being extremely inconveniently situated in one of the most elevated parts of Albano, the square of "S. Paolo," and supplying a very scanty quantity of water.

In the terrace of the Capuchin convent there is a small fountain of excellent water, which comes from the adjacent hills.

And in the yard of the same convent there is a capacious reservoir that receives the rain which drains from the roofs, but up to many days after the arrival of the commission sent from Rome, while the cholera was raging, it had always been kept closed, and was almost stagnant.

In the above-mentioned square, in front of the church and convent occupied by missionary monks, are to be observed several stone covers embedded in the ground, each of which encloses a supply of water belonging to the gentry and princely proprietors in Albano and in its vicinities, by which the fountains of their private villas and gardens are provided; but the public at large are excluded from the use of them.

The consequences of this penury of water are several, curious, and sad. The principal fountain already alluded to is a continual scene of laughter, strife, and fighting; in more than one instance stabbing, and even death, have occurred in this shocking drama; the fountain being always crowded with women, men, and boys, who go there with large copper recipients called "conche," containing many quarts of water, which they often knock or throw at one another's head; while at a short distance in the vicinity of "Rocca-di-Papa," on the west side of Monte Cave, there is an abundant flow of limpid water, which is allowed to go to waste among the trees of the forest and the rocks and cliffs of that picturesque wilderness, while many overtures have been made for the purchase and conveyance of it to Albano; but ill-management and selfishness on the part of persons whose

duty it is to remedy such evils, and to remove the cause of the above exposed flagrant scandals, by wisely providing for the urgent deficiency of a commodity of first necessity to society and indispensable to health, have always frustrated every attempt and every exertion made by the honest, benevolent, and conscientious few.

It has always been a source of regret and disgust to see how in some countries one of the paramount means conducive to health and comfort is lost sight of. For instance, in Albano the sewage is shockingly unheeded, and fearfully ill-managed, and there is hardly a house that has proper conveniences; but it is not only Albano, but almost all the towns in the greater portion of central Italy (not excepting Rome herself) that well deserve the severe epithet applied to her by a recent writer in a work descriptive of his travels through Italy—" sentina gentium."

When it was no longer possible to conceal the existence of the cholera in Rome, in the month of May, at the time of the concourse from every foreign region on the occasion of St. Peter's centenary, and it became evident that the disease had positively manifested itself, thousands of persons escaped from the city. Albano was chosen by many as an asylum, and the throng was so great that the houses of that town were actually crammed.

In the morning of the 3d of August the town was much excited at the report that a young maiden lately arrived from Rome had thrown herself out of the window. The fact was, that during the night she died of cholera, and to conceal the real cause of her death her body was found in the yard. Tuesday the 6th of the same month an old gardener and another person died of the same disease in the evening; but these two cases could not be concealed; in consequence, several hundreds of persons of every condition quitted the town the next morning; the most necessary shops were closed, and Albano soon became more like a desert than a gay populous town.

It was given out, and foolishly believed, that a dark cloud, in the shape of an enormous column, had appeared, and brought the cholera to Albano! I must here inform the reader that on the Sunday previous a public entertainment had been given at the small adjacent village of Ariccia, and the crowd that flocked thither was so thick that it resembled more a swollen river than a concourse of human beings.

Moreover, it is to be observed that the people in general, but the "villeggiatura" particularly, who repaired to Albano on this melancholy occasion, indulged to excess in quantity and inconsiderately in quality, at their repasts, both at table and at parties and sumptuous picnics, rashly concluding they might with impunity do at Albano what fear (if not prudence and temperance) had prevented at Rome; hence many who quitted that town on the manifestation of the disease, after having changed the air of Rome, unhealthy at that season, for the more wholesome air of Albano, died of cholera immediately on their arrival at the Eternal City.

The consequences of the above-stated concourse at Ariccia were also serious and deplorable; the throng of people, many of whom, as stated above, had just repaired to Albano from Rome, where the disease already raged, added to the intense heat of the atmosphere, and to the many causes of infection already existing in the town itself, as has been above demonstrated, could not but produce the unhappy effects we are contemplating.

The whole population was thrown into the deepest consternation by the almost incredible and sudden number of cases and deaths on the 7th, which increased every day more and more, while few out of a hundred attacked survived. This terrific scene of suffering and mortality continued for a week, when it abated sensibly, but after a slight lowering of the atmospheric temperature it recommenced with still greater fierceness, and so continued for nearly a fortnight.

As soon as the disease appeared all the authorities and officials of the town escaped or hid themselves; some thousands, partly visitors and partly inhabitants, also disappeared; the canons of the cathedral and other priests shut themselves in their houses or absconded; the monks remained in their convents; while the poor Capuchins only and three missionaries devoted themselves to the assistance and

comfort of the sick and the dying. Some of the dead bodies remained as long as six and even eight days in the houses, until a small portion of the papal Zouaves arrived from Rome, to the succour of the desolate and distressed surviving. And it may be recorded to their honour and real glory in this instance, that they gave an example of charity and devotedness seldom to be found; but which, alas! forms a melancholy contrast with * * * * Several "Sœurs-de-charitée" also flew to the holy work, and devoted themselves principally to the direction of the hospital and assistance of the infirm, with exemplary alacrity.

The Cardinal Altieri, Bishop of Albano, be it said in this instance to his perpetual encomium, manfully, and with Christian zeal, came to the comfort and to the assistance of his afflicted flock; but alas! on his way he met four priests, escaping the horrid scene of death, in a carriage, whom he obliged to retrace their steps. A few days after his arrival, shocked and grieved at finding the place thus forsaken, and likewise at the unseemly manner in which the dead were conducted to their graves, he fell a victim to his devotedness to his ecclesiastical and paternal duties, and died of cholera, leaving his flock in still greater bitterness and dismay than he had found it, lamented by the grateful, and deplored by the just.

XIII.—CHOLERA IN ROME.

July 6th, 1868. I have just received a paper by Professor Scalzi, giving the statistics of the Roman epidemic. I had an opportunity of showing in Rome the evidence in proof of the distribution of cholera matter by water in London, and I rejoice to find that Professor Scalzi has opened the subject, which certainly demands attention. Quarantine is of infinitely less importance. He describes and gives analyses of the principal waters: (1) *Acqua Vergine*, which takes its rise at Salone seven miles from the city; and from its five *castelli* including that of Trevi, the well-known Bottina di Piazza di Spagna, and others supplies the best water; (2) Acqua Felice, rising 22 miles from the city; and (3) Acqua Paolo, springing from Lago di Bracciano. The openings of the aqueduct, and the use of wells and pumps conceded to certain proprietors, he admits, put the purity of the waters, even of the Trevi, in continual peril, as they receive through those openings every kind of ordure. There can be no doubt that the waters of the Roman aqueducts are contaminated either on the gathering grounds in their course or in their distribution.

In the interest of the population of this important city the evil should be investigated fully and remedied.

The subsequent Table is supplied by Professor Scalzi:

Attacks and Deaths in Three Epidemics of Cholera in Rome.

Years.	Population.			Attacked.			Cured.			Died.			Deaths by Cholera.	
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	To 100 Attacks.	To 10,000 Inhabitants.
1837	78,606	70,217	148,823	4,444	4,928	9,372	1,893	2,060	3,953	2,551	2,868	5,419	57·22	364
1854-55	93,459	84,573	178,032	1,226	916	2,142	321	175	496	905	741	1,646	76·85	92
1865-66*	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1867	114,916	100,657	215,573	1,703	1,321	3,024	623	361	984	1,080	960	2,040	67·45	95

* No returns yet published for the Epidemic of 1865-66.

W. F.

XIV.—CHOLERA IN LONDON, 1848-49.

Extracts from Dr. Farr's Report to the Registrar-General on Cholera in England in 1848–49.

1. The Thames and the Water Supply of London.

The Thames collects the waters of 6160 square miles of country, extending from the Cotswold Hills in Gloucestershire to the eastern coast; and the great body of this water flows and reflows through London in tides, which carry the matter below London Bridge a mile and a half above Battersea Bridge twice a day, and ascend as high as Teddington. The contents of the greater part of the drains, sinks, and waterclosets of this vast city and of the 2,360,000 people on its sides are discharged through the sewers into its waters, which, scarcely sullied by the primitive inhabitants have now lost all their clearness and purity. The dark, turbid, dirty waters from half stagnant sewers are agitated by the tides, but are not purified until they reach the sea.

The Thames presents a large evaporating surface which must be taken into account, and it gives off vapours day and night in quantities which the phenomena of a "London fog" reveal. The still air then condenses the matter which at other times enters the atmosphere invisibly and escapes observation. The mean lowest night temperature of the Thames from May 27th to September 15th, 1849, was 64°; the mean lowest night temperature of the air was 52°; so that the wide simmering waters were breathing incessantly into the vast sleeping city tainted vapours, which the temperature of the air at night would not sustain.

It is a fact well worthy of attention that after the temperature of the Thames has risen above 60°, diarrhœa, summer cholera, and dysentery become prevalent, and disappear as the temperature subsides. The cholera reached London in the new epidemic form about October 1848; it prevailed through the winter and destroyed 94 lives in the second week of January, when the temperature of the Thames was 37°; it declined rapidly through April and May; the night temperature of the Thames then rose to 62° in the week ending June 2d; with some fluctuations it went up to 68° in July, and remained above 60° until the middle of September (week ending September 15th). The deaths from cholera registered during each of the 16 weeks were 9, 22, 42, 49, 124, 152, 339, 678, 783, 926, 823, 1230, 1272, 1663, 2026, 1682. The mean night temperature of the Thames fell to 56°; the deaths from cholera to 839 in the week September 16–22; the temperature gradually fell to 38° on the last week of November, when there was only *one* death from cholera registered.

The mortality from cholera increases generally in descending the river on the south side; in Wandsworth it was at the rate of 100 in 10,000 inhabitants, in Lambeth 120, St. Saviour 153, St. Olave 181, Bermondsey 161, Rotherhithe 205, where the water was perhaps most impure, Greenwich 75, where it had lost some of its impurities.

On the north side, commencing at the highest part of the river, the mortality from cholera was, in Kensington 33, Chelsea 46, Belgravia 28, Westminster 68, St. Martin-in-the-Fields 37, Strand 35, West London (on the old Fleet Ditch) 96, London City 38, East London 45, Whitechapel 64, St. George-in-the-East 42, Stepney 47, Poplar 71. The mortality from cholera in the three sub districts of Stepney, adjoining the Thames, was twice as great as in the two districts away from the river. The result is here disturbed by elevation. No good analysis has been made

of the Thames water at different points of its course ; but the matter in suspension is perhaps greatest between London Bridge and Limehouse Reach, against Rotherhithe.

The seven districts of London in which the mortality is highest from ordinary causes are the West London District (between Smithfield and the Thames), St. Saviour, Whitechapel, St. George-in-the-East, Chelsea, St. Olave, and Rotherhithe. They all adjoin the Thames.

Mr. Glaisher, of the Royal Observatory, Greenwich, was requested to make an estimate of the amount of vapour raised by evaporation from the Thames in London, and favoured the Registrar General with the subjoined statement :—

" For some years past I have made daily experiments upon the amount of water evaporated from a surface of water, and the amount exceeded 30 inches annually.

" A depth of water of fully 30 inches must evaporate from the surface of the Thames annually ; indeed the quantity must be larger than this from the circumstance of its relative high night temperature. Take it, however, at 30 inches, and we shall have—

$2{\cdot}5 \times 9 \times 4840 = 108900$ *cubic feet* evaporated in a year from an area of water of one acre.

$\frac{108900}{0{\cdot}1605} = 678505$ *gallons* of water evaporated in one year from an acre of water.

$108900 \times 2245 = 244{,}480{,}500$ cubic feet of water evaporated from a surface of 2245 acres of water in one year.

$\frac{244480500}{0{\cdot}1605} = 1{,}523{,}242{,}991$ gallons of water evaporated in one year from a surface of water of 2245 acres in extent, or more than 1523 millions of gallons. The salt water affects the water at Woolwich ; it is usually what is termed brackish there. Lieut. Sanders states that at Greenwich, at high-water spring tides, the water is frequently brackish.

" The dirt and filth in solution must be very large. The 'Dreadnought' experiments are made under my direction chiefly, and I can assure you that to read the instruments is a serious affair, owing to the filth of the waters ; on first pulling them up they are covered with a slimy adhesive mud ; they first have to be wiped, and if the wind is blowing strongly, this muddy water is blown about and over the observer. A new trunk is now being made, with a perforated copper-bottom turning downwards upon hinges, so as to get rid of the enormous deposit.

Upon Mr. Glaisher's estimate, 678,505 gallons evaporate from an acre of water in a year, which is at the rate of 1857·6 gallons daily. The bed of the Thames in London is estimated approximately at 2245 acres ; consequently 4,170,000 gallons are raised from the Thames on an average daily through the year. The quantity evaporated at low water is, perhaps, much less than this ; on the other hand the evaporation in summer is more active than in winter, and the proportion of decomposing organic matter in the water and on the banks exposed to evaporation is greater at low than at high water. Hence it is probable that in summer four million gallons, or about 18,000 tons of water, are raised from the polluted Thames daily and discharged into the atmosphere which is breathed by the inhabitants of London. It remains to determine how much of the organic matter in the water is raised with the vapour at different temperatures.

London derives its supply of water for washing, cleansing, cooking, and drinking, to a small extent from wells ; 18 districts have supplies from the River Amwell and from the Lea, a tidal tributary of the Thames ; two districts from the Ravensbourne ; and 18 districts from the Thames, at five points of its course. The water is generally pumped by steam-power into water-butts or reservoirs in the houses, at intervals of one, two, or three days. As the water is of very different degrees of impurity, it will now be right to state the fatality of cholera in the several water districts of London, arranged under the companies by which the water is furnished.

Grand Junction Company.—The *waters of the Thames at Kew* chiefly supply the sub-districts of Paddington, Hanover-square, and May Fair, and the greater part of the district of St. James Westminster. The mortality from cholera was at the rate of 8 in 10,000 inhabitants.

West Middlesex Company.—The *waters of the Thames at Hammersmith* supply Marylebone and a small part of Hampstead. The mortality from cholera was at the rate of 17 in 10,000 inhabitants in Marylebone. In Hampstead the mortality was 8 in 10,000.

Chelsea Water Company.—The *waters of the Thames at Battersea*, much below Battersea Bridge and below the Chelsea Hospital, supply the Belgrave sub-district of St. George Hanover-square, and the districts of Chelsea and Westminster. The

mortality from cholera was at the mean rate of 47 in 10,000 inhabitants; in the Belgrave sub-district the deaths from cholera were 28, in Chelsea 46, in Westminster 68 in 10,000 inhabitants.

Southwark Water Company.—The *waters of the Thames at Battersea*, still lower down the river, supply the districts of Wandsworth, St. Olave, and Bermondsey. The mortality from cholera was at the rate of 147 in 10,000. In Wandsworth the mortality was 100, in St. Olave 181, in Bermondsey 161 in 10,000.

Lambeth Water Company and Southwark Water Company.—The *waters of the Thames* between *Waterloo Bridge and the Hungerford Suspension Bridge*, supply parts of the districts of Lambeth, St. Saviour, St. George Southwark, Newington, and Camberwell; the other parts of these districts being supplied from Battersea by the Southwark Company. The mortality from cholera was at the rate of 136 in 10,000. In the district of Lambeth the mortality was 120, St. Saviour 153, St. George Southwark 164, Newington 144, Camberwell 97 in 10,000.

Southwark and East Kent Water Companies.—Rotherhithe is supplied with *water partly by the Thames at Battersea and by the Ravensbourne*, and partly from ditches and wells, into some of which the drains and cesspools soak. The mortality from cholera was at the rate of 205 in 10,000 inhabitants.

East London Water Company.—The Lea supplies the districts of Poplar, Stepney, Bethnal Green, St. George-in-the-East, and Whitechapel with water. The mortality from cholera was at the rate of 63 in 10,000 inhabitants; and 71, 47, 90, 42, and 64 in each of the five districts.

New River Water Company.—The Amwell and the Lea supply Islington, St. Luke, Clerkenwell, London City, West London, East London, Holborn, St. Giles, the Strand, St. Martin-in-the-Fields. The mean mortality from cholera was at the rate of 41 in 10,000 inhabitants; the mortality was least in Clerkenwell (19), near the head reservoir; greatest (96) in West London, on the edge of the Thames.

Kent Water Company.—The waters of the Ravensbourne supply Greenwich, where the mortality from cholera was 75 in 10,000 inhabitants; and parts of Lewisham, where the cholera was at the rate of 30 in 10,000 inhabitants.

Two or more companies supply some districts. The district of St. James Westminster is supplied by the Kew and the New River waters; the mortality from cholera was 16 in 10,000 inhabitants; Kensington is supplied by the West Middlesex, the Chelsea and the Grand Junction Companies; the mortality from cholera was 33 in 10,000. St. Pancras is supplied by the New River, Hampstead, and the West Middlesex Companies; the mortality from cholera was 22 in 10,000. Shoreditch and Hackney are supplied by the New River and the East London Companies; the mortality in the two districts from cholera was 76 and 25 in 10,000.

Arranging the groups of districts in the order of mortality, it appears that the mortality from cholera was lowest in districts which have their water chiefly from the Thames so high in its course as Hammersmith and Kew. Upon the other hand the mortality was greatest in the districts which derive their water from the Thames so low down as Battersea and the Hungerford Bridge. The districts of the New River occupy an intermediate station.

In the 6 districts which are supplied with water taken from the Thames at Kew and Hammersmith, 15 in 10,000 inhabitants died from cholera; and the mortality ranged from 8 to 33.

In the 20 districts which are supplied with water from the Amwell, the Lea, and the Ravensbourne, 48 in 10,000 inhabitants died of cholera; and the mortality ranged from 19 to 96.

In the 12 districts which are supplied with water taken from the Thames between Battersea and the Waterloo Bridge, 123 in 10,000 inhabitants died of cholera; and the mortality ranged from 28 to 205.

In the second group of districts cholera was three times as fatal; in the third eight times as fatal as it was in the first: 1, 3, and 8, express the relative virulence of the epidemic in the three conditions. The density of the population was greatest in the central group, and nearly the same in the first and third group.

LONDON. GROUP OF DISTRICTS.	Deaths from Cholera to 10,000 Persons Living.	Density of Population (Persons to an Acre).	Elevation in Feet above High-water Mark (Trinity).	Annual Value of Houses (Year ending April 5th, 1843).
				£
6 Districts supplied with Water taken from the THAMES *above* BATTERSEA - - - -	15	72	105	82
20 Districts supplied with Water from the NEW RIVER, the LEA, and the RAVENSBOURNE -	48	137	42	44
12 Districts supplied with Water taken from the THAMES, between BATTERSEA and WATERLOO BRIDGES - - -	123	73	5	31

Cholera Report, 1848–9, *pp.* lviii–lxi.

2. THEORY OF THE PROPAGATION OF CHOLERA.

Jameson, in the last page of the Supplement to his admirable "Report on Cholera in Bengal," after noticing that some of the natives placed "great faith in *boiled water* as a preventive," and that one of the principal native gentlemen of Calcutta ascribed the "singular healthiness of his numerous household to his having taken "the simple precaution of allowing no water to be drunk by them until it had been "previously boiled," adds: "*Bad water no doubt sometimes immediately induces "the disorder;* but we must not suppose it is the sole cause of it."* This is borne out by some observations in the Indian Reports, where, however, the sources of the water supply are too seldom referred to, although a popular belief prevails in many countries of India that it is the water which produces ague and remittent fever.† Dr. Barnes, who had medical charge of the district of Jessore in Bengal from 1810 to 1822, but who was absent in part of the years 1816 and 1817 when the disease assumed the epidemic character, stated in 1831 that he had there been intimately acquainted with the disease as an endemic. He had considered it from the first as a disease peculiar to that country and previously unknown, which had superseded the periodical remittent fever formerly so prevalent. If the annual storms of violent thunder, lightning, wind, and rain commenced early in March, and recurred at short intervals until the rainy season began, the hot season (April, May, June) was, he says, comparatively healthy, and conversely: if the rains broke up at the end of August, and the waters sank rapidly during September, the cholera commenced its attack at the beginning of October, carrying death and desolation among the inhabitants until the middle of December, when the disease in a short time became apparently extinct. Instead of the usual rainy and dry season, scarcely a week of 1816, in Jessore, was without rain; the sun was constantly obscured; the atmosphere close, heavy, moist; the thermometer from March to November ranging between 70° and 95°. The crowded, ill-ventilated native huts are on mounds surrounded with pits, which are the receptacles of stagnant water and of every kind of filth. Dr. Barnes asserts unhesitatingly that in these circumstances the Asiatic epidemic was generated from the *exhalations* arising from the decomposition of *animal and vegetable matter* and the *use of water in which this process was continually going on.* "These," he emphatically declares, "were the *sole cause of this disease.*"‡

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* Report on Cholera Morbus in Bengal, by James Jameson, p. 324, Supplement.

† See Bishop Heber's Indian Journal, ed. 1843, chap. xvii., p. 253. In a previous page (251) is a good description of the depressing and degrading effects of malaria on man.

‡ Letter addressed to Dr. Roupell, Dr. Babington, H. Field, Esq., and J. Ridout, Esq., members of the London Board of Health, dated Nov. 12, 1831, published in M'Culloch and Maclaren on Cholera, pp. 26–35, 1850.

"In the autumn of 1849, Dr. Brittain and Dr. Swayne, of Bristol, considered "that they had discovered the cause of cholera in a *minute fungus;* and Dr. W. "Budd, of the same city, met with the supposed fungus in various specimens of "water used as drink, in places where the cholera was very prevalent."* Upon further investigation the supposed fungi were, by experienced microscopists, pronounced to be other matters; and after the able Report of the Committee of the London College of Physicians, the hypothesis was generally abandoned.

Dr. Snow, in a paper dated Aug. 29, 1849, advanced a theory of the pathology of cholera; and it is in many respects the most important theory that has yet been propounded. Dr. Snow, after endeavouring in a subsequent paper to show that the disease is propagated by human intercourse, and that it is a local affection of the alimentary canal, thus states his doctrine:—

"The induction from these data is that the disease must be caused by something which passes from the mucous membrane of the alimentary canal of one patient to that of the other, which it can only do by being swallowed; and as the disease grows in a community by what it feeds upon, attacking a few people in a town first, and then becoming more prevalent, it is clear that the cholera poison must multiply itself by a kind of growth, changing surrounding materials to its own nature like any other morbid poison; this increase is the cause of the *materies morbi* of cholera taking place in the alimentary canal.

"The instances in which minute quantities of the ejections and dejections of cholera patients must be swallowed are sufficiently numerous to account for the spread of the disease; and on examination it is found to spread most where the facilities for this mode of communication are greatest. Nothing has been found to favour the extension of cholera more than want of personal cleanliness, whether arising from habit or scarcity of water, although the circumstance hitherto remained unexplained. The bed-linen nearly always becomes wetted by the cholera evacuations, and as these are devoid of the usual colour and odour, the hands of persons waiting on the patient become soiled, and unless these persons are scrupulously cleanly in their habits, and wash their hands upon taking food, they must accidentally swallow some of the excretion, and leave some on the food they handle or prepare, which has to be eaten by the rest of the family, who, amongst the working classes, often have to take their meals in the sick room. Hence the thousands of instances in which, amongst this class of the population, a case of cholera in one member of the family is followed by other cases; whilst medical men and others, who merely visit the patients, generally escape.

"With only the means of communication which we have been considering, the cholera would be constrained to confine itself chiefly to poor and crowded dwellings, and would be continually liable to die out accidentally in a place for want of the opportunity to reach fresh victims; but there is often a way open for it to extend itself more widely, and that is by the mixture of the cholera evacuations with the water used for drinking and culinary purposes, either by permeating the ground and getting into wells, or by running along channels and sewers into the rivers."†

Dr. Lloyd, on Aug. 30, 1849, at a meeting of the South London Medical Society, adduced instances of the great mortality from cholera, of people living in Silver-street and Charlotte-place, Rotherhithe, who got their water from a well and a ditch into which the privies discharged their contents. The disease was much more fatal in the parts of Rotherhithe where ditch-water was used than it was in places which had their supply from the waterworks. Dr. Snow has collected examples in the South London districts where the water, being derived from deep wells, few cases of cholera occurred; and other instances of a great fatality among people living in houses, such as those in Wandsworth-road, where the contents of the waterclosets found their way into the water. He shows, from a communication by Dr. Shapter, that in 1832 Exeter was supplied with water taken from the streams of the Exe, into which the sewers emptied them-

* Dr. Snow on Cholera, paper read at the Epidemiological Society. 1851.

† "On the Pathology and Mode of Communication of Cholera," by John Snow, M.D. (Paper reprinted from the London Medical Gazette, pp. 2, 3).

selves; and that subsequently waterworks were established on the river, two miles above the town, and more than two miles above the tidal range. In three months of 1832 cholera destroyed 347 lives in Exeter; in 1849 it was only fatal to 44 persons, many of them strangers, who died within three days of their arrival. An opposite instance is afforded by Hull, which in 1832 was scantily supplied with water from springs at Anlaby, three miles distant. About seven years since waterworks were established on the River Hull, two miles and three-quarters above its confluence with the Humber, and afford the town a plentiful supply. But half the sewage of the town is delivered into the waters of the River Hull, half into the Humber; the tide flows up the river many miles past the waterworks, and carries with it the contaminated liquids of the sewers. In 1832 the cholera was confined almost exclusively to the poor, and the deaths amounted to about 300; in 1849 the deaths were 1178, and occurred among all classes of persons.* Negative and positive instances in other towns are cited by Dr. Snow; and in their Reports to the Board of Health by Dr. Sutherland and Mr. Grainger.

Dr. Snow's theory of the propagation of Asiatic cholera in London is very simple. The cholera matter was brought to London by patients from Hamburgh; it was multiplied in the intestines of infected people until the disease spread in this way all over the metropolis. It necessarily implies that the rice-water discharges of the cholera patients may, under the present system of water-supply, be distributed unchanged to nearly every house in London where water is used for drink, ablution, and washing. Dr. Snow is unfortunately able to show that this excremental distribution, almost too revolting and disgusting to write or read, is possible to a very considerable extent.† The sewers of London run into the Thames and the Lea, from which a part of the water-supply is derived. The water, which the inhabitants of London have but the repulsive alternative to discuss in words or to use in fact, is, however, baled from the ditches only by the wretched inhabitants of such parts as Jacob's Island. It is in one case, before distribution, pumped up to a distant reservoir at Brixton; in other cases it is taken higher up the rivers, largely diluted, or beyond the reach of any but casual contamination; filtration is employed; chemical action, as the chemists on behalf of their wealthy clients tell us, is incessantly going on, and converting impurities into simple elements; so that it is only in some places, or in rare circumstances, that the organic waste can reach and injure the people. Still, in this mitigated form, the risk is too tremendous to be incurred by two millions and a half of the people, who require and can obtain an abundance of sweet water.

The supply of Paris is from various sources, but four-fifths of the water is from the Canal de l'Ourque, which, by the decision of Napoleon, was also appropriated to navigation. The water for some years, and in 1832, when the first epidemic was so fatal, was drawn from the dirty basin in which the boats and barges of the canals rested; but is now drawn from the canal before it enters the basin. The water in the Regent's Canal round London and in the Cumberland Basin, Regent's-park, present a pretty faithful image of the waters of the Canal de l'Ourque, which flow from the fountains and supply the wants of the Parisians. The water in the Cumberland Basin is described by Dr. Milroy as "in a most offensive state, and "indeed no better than that of a stagnant putrid ditch; and a great deal of "choleraic disease prevailed among the men who were employed in the barges, "and most of the families living in the houses on the wharves were more or less "affected."‡ The mortality of cholera in Paris was excessive, and in 1832 varied from 80 of 10,000 inhabitants in the elegant Chaussee d'Antin and in Montmartre on the heights, to 530 and 520 in the low Quartiers of the Hôtel de Ville and the Cité.§ The experience of Paris then, as well as of many of our own towns, lends some countenance to Dr. Snow's theory.

Cholera Report, 1848–9, *pp.* lxxvi—lxxviii.

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* Dr. Snow, pp. 7, 8. The numbers of deaths in 1849 are from the present returns.

† "On the communication of cholera," by J. Snow, M.D., pp. 23–26.

‡ Report of General Board of Health on Cholera, p. 48.

§ Etudes sur la Ville de Paris, par Horace Say, pp. 384–422, 481, and maps. And Rapport du Choléra dans Paris, 1834.

3. The Zymotic Principle of Cholera.

It may, I think, be admitted that the disease Asiatic cholera is induced in man by a certain specific matter, and as it has been proposed to call the matter varioline which causes small-pox, so *cholrine* may designate the zymotic principle of cholera. A variety of that matter was produced in India in certain unfavourable circumstances; it had the property of propagating and multiplying itself in air, or water, or food, and of destroying men by producing in successive attacks the series of phenomena which constitute Asiatic cholera.

That *cholrine* is an organic matter cannot, I think, be doubted by those who have studied the whole of its phenomena and the general laws of zymotic disease. The great questions remain — Is cholrine produced in the human organization alone and propagated by excreted matter? Is it produced and propagated in dead animal or vegetable matter or mixed infusions of excreta and other matter out of the body? Is it propagated through water, through air, through contact, or through all these channels?

Observations sufficiently exact to decide these questions definitively have yet to be made and discussed on the principles of probability. The decisive facts cannot be investigated by experiments in which human life may be exposed to risk. They must be carefully looked for and noted by good observers. Conflicting theories serve, among other purposes, to direct the attention of observers to important points which they may otherwise neglect. *Cholera Report*, 1848–9, *p.* lxxx.

4. Precautions against Cholera in regard to Water.

The precautions to take against cholera, in regard to *water*, are well stated by Dr. Snow; and they are of so simple a nature that, considering all the facts, no person can prudently neglect them.*

(*a.*) Water into which sewers flow, or which is navigated by persons living in boats, or which is any other way contaminated by the contents of drains or cesspools, should be entirely disused.

[To warn any class of men against the use of unclean excremental water, even filtered, may appear useless. But it is now known that it enters into the supply of some of the principal cities of Europe and contaminates the *eau sucrée* of Paris as well as the house water of London. The disagreeable revolting nature of this truth has probably been a cause of its suppression, and the consequent perpetuation of an insufferable nuisance.]

(*b.*) Hand-basins and towels, with sufficient water, should always be in readiness in the sick person's room, where everyone should observe strict cleanliness; nurses and other people should invariably wash their hands before touching food.

(*c.*) The healthy should be separated from the sick, and be removed to another abode when they have no place but the sick-room in which to prepare and take their meals.

(*d.*) Soiled linen should be immersed in water until it can be scalded and washed; for if it should become dry the matter might be wafted about in the form of dust. [The washing of the linen of cholera patients in the ordinary way is apparently not unattended with danger.]

The sanitary value of pure water, as well as the danger of habitually using water holding organic matter of any sort in solution, has been known from the earliest period. Instinct and science hallow springs and streams of living water. It is a difficult engineering task to place an adequate supply of fresh water within the reach of every householder in the large towns; but the task is of such vital importance that it cannot be neglected, and the mission of bringing it within the range of the municipal institutions of London, Paris, and every city, is too beneficent to be overlooked by statesmen. The quality of the best water is only to be discovered by experience; and may be learnt with sufficient accuracy from analyses of the waters of the salubrious fields. *Cholera Report*, 1848–9, *pp.* ci–cii.

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* Slightly altered from Paper on Cholera, by J. Snow, M.D., p. 23; read May 5, June 2, 1851, before the Epidemiological Society.

XV.—CHOLERA IN LONDON, 1853-54.

Extract from Dr. Farr's Letter to the Registrar General on the Cholera Epidemic of 1853–54.

1. Impure Water.

Independently of any regard to theory, it appeared to be desirable to determine the effects of the different waters on the population of London during the impending cholera epidemic; accordingly the following circular was addressed by Mr. Mann to the Secretaries of the several Water Companies :—

Sir, General Register Office, 13th October 1853.

The Registrar General will feel obliged if you will answer the accompanying inquiries for the public information.

I have the honour to be, Sir,
Your obedient servant,
(Signed) T. Mann.

To the Secretary of_____Water Company.

1. What is the source from which the Water Company obtains the water for the supply of the London districts? If wholly or partly from a river or running stream, state at what point the supply is taken.
2. Is it the same as it was in 1849?
3. Are the methods of filtration and purification the same as those in use in 1849?
4. Is the area of supply the same?
5. If any changes have been made in either of the above particulars, what are the date and nature of those changes?
6. If any change is contemplated in the existing arrangements, what is its nature, and when is it likely to come into operation?

A detailed abstract of the answers of the secretaries was published in a supplement to the Weekly Return, No. 47., November 19th, 1853; and the general result was thus summed up :—

From the returns received from the Water Companies it appears that cholera finds London, as regards water, in the situation in which it left it. This holds true with reference to all except the Lambeth Waterworks Company, who changed their source of supply nearly two years ago from Lambeth to Thames Ditton; and from a Table subjoined it will be seen that the results of the present epidemic in the districts supplied by that company, as compared with some others, are rather more satisfactory than they were in 1849, an improvement which, it is hoped, in the further course of events will be maintained. But new works undertaken by other companies in accordance with recent legislation are in progress. The return of cholera at an earlier period than was anticipated furnishes a motive for increased activity in their operations. With capital, public spirit, and natural advantages of locality, London may enjoy a pure and copious supply of this first necessary of life, as well as country towns and villages, and more than some towns with municipal institutions where the burgesses are too idle, or too busy, or too poor to bring it from surrounding springs to their doors. Manchester has set a good example, and it is only necessary that the national intelligence should be generally awakened to the question, for this great end—a good water supply—to be accomplished both in town and country.

Water Companies.	Sources of Supply.	Aggregate of Districts supplied chiefly by the respective Water Companies.			Deaths to 100,000 Inhabitants.
		Elevation in feet above Trinity High-water Mark.	Population enumerated 1851.	Deaths from Cholera in 12 Weeks ending Nov. 12, 1853.	
London - - -	- - - - - - - - -	39	2,362,236	626	27
Hampstead and New River.	Springs at Hampstead and Kenwood, two artesian wells, and New River.	80	166,956	6	4
New River - - -	At Chadwell Springs in Hertfordshire, from River Lee, and four wells in Middlesex and Herts.	76	634,468	50	8
Grand Junction - -	The Thames, 360 yards above Kew Bridge.	38	109,636	14	13
Chelsea - - - -	The Thames, at Battersea - -	7	122,147	22	18
Kent - - - - -	The Ravensbourne, in Kent -	18	134,200	27	20
West Middlesex - -	The Thames, at Barnes - -	72	277,700	72	26
East London - -	The River Lee, at Lee Bridge -	26	434,694	124	29
Lambeth and Southwark.	The Thames, at Thames Ditton and at Battersea.	1	346,363	193	56
Southwark - - -	The Thames, at Battersea - -	8	118,267	100	85
Southwark and Kent -	The Thames, at Battersea, the Ravensbourne in Kent, and ditches and wells.	—	17,805	18	101

It is believed that through nearly the whole of this Table the impurity of the waters with which the inhabitants of the several districts are supplied is in nearly a direct proportion to the mortality from cholera.

The water at St. Thomas's Hospital is thus described by Dr. R. Dundas Thomson, the Professor of Chemistry :—

The water as delivered at the pipe in the Laboratory of St. Thomas's Hospital on the 11th November was quite turbid, as it usually is, and contained diffused through it 1·16 grains of vegetable matter, dried at a steam heat, consisting principally of silica, the chief constituent of the shields of the lower class of plants. But as in its moist state it contained at least two thirds of its weight of water, we cannot estimate the filth in the water, which could be removed by filtration, at less than 3½ grains per gallon.

The influence of the water became more evident; and was discussed in the supplement to the Weekly Return (December 3d, 1853), from which the following Table is taken :—

MORTALITY FROM CHOLERA IN DISTRICTS SUPPLIED BY DIFFERENT WATER COMPANIES.

Water Companies.	Sources of Supply.	Aggregate of Districts supplied chiefly by the respective Water Companies.			Deaths to 100,000 Inhabitants.
		Elevation in feet above Trinity High-water Mark.	Population enumerated 1851.	Deaths from Cholera in 14 Weeks ending Nov. 26, 1853.	
LONDON - - - - - - - - - -		39	2,362,236	744	32
* (1) Hampstead and (2) New River.	Springs at Hampstead and Kenwood, two artesian wells, and New River.	80	166,956	8	5
New River - - -	At Chadwell Springs in Hertfordshire, from River Lee, and four wells in Middlesex, and Herts.	76	634,468	56	9
Grand Junction - -	The Thames, 360 yards above Kew Bridge.	38	109,636	16	15
Chelsea - - - -	The Thames, at Battersea - -	7	122,147	22	18
Kent - - - -	The Ravensbourne, in Kent -	18	134,200	31	23
West Middlesex - -	The Thames, at Barnes - -	72	277,700	89	32
East London - - -	The River Lee, at Lee Bridge -	26	434,694	162	37
* (1) Lambeth and (2) Southwark.	The Thames, at Thames Ditton and at Battersea.	1	346,363	220	64
Southwark - - -	The Thames, at Battersea -	8	118,267	121	102
* (1) Southwark and (2) Kent.	The Thames, at Battersea, the Ravensbourne in Kent, and ditches and wells.	—	17,805	19	107

* In three cases (marked with an asterisk) the same districts are supplied by two companies.

After correcting the above Table and the tables of cholera 1848–49, for the effects of elevation, it is found that a large residual mortality remains, which is fairly referable to the impurity of the water; for it is least where the water is known to be sweetest, greatest where the water is known to be the most impure.

After the great loss of life in 1849, and the patient investigations of two able committees of the House of Commons, the present water companies were left in the undisturbed possession of the monopoly, which they enjoy, of selling the people of London water. In the present state of engineering and sanatory science, purer waters from gathering grounds, or from springs, could probably be procured, and be supplied at cheaper rates by new companies, or by the incorporated ratepayers. But this would disturb the values of large masses of invested capital. To avoid such a result, always undesirable, the supply is left in the hands of the existing companies; but by Act of Parliament they are prohibited from obtaining supplies from the tidal waters of the Thames and Lee, after certain fixed dates.

It is enacted, that it shall not be lawful "after those dates" to distribute the pernicious waters over London. It unfortunately happens that in the invasion of cholera with which we are threatened next year (1854), every parish, except those which the Lambeth Company supplies, may receive waters as bad as those of 1849 without a direct violation of the Act of Parliament.

But the Water Companies will do well to bear in mind that the dates in the Act are the extreme limits of time beyond which they can supply London with impure water without a direct violation of the law. They may complete the works in half the time. They can accelerate their progress. And the returns which they have furnished will enable us to appreciate their zeal and spirit in the public service under an extraordinary emergency.

Instead of the distant dates of 31st August 1855, 1856, and 1857, which were fixed when the return of cholera was not contemplated, the companies should aim at supplying London with the water which they are then bound to furnish, at a date not later than the first of July 1854. This would probably be the means of saving thousands of lives, and entitle the directors to the public gratitude.

Dates after which it will not be "lawful" for the Water Companies to supply waters from the same sources, or of the same quality, as at present (1853), to the inhabitants of London:

New River - - - -	30th June 1857.
Grand Junction - - -	31st August 1855.
Chelsea - - - - -	31st August 1856.
West Middlesex - - -	31st August 1855.
East London - - - -	August 1856.
Southwark - - - - -	31st August 1855.

The Grand Junction and the Southwark Companies state that they propose to complete their works in 1854, a year before the limit prescribed by the Legislature.

The cholera broke out again in 1854: the effects of the bad water were watched during the epidemic; and the general results of a special inquiry are thus described in the Weekly Return (October 14th, 1854).

INFLUENCE of the WATERS of LONDON on the MORTALITY of CHOLERA.

The present epidemic of cholera in London presents a favourable opportunity for determining the influence of waters of various degrees of impurity on the mortality of cholera.

The Lambeth Company, which in 1849 took up its supply from the Thames at the part where the water is most impure, has since January 1852 drawn its water from the Thames above the tidal flow, and has thus afforded an opportunity for ascertaining the effects of this great improvement.

It was observed in the first eruption (1853) of the present epidemic that the mortality was diminished in districts which were partially supplied by that company.

On October 13th, 1853, a circular had been sent to the London Water Companies, and the replies of all, except the Lambeth Company, showed that their new works and improvements had not then been carried out, as they were only bound under the Act of Parliament to complete them in 1855, 1856, or 1857.*

The Southwark Company, which now supplies the most impure water stated, however, that though the Act "allowed three years from August 1852 for the execution of the new works, the contracts for the whole having been made immediately after the passing of the Act, and *being now* [October] *in a rapid course of fulfilment, the works will be completed and in operation one year within the time it prescribes*," that is in September 1854.

The hopes of the Company, notwithstanding their efforts on the approach of cholera, were defeated, the officers informed Lord Palmerston, by a concurrence of various causes, and the impure water of the Thames is still supplied by this Company.

Bermondsey, one of the south districts of London, is exclusively supplied with the impure water, and the deaths by cholera are already more numerous than they were in 1849, while in the parish of Lambeth, which is supplied partly by the Southwark Company, and partly by the Lambeth Company, the mortality is much lower than it was in 1849.

DEATHS from CHOLERA.

Districts.	In the year 1849.	In the 14 weeks ending 14th Oct. 1854.
Bermondsey	734	829
Lambeth	1,618	904

But the pipes of the two Companies which were once in active competition often run down the same streets, and through the same sub-districts, so that alternate streets or houses in the same sub-districts are supplied with the pure and the impure waters.

Dr. Snow, who has devoted much time to the investigation, having procured from this office the addresses of the persons who died of cholera in Kennington and some other sub-districts, states, as the result of an inquiry from house to house where the pipes of the Lambeth Water Company are intimately mixed with those of the Southwark Company, that, in the 7 weeks ending August 26th, of 600 deaths from cholera, 475 have happened in houses supplied by the Southwark Company; 89 in houses supplied by the Lambeth Company; 13 in houses supplied by pumps, wells, and springs; 8 in houses which derived their water directly from the Thames and from ditches.

The Registrars on the south side of London were instructed to inquire, in all cases of death by cholera, whether the house in which the patient was attacked was supplied by the Southwark, the Lambeth, or the Kent Companies, or with water from pumps, wells, ditches, or other sources. The inquiry was attended with considerable difficulty, as the information could not be obtained from hospitals or workhouses, and the informants and the householders themselves were often ignorant of the source of supply, as the water rate in the worst districts is paid by the landlord. The information was thus not obtained in 766 out of 3805 instances; but it was stated that in 3039 instances 2284 deaths occurred in houses supplied with the impure Thames water, 294 in the houses supplied by the Lambeth Company with the purer filtered Thames water. The disparity was observed week after week in the progress of the epidemic.

The total number of houses supplied by the Southwark Company is stated to be 40,046; by the Lambeth Company to be 26,107; consequently there were in 6 weeks 57 deaths in every 1000 houses supplied with impure water, and 11 in every 1000 supplied with the less impure or comparatively pure water.

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* The Secretary of the East London Water Company in August 1854 wrote thus to Viscount Palmerston:—"In reply to your Lordship's inquiry, what steps have been taken by the East London Waterworks Company to effect a remedy in regard to the water supplied by them, I am instructed to state that the Company has already expended 150,000*l.* in effecting improvements; the supply has, for two months past, been taken through a newly constructed aqueduct, from a point in the valley of the Lee, nearly three miles higher up than formerly; the sewage of the valley, so far as it can effect the purity of this Company's supply, has been diverted by an intercepting drain, and the whole of the water delivered is filtered. Further works are also in progress."

MORTALITY by CHOLERA in the SOUTH DISTRICTS of LONDON during the Six Weeks—August 28 to October 7, 1854.

———	Inhabited Houses.	Population enumerated 1851.	Deaths from Cholera.	Mortality to every 100,000 Inhabitants.	Mortality to every 1,000 Houses.
South Districts of London	92,654	616,635	3,805	617	41

DEATHS by CHOLERA in SIX WEEKS in the Houses of the SOUTH DISTRICTS of LONDON supplied with Water from various Sources.

Week ending	Number of Houses supplied with Water by					
	The Southwark Company.	The Kent Company.	The Lambeth Company.	Pumps, Wells, and other Sources.	Unascertained Sources.	Total.
September 2 - -	399	38	45	72	116	670
September 9 - -	580	45	72	62	213	972
September 16 - -	524	48	66	44	174	856
September 23 - -	432	28	72	62	130	724
September 30 - -	228	19	25	24	87	383
October 7 - - -	121	10	14	9	46	200
	2,284	188	294	273	766	3,805

INFLUENCE of the WATER SUPPLY on the MORTALITY from CHOLERA in the SOUTH DISTRICTS of LONDON during the Six Weeks from August 28th to October 7th, 1854.

Water Company.	Source of Supply.	Houses supplied.	Estimated Population of the Houses supplied.	Deaths registered by Cholera in Houses.	Mortality to every 100,000 Inhabitants.	Mortality to every 1,000 Houses.
Southwark Company -	The Thames, at Battersea.	40,046*	266,516	2,284	857	57
Lambeth Company -	The Thames, at Thames Ditton.	26,107	173,748	294	169	11
Kent Company - -	The Ravensbourne -	14,594	97,127	188	194	13

* There are, *exclusive* of this number, 634 consumers, viz., railways, distilleries, road watering, fires, flushing sewers, and trades generally, averaging per day 2366 gallons. (See Parliamentary Return, "Metropolis Water," dated 26th July 1854, No. 415.)

Note.—The sources of water supply was not ascertained in 766 instances. The water was said to be derived from pumps, wells, rivers, and other sources in 273 instances.

At the close of the epidemic the results of the observations on the water were finally summed up in the Weekly Return, December 9th, 1854.

The deaths of 26,088 people in London, out of two millions and a half, living in 135 sub-districts at elevations rising from 3 feet below to 350 feet above the high-water mark of the Thames, have shown how much more fatal the cholera is on low ground than it is on ground of a moderate elevation.

It has been calculated that more than four million gallons of water evaporate daily from the Thames in its course through London; and besides the supply from wells, pumps, and streams, nine water companies in their returns state that they pumped on an average 60,614,420 gallons of water into 302,428 houses and a certain number of manufactories daily, during the year 1853. The water that flows through the houses and streets daily is probably double the weight of the population. It is pumped at intervals into reservoirs until it is withdrawn for cooking, for cleansing, for washing linen, for ablution, and in some cases for drink by the people. It thus comes into contact with the body in many ways and it gives off incessantly at its temperature, ranging from the freezing point to summer heat, vapors and effluvia into the atmosphere that is breathed in every room; while the residue is discharged to carry the dirt of the houses and the town-guano of the waterclosets into the sewers and the Thames.

A certain portion of the water of London is drawn by the New River Company from distant springs and wells in the basin of the Lee river, which is a tributary of the Thames; but a large quantity of the water of this company, as well as the whole of the water of the East London Company is drawn from the Lee lower down its channel. The Lambeth Company draws its water from the Thames at Ditton above the tidal range, but the Grand Junction at Kew, the West Middlesex at Hammersmith, and still lower down at Battersea, the Chelsea and the Southwark Companies draw up their water from a part where the Thames is now evidently contaminated by the sewers which discharge the drainage of the population into the river. The temperature of the water of the Thames ranged from 60° to 70° during the cholera epidemics, and the chemical composition and changes of the matters in its waters undoubtedly varied to a great extent; but the microscope and chemical analysis have confirmed the evidence of the senses, in showing that the water which the Chelsea and the Southwark Companies draw at Battersea contains the greatest quantity of organic matter; that it is the most impure; and that fragments of the muscular fibre of food exist in the Southwark water. The other waters are of a better quality.

The mortality from cholera in the sub-districts of London is shown under two aspects; thus, the mean mortality of the districts wholly or partially supplied by the New River Company in the two epidemics was at the rate of 15, 28, 28, 46, and 70 in every 10,000 living on the successive terraces of elevation; and the mortality in the sub-districts that are supplied by other companies at corresponding elevations is found to differ from this scale, some in excess, others in defect.

In the supply by all the companies extensive improvements are projected, and in some cases have been partially carried out. The New River Company states in reply to an inquiry, that "works have been since June in operation to prevent sewage from Waltham, Ponder's-end, and Tottenham running into the river Lea, which before affected the pumping station at Tottenham." On the terrace of 60 to 80 feet elevation, containing Berwick street, the cholera was more fatal (30) in 1854 than it was in 1849 when it was 25; but on the other elevations the mortality from cholera was less than it was before, in the proportion of 18, 42, 72, and 73, in 1849; and 11, 14, 19, and 67 in 1854, to every 10,000 inhabitants, at the respective elevations, supplied with water by the New River. A similar decrease is observed in the mortality of the sub-districts supplied by the East London Company, which has latterly drawn its water three miles higher up the River Lea, than it did in 1849.

The sub-districts that were supplied by the Grand Junction and by the West Middlesex Companies suffered much less from cholera in 1849 than the sub-districts of the New River and the East London; but in 1854 the mortality increased in the districts of the two former companies, and in all the districts that derive their water from the Thames, which from Kew down to Battersea and Chelsea has every year for the last five years received an increased quantity of town sewage.

The Lambeth Company has in the interval between the two epidemics changed the source of its supply from Hungerford Bridge to Thames Ditton, where the river is unpolluted by the London sewage; but the pipes of this company run into the same districts as those of the Southwark Company, against which it was at one time in active competition, so that a special method of inquiry must be here resorted to. The Tables 1. and 2. only show that the sub-districts that were supplied wholly or partially with the impurest Thames water experienced a high and extraordinary mortality from cholera in 1849, and again in 1854.

The region of London south of the Thames is divided into 11 large districts, comprising 42 sub-districts, which extend from Putney in the west to Woolwich in the east,—from the large tract of low ground along the Thames to the heights of Norwood and Sydenham. Many houses in every district derive their water supply from wells, pumps, and tidal ditches; in addition to these sources Bermondsey, St. Olave, and Wandsworth are supplied almost exclusively by the Southwark Company; the Greenwich and the Lewisham districts chiefly by the Kent Company; in the streets of the other districts the pipes of the Lambeth and Southwark Company—the one supplying water comparatively pure, the other impure—are so intermingled that neither the informants nor the Registrars knew in 823 cases out of 4,059 whether the house in which the death from cholera occurred obtained its water from the Lambeth, Southwark, or the Kent Company. The officers of the latter company themselves have stated that they experience almost insuperable difficulties in distinguishing the houses which they supply in every street. It is therefore evident, that in the general character of the houses, the means of the householders, the density of the population, and the elevation of their dwellings, the difference is not considerable. The water supply is the chief element in which there is an evident difference; one class of houses is now supplied by water from Ditton, the other by water which the Southwark Company draws from Battersea, where the Thames is contaminated by the London sewage. And what is the result?

In the 26,107 houses that derived the water from Ditton 313 deaths from cholera occurred in ten weeks; in the 40,046 houses that received the impure water from Battersea 2,443 persons it was ascertained died from cholera in the same time. The deaths in the latter districts exceeded by nearly 2000 the deaths that would have occurred if cholera had only been as fatal as it was in the houses that derived their water from Ditton. The Registrars were probably in some cases misinformed, but there is reason to believe that no undue proportion of the deaths is referred to houses that the Southwark Company supplies.

The deaths are given in Table 3. as they were returned by the Registrars in the eleven districts; and it will be observed, that the balance of mortality is heaviest in every district against the impure water, to an extent that leaves little room for doubt on the mind.

Thus in *St. Saviour* Southwark, 280 of the deaths by cholera were in houses supplied by the Battersea water, 59 in houses supplied with the Ditton water. In the week ending September 2d the

proportions were 58 to 11; in the week ending October 14th they were 9 to 1. In *St. Olave*, containing the hospitals, and in Bermondsey, an undue proportion is perhaps referred to Southwark, as the Registrars notice no cases in houses that derived water from wells and ditches. In *St. George* Southwark 254 persons died of cholera in houses that were supplied with water from Battersea, 79 in houses that were supplied with water from Ditton; the proportions were 303 to 47 in Newington, 349 to 95 in Lambeth, 206 to 6 in Wandsworth and Clapham, 167 to 24 in Camberwell; and so the proportions ran week after week. And it will be observed that in Bermondsey, which is not entered by the Lambeth Company, 734 persons died by cholera in 1849, and 846 in 17 weeks of 1854; while in Lambeth, which was wholly supplied with impure water in 1849, the deaths in that year by cholera were 1618, while in 17 weeks of 1854, when it was partially supplied with a comparatively purer water, the deaths by cholera were only 935; of which about four fifths were in houses that received impure water.

Works are now in progress for procuring better water for Southwark and for the rest of London; and the salutary effects of the changes that have been already wrought justify us in anticipating that when London is well drained, and when the water companies supply London with the cool, pure, refreshing water of the streams from the high grounds of Middlesex, Hertford, and Surrey on the system of constant supply, the health of the metropolis will be improved, and under wise medical arrangements the devastations of cholera, if they recur, will be no longer terrible.

TABLE of DEATHS from CHOLERA in the Eleven Districts of LONDON on the SOUTH SIDE of the Thames, distinguishing the Deaths in Houses supplied with Water by Three Water Companies, or by Wells, Pumps, &c.

DISTRICTS.	Signatures of Companies by which the water is chiefly supplied.	DEATHS from CHOLERA.		Of the Deaths from Cholera in 17 Weeks of 1854 it was found by inquiry in 10 Weeks that the subjoined numbers occurred in Houses of which the Water Supply was inquired into.					
				TOTAL DEATHS investigated in 1854.	Deaths in Houses supplied with Water by—				
		1849 (Year).	1854 (17 Weeks).		Southwark Company.	Lambeth Company.	Kent Company.	Wells, Pumps, Rivers, and other Sources.	Source of Supply unascertained.
St. Saviour, Southwark	S. L.	539	491	341	280	59	—	—	2
St. Olave, Southwark	S.	349	313	209	186	—	—	?	23
Bermondsey - -	S.	734	846	555	555	—	—	?	—
St. George, Southwark	S. L.	836	543	386	254	79	—	—	53
Newington - -	S. L.	907	694	525	303	47	—	1	174
Lambeth - - -	L. S.	1618	935	684	349	95	—	9	231
Wandsworth - -	S.	484	421	325	206	6	—	73	40
Camberwell - -	S. L.	504	549	352	167	24	11	102	48
Rotherhithe - -	S.	352	283	180	139	—	9	2	30
Greenwich - -	K.	718	563	441	4	—	161	85	191
Lewisham - - -	K.	96	81	61	—	3	15	12	31
TOTAL - -	- -	7137	5719	4059	2443	313	196	284	823

The Southwark Water Company, which obtains its supply from the Thames at Battersea near the Red House, supplied 40,046 houses in 1853.

The Lambeth Water Company obtains its supply from the Thames at Thames Ditton, about a mile and a half above Kingston, and three miles beyond the influence of the tide. This Company supplied 26,107 houses in 1853.

The Kent Water Company obtains its supply from the Ravensbourne below the Lewisham Mills. It supplied 14,594 houses in 1853.

The further inquiry to which reference has been made in the Weekly Returns, was undertaken at the instance of the Board of Health Committee for Scientific Inquiries*; and the general result, as stated in the lucid report of Mr. Simon, the Medical Officer of the Board of Health, is: "the population drinking dirty water "accordingly appears to have suffered 3½ times as much mortality as the popula- "tion drinking other water."

The results of this conclusive investigation of the Board of Health complete the inquiry.†

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* The Committee consisted of Arnott, Baly, Farr, Owen, and Simon.

† Report on the last two Cholera Epidemics as affected by the consumption of impure water. By the Medical Officer of the Board, p. 6.

SYNOPSIS OF RESULTS.

Death Rates per 1,000 of living Population in Two Epidemic Periods.		In Houses enumerated in 1854 as receiving their Water Supply	
		from the LAMBETH Company.	from the SOUTHWARK and VAUXHALL Company.
CHOLERA –	1848–9 –	12·5	11·8
	1853–4 –	3·7	13·0
DIARRHŒA –	1848–9 –	2·9	2·7
	1853–4 –	2·1	3·3

N.B.—Between the two epidemic periods the Lambeth Water Company had changed its source of supply.

We have now learnt in England that the mortality of a settled population, or of such moving bodies of men as armies, in an epidemic of cholera, is reduced to an insignificant fraction,—when they are lodged on places of some elevation—are supplied with pure water—are kept in generally favourable hygienic conditions—and obtain, when attacked by diarrhœa, immediate medical advice.

The practical importance of these results is evident, when we reflect that the disease which they show us how to combat, destroyed within seven years, in two epidemics, little less than *a quarter of a million* of the population of the United Kingdom at home, where its visitations were less deadly than they were in our army and navy abroad and among other nations.

It is right to state that Dr. Snow by his hypothesis*, by his researches, and by his personal inquiries; that the Registrar General, by procuring information and by promoting inquiry; as well as the Board of Health by their Report; have all contributed in various ways to establish the fact that the cholera matter or *cholrine*, where it is most fatal, is largely diffused through *water*, as well as through other channels.

Appendix to Registrar-General's Seventeenth Annual Report, pp. 91–99.

* The following is a very brief outline of Dr. Snow's views as expressed in his last publication, *Cholera and the Water Supply in the South Districts of London:*

"The cholera commences as an affection of the alimentary canal, and not with general illness; there is no evidence of poisoning of the blood in this disease, except in some cases where secondary fever occurs; there is conclusive evidence that cholera may be communicated from person to person, and it follows, therefore, that the morbid matter which produces the disease is applied to the interior of the alimentary canal, where it increases and multiplies during the period of so-called incubation, and passes off, during the attack, to cause fresh cases when suitable opportunities occur. Various circumstances connected with the propagation of cholera seem in accordance with the above view of its pathology. Thus, it was observed to pass frequently from person to person in the crowded habitations of the poor, who eat, drink, cook, and sleep in the same apartment, and pay little or no regard to cleanliness, who live, in fact, under circumstances where the sudden and copious evacuations of cholera, soiling the bed and body linen, would not fail to contaminate the hands of the patient and his attendants, and be thence transferred to any food they might touch. The absence of colour and odour in the evacuations could not help to favour this result."

"It occurred to me, as soon as I began to entertain the above opinions, that if the cholera excreta could reproduce the disease in the way just mentioned, they might also do so when diffused in water taken as drink, and that, unless this were the case, the whole of the phenomena of cholera, as an epidemic, could not be explained."

List of some of the Principal English Official and other Publications relating to Cholera.

Acland, Dr. ; On Cholera at Oxford.

Baly and Gull, Drs. ; Reports [to Royal College of Physicians] on Epidemic Cholera [of 1848–9], published 1854.

Beale, Dr. L. S. ; Microscopical Researches on Cholera in Medical Times and Gazette.

Berg, Dr. ; Cholera in Sweden, 1850. (In Swedish.)

Briquet, M. ; Rapport sur les Épidémies de Choléra-Morbus qui ont régné de 1817 à 1850. (In "Mémoires de l'Académie Impériale de Médecine."—Vol. 28, Part 1.)

Bryson, Dr. ; On the Infectious Origin and Propagation of Cholera (1851).

Budd, Dr. W. ; On Asiatic Cholera in Bristol. (In "British Medical Journal" of 13th April 1867.)

Chapman, Dr. John ; Diarrhœa and Cholera.

Congrès International de Statistique ; Réuni à Florence, Compte-rendu des travaux de la VI• Session, 1867. Published in 1868 at Florence. This valuable Report of Dr. Maestri contains information and some important recommendations from the congress on the subject of Water Supply.

Epidemiological Society ; transactions of.

General Boards of Health ; On Cholera in 1831–2.

Report on Epidemic Cholera of 1848–49.

Appendix A. ; Report by Dr. Sutherland on Ditto.

Appendix B. ; Report by Mr. Grainger.

Appendix C. ; Abstract of Report by James Wynne, M.D., on Epidemic Cholera in United States, 1849–50.

Report of the *Medical Council* on Epidemic Cholera in 1854.

Report of *Committee for Scientific Inquiries* in relation to the Epidemic of 1854 (with Appendix).

Report on Cholera as affected by the Consumption of Impure Water—by the Medical Officer of the Board (1856).

Report of Dr. Sutherland on Cholera in London, 1854.

Reports 1 and 2 on the Results of different Methods of Treatment of Cholera (by Medical Council Committee).

Griesinger ; On Cholera. (*In Virchow's Handbuch der Speciellen Pathologie und Therapie —2 Band, 2 Abth.*)

Grimaud de Caux ; Du Cholera, 1866.

Günther, Dr. Rudolf ; Atlas zu die Indische Cholera in Sachsen im Jahre 1865.

Hallier, Dr. Ernest ; Das Cholera-Contagium, 1867.

Haughton, Rev. Dr. ; Papers on Cholera in Medical Times and Gazette, 1867.

International Cholera Conference at Constantinople ; Despatch from Her Majesty's Ambassador at Constantinople, with Documents presented to both Houses of Parliament, 1868. (See also Paper by Dr. Goodeve, read before the Epidemiological Society in 1866.)

Ireland—Hayden and Cruise ; Cholera Epidemic of 1866 in Dublin.

Mapother, Dr. ; Lectures on Public Health, 1867.

JAMESON, JAMES ; Report on Epidemic Cholera in the Presidency of Bengal in 1817–19.

JOHNSON, DR. GEORGE ; On Epidemic Diarrhœa and Cholera ; their Pathology and Treatment.

Notes on Cholera.

KLOB, DR. JULIUS ; Studien über das wesen des Cholera Processes, 1867.

MACPHERSON, DR. JOHN ; Cholera in its Home, 1866.

MARTIN AND JOHNSON ; on Tropical Climates.

MÜLLER, DR. E. H. ; Die Cholera-Epidemie zu Berlin, 1867.

NEWCASTLE-UPON-TYNE ; Report of Commission on Cholera Epidemic of 1853.

ORTON, —— ; On the Epidemic Cholera of India.

PACINI, M. ; Du Choléra asiatique. Traduit par Janssens. Bruxelles, 1865.
(*Note.*—An earlier publication is out of print.)
Della Natura del Colera Asiatico (Firenze, 1866).

PARKES, E. A. ; On Asiatic or Algide Cholera, 1847.

PETTENKOFER, DR. ; Verbreitungsart der Cholera (Munich, 1855).

PRIVY COUNCIL, MEDICAL OFFICER OF ; Eighth Report.
Ninth Report.

RADCLIFFE, MR. J. N. ; On the Sources and Development of Cholera in Europe (8th Report Med. Off., Privy Council).
On Outbreak of Cholera at Theydon Bois (Ditto).
On Cholera in London (9th Report Med. Off., Privy Council).

REGISTRAR-GENERAL OF ENGLAND ; Report on Cholera in 1848–49, by Dr. Farr.
The Cholera Epidemic of 1853–54. (*In Appendix to Seventeenth Annual Report.*)
Report on the Cholera Epidemic of 1866.
Cholera in London. (See *Weekly Returns for* 1849, 1854, *and* 1866).

RICHARDSON, DR. ; Theory of Propagation of Cholera. (*In Transactions of Epidemiological Society*, Vol. II., Part II.)

ROGERS, S. ; Reports on Asiatic Cholera in Madras, 1848.

ST. JAMES, WESTMINSTER ; Report on Cholera (1854).

SANDERSON, DR. J. B. ; On Communicability of Cholera (9th Report Med. Off., Privy Council).

SCOTT, WILLIAM ; on Epidemic Cholera in Presidency of Fort St. George, 1849.

SHAPTER, DR. ; History of Cholera in Exeter.

SNOW, DR. JOHN ; On the Mode of Communication of Cholera (1854).

SUTTON, DR. H. G. ; On the Characters of the Cholera of 1866 (9th Report Med. Off., Privy Council).

THOMSON, DR. R. D. ; On Cholera. Transactions of Royal Medico-Chirurgical Society. Vol. XXXIII.

THUDICHUM, DR. ; Chemistry of Cholera (9th Report Med. Off., Privy Council).

WEBER, DR. HERMANN ; On Pettenkofer's Theory of the Propagation of Cholera. (In Transactions of Epidemiological Society, Vol. II., Part II.)

Note.—A copious List of Works on Cholera will be found in the British and Foreign Medico-Chirurgical Review, Nos. lxxv., lxxvi., and lxxix.

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