The minority report of the Royal Commission on Vaccination.

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PREFATORY NOTE.

The Royal Commission on Vaccination was issued by Queen Victoria on May 29th, 1889, and finally reported in August, 1896. Of the fifteen original Commissioners, three died before the Commission reported, viz., Sir William Savory, Dr. Bristowe and Mr. Bradlaugh ; the latter was replaced by Mr. J. A. Bright in April, 1891.

The Majority Report was signed, without reservation, by Lord Herschell, Sir James Paget, Sir Charles Dalrymple, Sir Edwin Galsworthy, Mr. Dugdale, Professor M. Foster and Mr. Meadows White.

Sir Guyer Hunter and Mr. Jonathan Hutchinson signed the Report with a reservation against going so far in relaxation of the law as the Report recommended, desiring that the conscientious objector should be required to make a sworn deposition before a magistrate and that a second vaccination at the age of twelve should be compulsory. Mr. Samuel Whitbread and Mr. J. A. Bright, while signing the Majority Report, joined Dr. Collins and Mr. Allanson Picton, who did not sign it, in expressing " dissent from the proposal to retain in any form compulsory vaccination." The Minority Report or " Statement of Dissent," by Dr. Collins and Mr. Picton will be found on the following pages 7-112.

The terms of reference to the Commission were :—

" To inquire and report as to—

(1) The effect of vaccination in reducing the prevalence of, and mortality from, small-pox.

(2) What means, other than vaccination, can be used for diminishing the prevalence of small-pox ; and how far such means can be relied on in place of vaccination.

(3) The objections made to vaccination on the ground of injurious effects alleged to result therefrom ; and the nature and extent of any injurious effects which do, in fact, so result.

(4) Whether any, and, if so, what means should be adopted for preventing or lessening the ill effects, if any, resulting from vaccination ; and whether, and, if so, by what means vaccination with animal vaccine should be further facilitated as a part of public vaccination.

(5) Whether any alteration should be made in the arrangements and proceedings for securing the performance of vaccination, and, in particular, in the provisions of the Vaccination Acts with respect to prosecutions for non-compliance with that law."

The Majority Report of 537 paragraphs covers 141 pages and has two appendices on (*a*) the "Variolous test," and (*b*) "Woodville's cases." On the first head of reference the majority reported: "We think (1) That vaccination diminishes the liability to be attacked by small-pox; (2) That it modifies the character of the disease and renders it (*a*) less fatal, and (*b*) of a milder or less severe type." They also were of opinion that the protection against attack rapidly diminishes, more rapidly than its power to modify the disease, that re-vaccination, which should be repeated at intervals, restores the protection, and that the vaccine matter is more effectual if inserted in three or four places than in one or two, and that the marks should be half a square inch in area.

On the second head of reference, viz., "means other than vaccination for diminishing the prevalence of small-pox," the materials for sections 451-508 of the Majority Report were, it is understood, mainly contributed by one of the authors of the Minority Report. The Majority reported: "We are very far from under-rating the value of a system of isolation," but "what it can accomplish as an auxiliary to vaccination is one thing, whether it can be relied on in its stead is quite another." . . "We can see nothing to warrant the conclusion that in this country vaccination might safely be abandoned, and replaced by a system of isolation."

In regard to the third head of reference, the Majority concluded, that "although some of the dangers said to attend vaccination are undoubtedly real and not inconsiderable in gross amount, yet when considered in relation to the extent of vaccination work done they are insignificant."

The risks of erysipelas, of blood poisoning, and of skin eruptions were admitted, but their occurrence was held to be rare. The fact of vaccino-syphilis in arm to arm vaccination, though at one time confidently denied, is found to have been established, but by the use of calf-lymph it is claimed that absolute freedom from such risk may be secured.

On the fourth head of reference the Majority held that parents should not be required to submit their children to vaccination with other than calf-lymph and suggested various means for rendering untoward results less frequent.

On the fifth head of reference the Commission had in 1892 unanimously reported against repeated penalties for non-vaccination or treating persons imprisoned for non-vaccination as criminals. The Majority also concluded "that it would conduce to increased vaccination if a scheme could be devised that would preclude the attempt (so often a vain one) to compel those who are honestly opposed to the practice to submit their children to vaccination, and at the same time leave the law to operate, as at present, to prevent children remaining unvaccinated owing to the neglect or indifference of the parent."

By an amending Vaccination Act, passed in 1898, some of the administrative changes recommended by the Commission were

provided for, the liability to more than two prosecutions for default in respect of the same child was removed, and it was enacted that no penalty for neglect should arise if the parent or person responsible for the child obtained, within four months of its birth, a certificate that he had satisfied two justices or a stipendiary or metropolitan police magistrate in petty sessions that he conscientiously believed that vaccination would be prejudicial to the health of the child.

Prosecutions for non-vaccination and imprisonment for default nevertheless continued and opposition to vaccination showed no signs of abatement. Moreover, objectors were often brow-beaten by Magistrates and sometimes refused the certificates to which by law they were entitled.

The question again came before Parliament in 1907, and on February 15th of that year one of the Commissioners, Dr. (now Sir William) Collins, M.P., in debate in the Commons, said: "The Legislature of 1898, I regret to say, did not follow the advice tendered to Her Majesty by the Royal Commission, either by the Majority or the Dissentient Commissioners . . . if the Legislature had consented to follow the recommendation of four members of the Commission, or even the recommendation of the seven of the Majority Commissioners, possibly we might not have had the irritation which is going on at the present time . . . I very much doubt whether the suggestion of the right hon. gentleman, the President of the Local Government Board (Mr. Burns), merely to substitute a statutory declaration will enable him to find any rest for the sole of his foot there, and whether he will not find, in this as in other matters, it will only be an instalment leading up to a larger policy, and that the repeal of the law with regard to compulsory vaccination will be the final result in accordance with the recommendation signed by Mr. Whitbread, Mr. Picton, the junior member for Oldham (Mr. J. A. Bright) and myself."

By the Vaccination Act, 1907, a statutory declaration made before a Justice of the Peace was substituted for the certificate of a magistrate required of an objector by the Act of 1898. In the House of Commons an amendment was carried enabling a mother, as well as a father, to make the statutory declaration. This was, however, rejected by the Lords. The Commons were reminded that it was by a majority of one in a House of fifteen peers that repeated penalties for defaulters had been maintained since the year 1871. The Commons, however, accepted the Lords' amendment.

Since the Royal Commission reported in 1896, not only have there been considerable changes in the law regarding vaccination and in its administration, but also marked changes in medical opinion as to its inherent dangers, its value in protecting the community against small-pox and the wisdom of seeking to compel it. The trend of all these changes has been in the direction foreshadowed by the two Commissioners who signed the Minority Report.

The primary infantile vaccinations in England and Wales, which had reached 766,824 in 1877, fell off considerably during the sittings of the Royal Commission (1889-1896) and, notwithstanding some recovery in 1902-4, continued, though with some interruptions, to fall, at an accelerated rate, after the Act of 1907. In 1925 they amounted only to 314,325, or considerably less than half the number of registered births.

This falling off in vaccinations has not only been unaccompanied by any increased mortality from small-pox, but the disease that has been prevalent of late has been remarkably mild in character and of exceptionally low fatality.

A Departmental Committee, appointed by the Ministry of Health in 1926 (Cmd 3148), called attention to the fact that " In 1901-4 there were in London 10,463 cases of small-pox admitted to hospital and of them 1,668, or 16 per cent., died. During these years approximately 75 per cent. of the births were vaccinated. In 1921 there were 336 cases of small-pox throughout the country, with five deaths (1.5 per cent.) ; the percentage of births vaccinated was 38.3."[1] In Nottingham in 1921 there were 142 cases of small-pox, none of which proved fatal, and " it was alleged by the public that vaccination was accompanied by a much greater degree of discomfort than was small-pox, and consequently it fell into disfavour."[2] Out of 21,796 cases of small-pox in England and Wales in 1923-26 there were 47 fatalities,[3] while between November, 1922 and September, 1927, there were 51 deaths from post-vaccinal nervous disease and 17 attributed to vaccinia.[4] (1922-26.)

The last available Statistical Review of the Registrar-General (1928) gives the annual death-rates from small-pox per million persons living in England and Wales as follows :—

1861-70	...	...	...	149
1871-80	...	...	...	228
1881-90	...	...	...	45
1891-1900	...	...	...	14
1901-10	...	...	...	13
1911-1920	...	...	...	0
1921-25	...	...	...	0

In 1928, while 12,420 cases of small-pox were notified, in England and Wales, the deaths from that disease were only 53.

The same Departmental Committee was enjoined to report on methods to diminish the risks resulting from vaccination. They held [5] that while an improvement had taken place since the Royal Commission reported, yet " further efforts in this direction are desirable." There were 371 deaths ascribed to vaccination in England and Wales in the years 1899 to 1925. Among the deaths associated with vaccination in the years 1911-25 were 54 from blood-poisoning, 12 from erysipelas, 9 from convulsions and 10 from other diseases of the central nervous system.[6] These latter were mostly post-vaccinal encephalitis, which though recently

[1] p.73. [2] p.75. [3] p.76. [4] p.87. [5] Report Cmd 3148. p. 39. [6] Ibid. p.40.

attracting attention, according to Professor Jorge " it is probable that accidents of this character have been going on for many years."[8] The Committee were " unable to exonerate vaccination from playing some part "[9] in the causation of this disease, and recognised that " the occurrence of post-vaccinal nervous disease, however seldom it may occur, is of serious import and cannot fail to have an effect on vaccination, both in its administrative and in its purely medical aspects."[9] Pathologically, they say, " the one positive fact that emerges is that the virus of vaccinia has been demonstrated in certain of the brains ; "[10] while Professor McIntosh was unable to set aside the view that the cases investigated " resulted solely from vaccination."[11]

By an order of the Ministry of Health (No. 640, 1929) one insertion in place of the officially advocated four was advised, and in the belief that post-vaccinal nervous diseases occur mainly in children of school age or adolescents, the Ministry consider " it is not generally expedient to press for the vaccination of such persons," in view of the mildness of the prevalent small-pox. The belief is an erroneous one, as several fatal cases of post-vaccinal encephalitis have been recorded by the Departmental Committee itself, but the advice tendered surrenders the principle of universal vaccination.

In Holland, in consequence of the numerous fatal cases of post-vaccinal encephalitis which had occurred in that country, compulsory vaccination has been suspended.

As regards the changes in medical opinion during the 34 years since the Royal Commission reported, it will suffice to quote a few of the authorities which have emphasised the dangers of vaccination and questioned its value as a prophylactic to be enforced upon the whole population.

Dr. J. W. Carr, in his Presidential Address to the Medical Society of London, on October 8th, 1928,[12] said : " Evidently our views about vaccination are changing ; they would probably change even more quickly had it not become a part of the official creed, established by law, and therefore as dogmatic and as difficult as the Athanasian Creed itself." He asked, " Is protection against the present type of small-pox worth the price that is being paid for it ? " seeing that " it is now recognised that in a certain number of cases recently the vaccination of children previously perfectly healthy has been followed by an obscure condition of encephalo-myelitis which not uncommonly proves fatal."

Professor Major Greenwood, a medical officer of the Ministry of Health and Reader in Medical Statistics of the University of London, informed the Epidemiological Section of the Royal Society of Medicine on January 25th, 1929, that " a dreadful amount of nonsense was perpetually talked about vaccination, and that was the difficulty. In Jenner's classical paper no mistake was omitted that could possibly

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[8] Report Cmd 3148, p.165. [9] p.200. [10] p.197. [11] p.125. [12] *Lancet*, Oct. 13, 1928, pp. 753-757.

have been made, and there was a good deal of evidence that Jenner had been a rogue . . . .Why should they not treat vaccination like any other form of prophylaxis and advocate it only when circumstances of special risk were incurred? The whole problem of herd immunity and individual immunity was in its infancy and nobody knew the truth about it."[13] On February 18th, 1930, at the Royal Statistical Society, Professor Major Greenwood returned to the question, and said: "the price of compulsory vaccination on a scale likely to save lives must be paid in lives," and that "he is not satisfied that the resultant saving of life must exceed the price paid," and he accordingly supported the policy advocated by Dr. Millard, of Leicester.[14]

Dr. Garrow, Medical Officer of Health for Hornsey, said: "He had been cured of any views he ever held about the advisability of compulsory vaccination."[15]

Dr. S. P. Bedson, Senior Freedom Research Fellow of the London Hospital, in a paper delivered to the Post-graduate course at that Hospital, said:—

"The question of practical importance is: What is to be the attitude of the medical practitioner towards vaccination? There are those whose reply is: 'Continue vaccinating as before.' It is inconceivable to my mind that anyone should adopt such an attitude. Were we dealing with protection against the risk of virulent small-pox there might be some excuse for this attitude. Even so, it would be a confession of ineptitude on our part. But the type of small-pox in this country at the present time is extremely mild and rarely fatal, so that to continue vaccinating as before would be to ask the individual to submit to a prophylactic measure whose risk of death equalled that of the disease against which he was being protected. Obviously something must be done."[16]

These and many more authoritative medical opinions in this country and abroad could be quoted in confirmation of the conclusion of the Minority Commissioners that compulsory vaccination, whether direct or indirect, and in any form, should be forthwith abolished.

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[13] *Lancet*, Feb. 2, 1929, p.233.

[14] *British Medical Journal*, March 1, 1930, p.401.

[15] *Lancet*, Feb. 2, 1929, p.233.

[16] *Lancet*, Nov. 2, 1929, p.920.

STATEMENT BY DR. COLLINS AND MR. PICTON OF THE GROUNDS OF THEIR DISSENT FROM THE COMMISSION'S REPORT.

1. We entirely agree with the Report of our colleagues in so far as it shows the great change of professional and scientific opinion since vaccination first engaged the attention of the Legislature, and since the passing of the first compulsory Act in 1853. We hold with them that the prophylactic power of vaccination has been at least exaggerated, and that dangers incidental to the practice, though at one time denied, "are undoubtedly real and not inconsiderable in gross amount." We gladly added our signatures to theirs in support of the Commission's interim report recommending the abolition of repeated prosecutions, and also that recalcitrants against the vaccination laws should no longer be subjected to the same treatment as criminals. We now desire also, if compulsion in any form is to be maintained, to support their final recommendations for the relief of conscientious noncomformity with the law. We also gladly endorse the precautions they recommend with the object of preventing avoidable dangers in connexion with the operation. There is no difference among us on these points; so far as these recommendations go the Commission is absolutely unanimous. We feel, however, that the evidence not only justifies but requires a more complete reconsideration of the present state of the law as well as of the methods adopted in dealing with small-pox. For this purpose it is necessary to review in some detail the history of small-pox and the various preventive measures which have at different times been in vogue, and to scrutinise the grounds on which one alone of these preventive measures has been relied upon to the exclusion of others. We desire also to give reasons for thinking that other more effective and practicable (as well as less objectionable) modes of stamping out small-pox, or protecting communities from its introduction, are available. We venture to think that the report of our colleagues, in the preparation of many portions of which we have borne our part, has approached the consideration of the behaviour of small-pox and the means of preventing it too exclusively from the standpoint of vaccination, and that too little attention has consequently been accorded to sanitary organisation, prompt notification and isolation, measures of disinfection and cleanliness, and healthy conditions of living, which we believe to be of the first importance in preventing and controlling outbreaks of small-pox.

Reference I.—The Effect of Vaccination in Reducing the Prevalence of, and Mortality from, Small-Pox.

2. The origin and antiquity of small-pox are involved in obscurity. No account of the disease appears in the writings of Hippocrates or Galen; it seems to have been unknown in ancient Greece and Rome. Unambiguous evidence of its presence on the Continent of Europe is to be found in the 15th century, and scattered references of more debatable character may be found in the two previous centuries.

Small-pox, like the plague and some other infectious maladies, appears to have, as it were, its habitat in certain countries, and its diffusion thence results from importations under favourable circumstances of the morbid poison by infected persons or things. Such native foci of small-pox are said to be the countries of Central Africa and India.

3. The first extant work on small-pox is by an Arabian physician, Rhazes of Bagdad, written in the 10th century A.D. His account of the disease was so accurate and complete that it served as a model for many medical writers when the disease became common in Europe.

4. Various theories of the cause of small-pox were advanced in mediæval writings, but contagion, though referred to by some of the earlier Arabian authors, was not thought to be of importance. No doubt small-pox was often confounded with other eruptive diseases, such as measles, and even as late as 1700 these were classed together in Bills of Mortality. Sydenham (1624-89) described fully the small-pox as it occurred in London in the 17th century. He emphasised the distinction between small-pox and measles, and introduced the " cool treatment " for these diseases. He describes small-pox as prevailing epidemically, attacking persons of all ages, varying greatly in its severity ; the mortality being in his opinion largely augmented by mischievous treatment. Sydenham, like his contemporaries, did not attribute the propagation of small-pox to contagion, but to what he termed the " epidemic constitution of the atmosphere " due to " certain hidden and inexplicable changes within the bowels of the earth."

5. It was reserved for Boerhaave, of Leyden (1668-1738), to proclaim the view, now generally accepted, that small-pox arises only from contagion.

6. During the 17th century small-pox became more prevalent in Western Europe, especially in large towns and trading ports. It was introduced into Boston (U.S.A.) early in the century ; and on numerous occasions epidemics in the West Indies and South America have been traced to slave importations from Africa. On the other hand it appears that places and countries naturally isolated, or removed from the more populous centres of human intercourse, then, as now, enjoyed complete or comparative immunity from the disease. Thus the Faroë Islands were first infected by a ship from Denmark in 1651, Cape Colony in 1713 by a ship from India, while the continent of Australia, it is stated, enjoyed an absolute immunity until 1838, and the island of Tasmania continued to be exempt until 1887.

7. In view of the curious notions entertained by the most learned medical writers in the 17th century as to the propagation of small-pox, and the superstition with which an epidemic was regarded by the common folk, it is not surprising that the century closed without any effort being made to protect individuals or communities from this disease. In London the ravages of the Plague until its extinction in 1680 appear to have eclipsed the lesser evils of the small-pox, and to have absorbed whatever of organised effort was available on the part of the those responsible for the public health.

8. The London Bills of Mortality were first compiled by the parish clerks in 1629, and though the data they furnish in regard to the deaths from various diseases cannot be regarded as even approaching to scientific accuracy, they give some idea of the health, or rather of the unhealthiness, of 17th century London.

ANNUAL DEATH RATES IN LONDON PER 100,000 LIVING. Vol. I., App., p. 88.

Causes of Death.	1629-35.	1660-79.
All causes	5,000	8,000
Plague	125	1,225
Fever	636	785
Small-pox	180	417

There can be no doubt that the conditions which obtained in London "within the Bills" during the 17th century were in the highest degree favourable to the propagation of pestilential diseases. The general death rate was enormously high, and though plague disappeared soon after the Great Fire, fevers and small-pox became more severe and fatal and were perennially endemic.

9. Not only were the insanitary conditions which prevailed well calculated to foster and perpetuate any infection which happened to be introduced, but owing to the non-recognition of the part played by contagion in the dissemination of these diseases, the latter were accepted as well nigh inevitable evils, and no effort was made to restrict their ravages. 11,004.

10. In 1710, for the first time since the Bills of Mortality had been compiled, more than 3,000 deaths were ascribed to small-pox in London, or 127 per 1,000 deaths from all causes. The prevalence of the disease led to many speculations as to possible means of deliverance from it. The orthodox teaching of propagation by "epidemic constitution of the atmosphere" was not calculated to inspire sanitary precautions, or the separation of the sick from the whole. Mead's work on the prevention of contagions, primarily directed against a threatened invasion of plague, was not written until 1720. On the other hand there were reports from the Levant, where small-pox had been long endemic, that by a method of "engrafting" the disease artificially it might be robbed of its terrors. As far as the epidemiological history of small-pox can be followed back in Asia and Africa, we find records of the popular practice in some form or other, and often with religious associations, of the artificial induction of the disease. Even in Wales and Scotland, and in Western Europe, some kind of popular tradition of a similar practice has been traced by some authorities. Vol. IV., App. 1, p. 400. 10,332—10,335 107—10,340.

11. Whatever credit may attach to the introduction of the practice of innoculation into this country is, however, due to Lady Mary Wortley Montagu. During her residence at Pera, while her husband was Ambassador to the Porte, Lady Mary learnt that it was there the fashion "to take small-pox by way of diversion as they take the waters in other countries." In a letter, dated 1717, she announced her intention of submitting her son, aged five, to the operation, and

added, " I am patriot enough to take pains to bring this useful invention into fashion in England." Her son was accordingly inoculated by a Greek woman, under the supervision of Mr. Charles Maitland, Surgeon to the Embassy, and he passed favourably through the disease. Lady Mary returned to London, and in the spring of 1721 had her younger child inoculated by Maitland. The operation, which was satisfactory, was witnessed by three physicians, as well as several ladies and persons of distinction. In August, 1721, inoculation was tried experimentally on six criminals at Newgate, and the practice was encouraged by the Court.

12. While the effects in most of the early cases appear to have been mild, a few terminated fatally, and the practice became for a while less popular. After 1740, however, inoculation was revived, and, in the modified form of Dimsdale and Sutton, was widely adopted in many parts of the United Kingdom. In 1746 an inoculation hospital was started in London, and in most of the large provincial towns the new practice was encouraged by the clergy, as well as the leading medical practitioners, " and in 1754 the Royal College of Physicians of London pronounced its authoritative sanction of what was no longer a speculative novelty." The resolution of the College was :— " The College, having been informed that false reports concerning the success of inoculation in England have been published in foreign countries, think proper to declare their sentiments in the following manner, viz. :—That the arguments which at the commencement of this practice were urged against it have been refuted by experience ; that it is now held by the English in greater esteem, and practised among them more extensively than ever it was before ; and that the College thinks it to be highly salutary to the human race." From this date to the end of the century inoculation was widely diffused, though to varying degrees, in different districts ; the practice doubtless paved the way for the later acceptance of vaccination. The latter came to replace the former method, and by the Act of 1840, sec. 8, the practice of inoculation became a penal offence.

Vol I., p. 66.

13. Now the practice of inoculation was based on the belief that one attack of small-pox protected from subsequent attack those who recovered. And it was argued that the artificially-inoculated disease, though usually far less severe than the natural disease, yet afforded a similar immunity. It is neither necessary nor profitable to discuss at any length the various theories that have been advanced to account for such immunity ; suffice it to say there exists, and has always existed, a belief, shared by medical writers, that in the case of many infectious diseases one survived attack affords a certain amount of protection against a second attack. We are not aware of any large body of statistical evidence which can be cited in support of the general statement ; but the belief is held by those most conversant with the facts, and has been insisted on most strongly in the case of small-pox. It has been stated that second attacks of such diseases, when they do occur, are more severe than the first, and there is, so far as we know, no ground for asserting that second attacks of infectious

4545. 26,127.

diseases are in any way mitigated in severity by the abiding influence of the first attack.

14. The earlier writers on small-pox appear to have held that second attacks of the disease undoubtedly occurred and not unfrequently. The view that second attacks of small-pox occurred was held by Sydenham, also by Diemerbroek who observed that the eruption was more severe in second attacks than the first. The case of Louis XV has been often quoted ; he had a first attack at 14, and died of a second attack at 64. During the inoculation period the possibility of second small-pox was emphatically denied by several writers. After the introduction of vaccination the controversy which took place over its relative merits when compared with those of inoculation brought to light numerous instances of second small-pox in the same individual. Jenner collected more than a thousand cases of the kind. Moore says, " For some years the periodical and other medical publications teemed with cases of small-pox occurring twice." At the present time cases of second attacks of the disease are usually met with in every outbreak of any extent, and it would seem reasonable to conclude that the protection afforded by a previous attack, though considerable, is by no means absolute. Moreover, experience, though of limited amount, appears to show that no mitigating influence is exerted by the first upon a second attack should it occur.

24,848.

24,850.

26,125.

4545.
24,937.

15. Notwithstanding the extensive practice of inoculation, or, as has been alleged, in consequence of it, small-pox continued throughout the 18th century to be endemic in London, and severely epidemic, often at frequent intervals in many towns and villages in this country and abroad. During the latter half of the century attention was called by many writers to the serious evil to society of partial and indiscriminate inoculation. It was shown that, whatever advantages might result to the inoculated by way of protection from attack, the practice had frequently been the means of introducing the disease into towns and villages that were previously free from it, and that it could only be worked at an intolerable cost of life.

Vol. I., App., p. 66.

16. Attention was also, about this time, called to the restrictive influence which might be exerted upon outbreaks of small-pox by separating the sick from the healthy. The part played by contagion in the propagation of epidemics had, since the adoption of inoculation, come to be clearly recognised, and measures were suggested for stamping out small-pox on the lines of methods employed against the plague.

Rast. Faust 11,015. Haygarth. Dimsdale, 1105.

Some, like Haygarth, suggested the combination of general and systematic inoculation at stated intervals with measures of isolation. Others, like Rast, Faust and Cappel, advocated hospital isolation of the infected, and regarded inoculation as not only superfluous, but dangerous, and opposed in principle to the proper method of exterminating the infectious poison.

10,796—10,969.

17. It was at this juncture that the value of the cow-pox as a protection against small-pox attracted attention. It could be inoculated, like the small-pox, from one person to another, but unlike the latter it was stated to be not communicable by infection. If it

10,803.

afforded protection against small-pox without spreading the disease, opinion was evidently ripe for the substitution of the one practice for the other, for inoculation had come to be regarded about this time, not merely as a troublesome affair to those who submitted to it, but as a serious evil to society. Henceforth the controversy over the cow-pox absorbed almost exclusively the attention of those concerned for the prevention of small-pox, and for a long while little was heard of any means other than vaccination, such as isolation, etc., for the suppression or restriction of the disease.

Vol. 1., App., p. 66

18. From such records and statistics as are available it would appear that small-pox was more prevalent and the mortality from it was greater, especially in large towns, during the 18th century than it had been in the 17th. It is also true that, speaking broadly, the present century compares favourably with the last; the disease has not been the scourge that it then was. Prior to 1838, when official registration of the causes of death in this country began, the longest series of figures, and those which have been most often quoted, are the London Bills of Mortality. The following figures are taken from a table put in by Sir J. Simon, which was compiled by Dr. Farr, with due regard to the many sources of error which these Bills admittedly contain :—

ANNUAL DEATH RATES IN LONDON PER 100,000 LIVING AT SEVEN DIFFERENT PERIODS DURING THE YEARS 1629-1835, FROM—

		All Causes.	Smallpox.	Fever.
1629-35	...	5,000	180	636
1660-79	...	8,000	417	785
1728-57	...	5,200	426	785
1771-80	...	5,000	502	621
1801-10	...	2,920	204	264
1831-35	...	3,200	83	111

There was evidently a great improvement in the health of London, as measured by the fall of the death-rate from all causes, from its highest point in the Plague period, to a rate of about one half or one third of what it had been. A great improvement took place between the middle of last century and the earlier years of the present. Dr. Farr, remarking on these figures, says :—

"The diseases of London in the 16th century still prevail in unhealthy climates; not only the diseases and the manner of death have changed in this metropolis, but the frequency and fatality of the principal diseases have diminished.

"Small-pox attained its maximum mortality after inoculation was introduced. The annual deaths of small-pox registered 1760-79 were 2,323; in the next 20 years, 1780-99, they declined to 1,740; this disease, therfeore, began to grow less fatal before vaccination was discovered; indicating, together with the diminution of fever, the general improvement of health then taking place. In 1771-80 not less than 5 in 1,000 died annually of small-pox; in 1801-10 the mortality sank to 2, and in 1831-5 to 0.83.

"Fever, exclusively of the plague, has progressively subsided

since 1771 : *fever has declined nearly in the same ratio as small-pox.* In the three latter periods of the table the deaths from fever decreased as 621 : 264 : 111 ; from small-pox as 502 : 204 : 83."

19. We think these figures suggest that the fall of the death rates from fever and small-pox were associated in cause as well as in time with the improvement in the public health which the fall in general mortality indicates. It is possible that inoculation, as practised in London in the latter part of last century, prevented an earlier or greater reduction in small-pox than actually took place. Among the influences at work in the last quarter of the 18th century which would tend to counteract any injurious influence of inoculation were the progressive rooting out of small-pox from our prisons, the sanitary improvements in our towns, the growth of what has been termed the " new humanity," which made the care of the sick and the protection of the public health against noxious agencies matters of public concern and active philanthropy, influences for good with which the names of Howard and of Cook and of Haygarth are honourably and eternally associated. 5491—3.

Since Dr. Farr compiled the figures which we have quoted above, we have five completed decades of registration statistics, and extracting for London the death rates to the same scale from all causes, from small-pox, and from fever we obtain the following :—

ANNUAL DEATH RATES IN LONDON PER 100,000 LIVING, FROM :—

	All Causes.	Smallpox.	Fever.
1841-50 ...	2,500	40	97
1851-60 ...	2,400	28	88
1861-70 ...	2,400	27	90
1871-80 ...	2,240	45	37
1881-90 ...	2,037	14	21

20. Objection has been taken to a comparison between fever and small-pox when endeavouring to decide what has been the influence of the various agencies collectively spoken of as " sanitation " upon either, on the ground that the term fever has varied in its signification, and that measles and whooping-cough should be therefore used instead for such comparison. We cannot agree with this view ; our knowledge of the history, epidemiology and behaviour of measles and whooping-cough does not suggest to us that they have hitherto been very amenable to sanitary reforms, or that they present an analogy with small-pox, like the fevers and especially typhus fever. As regards the objection that the nomenclature has varied, it appears that Dr. Greenhow and Dr. Farr, in the figures which Sir J. Simon quotes from them, paid particular attention to this source of fallacy ; thus the former writer, " throwing into one group all those deaths of the present day which might have been included under the old application of the word ' fever ' (counting scarlet fever and inflammation of the brain, and inflammation of the lungs in this category), still finds that even with this large addition the so-called ' fever ' of the present day occasions only a death rate of 385 per 100,000, whereas a century ago its death-rate was close on 539." 871. Simon, '57. Papers, App., p. 29, and Vol. I., App., p. 88.

21. But since 1869 the Registrar-General has separately distinguished deaths from typhus, typhoid and simple fever, and we find that the decline has not been at the expense of one of these classes only, but has been shared by all.

The 42nd report of the Registrar-General, p. xxx, says: "Had the deaths from one or more of this group (fever) of causes fallen, while those from others in the same group had risen; or had the fall been trifling; or the totals dealt with insignificant in amount; it might have been suspected that the alteration was a mere alteration of name. But as the deaths under each heading have declined; as the fall in the death rate from them has been enormous, 62.4 per cent. in the course of 10 years; and as the totals are by no means small; it may be accepted as an indisputable fact that there has in truth been a notable decline in these pests, and it may be fairly assumed that the decline is due to improved sanitary organisation. The deaths from these causes, per million persons living, were 850 in 1869, and only 320 in 1879."

ANNUAL DEATH RATES PER MILLION LIVING (ENGLAND).

	Typhus.	Typhoid.	Simple Fever.
1871-75 ...	81.4	373.8	140.2
1876-80 ...	34.2	277.2	69.2
1881-85 ...	22.8	216.0	34.2
1886-90 ...	6.6	179.2	16.6

We are, therefore, led to the conclusion that the great fall in the fever death rate since the middle of last century in London is a real and substantial one, that it is in all probability due to greater sanitary activity, and that a fall of about the same amount has during the same period taken place in small-pox mortality, and we are unable to agree that it is not largely due to similar causes.

22. The infectious nature of the inoculated small-pox came as a surprise to the first inoculators in England; but it was not long before the practice was accused of introducing and spreading the disease. Thus Dr. Wagstaffe, writing in 1722, instanced an occurrence in the town of Hertford, where, in consequence of a few inoculations, the small-pox had spread and occasioned a considerable mortality. (Moore's "History of Small-pox," p. 242.) Moore, alluding to these occurrences, remarks (p. 233) that they should have "induced the profession to pause ere they proceeded, or at least to have prompted them never to inoculate without adequate measures being adopted to prevent the infection spreading to others. The neglect of this easy precaution has occasioned the loss of millions of lives." Statistics prepared by Dr. Jurin and others appeared to prove the advantages of inoculation to those who received it, but Moore, alluding to Jurin's calculations, said (p. 243, "History of Small-pox"):—"These proved that an individual who resided in London, or in any large city where the small-pox prevailed, had a much better chance of surviving that disease by being inoculated; but they did not apply to the country, or to places where the small-pox was infrequent. And, as in the year 1723, a great increase of

the mortality by small-pox took place in London ; Dr. Jurin expressed his opinion that this ought not to be imputed to inoculation, as the numbers who had been inoculated in town that year did not exceed 60. This was a very inadequate answer ; a single person may bring the Plague into a town, or into a nation, and be the cause of the destruction of an innumerable multitude. The small-pox is fully as infectious a disease as the Plague, and sixty inoculations were more than sufficient to account for the augmented mortality, and were probably the real cause of it." Without accepting this opinion we are nevertheless satisfied that inoculation did tend to establish and spread the disease, and introduce it into places which would probably have otherwise remained free, and that in places where it was restricted a less mortality resulted. It is also doubtless true that inoculation, by opening up a new line of thought as to the preventability of disease, paved the way for the subsequent reception of vaccination, and at the same time the knowledge that disease could be thus propagated at pleasure must have suggested the possibility of its being controlled at will. To the continuance and universal acceptance of Sydenham's doctrine of "epidemic constitution of the atmosphere," Haygarth attributed the persistence of small-pox.

10,738.

23. We also learn on the authority of Haygarth how great was the contrast, in respect of small-pox prevalence, between towns and country districts. Thus, in Kent, where inoculation was cautiously avoided, he quotes figures to show that last century the annual small-pox mortality did not exceed one in 20,000. From Sussex, too, he had evidence pointing to a similar experience. Writing in 1793, he adds, "How far this wonderful exemption from the mortality of the distemper extends through the South of England I cannot determine. The facts here related in regard to both Kent and Sussex are taken by accident, and I have no reason to believe them extraordinary in these counties. But no fact in any degree similar to them can be produced in this neighbourhood (Chester), nor probably in any other where inoculation is freely allowed, and where, at the same time, the casual contagion is permitted to make its destructive progress without any kind of interruption. If the feeble, irregular, unconnected, and unauthorised efforts of individuals can prevent so much mischief, *how much more benefit might reasonably be expected from the united, systematic and concerted regulations of the whole island aided and strengthened by legal premiums and punishments.*" (Italics ours.)

Vol. IV., App. 1., p. 398.

In 1763 small-pox was unusually severe in Paris, and upon inquiry it was determined that this was owing to increased infection from inoculation ; a decree was accordingly issued prohibiting the practice in that city. It is stated by Moore and others that in Spain inoculation never became a general practice, and that no other country in Europe last century suffered so little from small-pox.

24. In estimating the influence of the practice of inoculation on the amount of and mortality from small-pox in a community regard

must be had to several factors. If we accept the common view that one attack of the disease, though artificially administered, affords a considerable amount of immunity against a future attack, though perhaps not influencing the severity should such attack occur, the universal practice would, in view of the usually greater mildness of the inoculated disease, determine a low small-pox death rate. Inasmuch as such universality of the practice never was and never could be attained, the extent to which it failed ensured (except in the rare cases where special isolation of the inoculated was secured) the constant presence of infected persons who were centres of contagion to the susceptible. There is plenty of evidence, not only last century but of more recent dates, that inoculation has been the means of introducing and spreading small-pox in localities where the population was largely composed of susceptible persons. The effect of inoculation would in any particular time or place depend not only on the proportion of the inoculated to the susceptible, but also on the condition of things obtaining as regards the diffusion of the contagion independently of this particular mode of its propagation. Thus, if through habitual disregard of contagion small-pox patients were suffered to mix freely with those liable to the disease, the effect of any such superadded source of contagion as inoculation might well be inconsiderable. In a town where the disease had been long naturalised, and no particular measures taken to prevent it, we should not expect to find a very marked augmentation of the disease by even the partial practice of inoculation. In the case of isolated towns or villages removed from the more populous centres of human intercourse, and in which accordingly small-pox came rarely and epidemically, the introduction of inoculation might be expected to establish and spread the disease. Moreover, the habitual and systematic carrying on of the practice, without precautions, in a large town by ensuring the endemicity of the disease, and, as it were, making it indigenous, would in the case of small-pox tend to mask and obscure any influences at work of a countervailing character as regards the public health.

10,492. 2886—7. 3182—4. 8128.

25. This is in fact what we find when we examine such figures as are available for determining the influence of inoculation on the prevalence of and mortality from small-pox, as, for instance, the London Bills of Mortality. Whether we consider the horribly insanitary conditions with the attendant overcrowding, or the disregard of precautions against contagion, it would probably be difficult to conceive conditions more favourable to the spread and fatality of small pox than those which obtained in London in the first three quarters of last century. In this respect it is probable London was as bad as or even worse than other large European towns. Small-pox and other infectious fevers were allowed to run riot, and Bernouilli's calculation, derived from the experience of such places at such times, to the effect that 60 per cent. of those born took small-pox was probably not far wrong. The introduction of even partial and indiscriminate inoculation was not likely to, and in fact did not,

11,004.

increase to the extent which might otherwise have been expected the heavy toll that small-pox already exacted. Thus the figures from the London Bills show that in the first quarter of the 18th century, when inoculation had scarcely begun to be practised in London, the deaths from small-pox were 44,306 out of 586,270 total deaths, or 7.6 per cent. In the following quarter, when a certain amount of inoculation was carried on, especially towards its close, small-pox was responsible for 49,941 deaths out of 660,800, or again 7.6 per cent. In the third quarter, when inoculation had become an established custom, 56,690 out of 549,891 deaths, or 10.3 per cent., were ascribed to small-pox. In the last quarter of the 18th century, although the total deaths had greatly fallen, under the influences to which we have already alluded, the deaths from small-pox still constituted 9.2 per cent. of the whole (45,428 out of 493,309). It cannot be denied that the proportion of small-pox deaths to deaths from all causes was greater last century in London after the introduction of inoculation than it was before, though it is also true that the death rate in proportion to the estimated population from all causes and from small-pox showed signs of improvement during the last quarter of the 18th century.

26. The Committee of the House of Commons which reported on Jenner's petition stated :—" As a comparison between this new practice and the inoculated small-pox forms a principal consideration in the present inquiry, some facts with regard to the latter engaged the attention of your Committee, and in the supplement are inserted statements of the mortality occasioned by the small-pox in 42 years before inoculation was practised in England, and of the 42 years from 1731 to 1772 ; the result of which appears to be an increase of deaths amounting to 17 in every 1,000 ; the general average giving 72 in every 1,000 during the first 42 years, and 89 in the 42 years ending with 1772, so as to make the whole excess of deaths in the latter period 1,742. The increase of mortality is stated by another witness (No. 10) to be as 95 to 74, comparing the concluding 30 years with the first 30 of the last century, and the average annual mortality from small-pox to have been latterly about 2,000 ; for though individual lives are certainly preserved, and it is true that a smaller loss happens in equal numbers who undergo the small-pox now than there was formerly, yet it must be admitted that the general prevalence of inoculation tends to spread and multiply the disease itself ; of which, though the violence be much abated by the present mode of treatment, the contagious quality remains in full force."

Vol. I., App., p. 95.

27. Calculations made by de Haen, Rast, Heberden and others confirmed the belief that inoculation, as practised in London, kept going a constant source of contagion and increased the prevalence of small-pox. Dr. Heberden, writing in no controversial spirit, thus summed up the case in 1801 :—" The inoculation of the small-pox having been first used in England since the beginning of the eighteenth century, and having been now for many years generally adopted by all the middle and higher orders of society, it becomes an interesting

10,515. Vol. I., App., p. 66.

inquiry to observe, from a review of the last hundred years, what have been the effects of so great an innovation upon the mortality occasioned by that disease. But, however beneficial inoculation prove to individuals, or indeed to the nation at large, the Bills of Mortality incontestably show that in London more persons have died of the small-pox since the introduction of that practice. The poor, who have little care of preserving their lives beyond the getting their daily bread, make a very large part of mankind. Their prejudices are strong, and not easily overcome by reason. Hence, while the inoculation of the wealthy keeps up a perpetual source of infection, many others, who either cannot afford or do not choose to adopt the same method, are continually exposed to the distemper. And the danger is still increased by the inconsiderate manner in which it has lately been the custom to send into the open air persons in every stage of the disease, without any regard to the safety of their neighbours. It is by these means that, while inoculation may justly be esteemed one of the greatest improvements ever introduced into the medical art, it occasions many to fall a sacrifice to what has obtained the distinction of the natural disease. This must always be an objection against making any great city the place for inoculation until the practice is become universal amongst all ranks of people. Out of every thousand deaths in the Bills of Mortality, the number attributed to the small-pox during the first 30 years years of the eighteenth century, before inoculation could yet have had any effect upon them, amounted to 74. During an equal number of years at the end of the century, they amounted to 95. So that, as far as we are enabled to judge from hence, they would appear to have increased in a proportion of above five to four."

282. 28. We agree with those witnesses who are of opinion that inoculation as practised in this country and many parts of Europe last century did tend to increase the prevalence and mortality from small pox, that it introduced the disease into places that in all probability would have remained exempt from it, and in some large towns like London it tended to keep the contagion alive and to make the disease endemic. It appears, however, from the Bills that its introduction did not at once or very materially increase the mortality from small-pox in London. This was doubtless owing to the fact that it was scarcely possible to make matters much worse then than they were before in regard to the number of small-pox deaths.

29. We are led to believe that but for the disease being kept alive by inoculation, the improvement of the public health which set in towards the end of the 18th century, in obedience to the causes to which we have alluded, would have brought about an earlier and greater decline of small-pox mortality. The mere substitution of a non-contagious process like vaccination for the old inoculation in a population of whom some 80 per cent. or more had acquired naturally or artificially such protection as previous small-pox affords would have a striking effect upon the small-pox death rate by reducing the liability to infection of the remaining susceptible.

30. We think there can be no doubt that, speaking generally, in London last century, whether from the indiscriminate practice of inoculation or from the habitual indifference which permitted small-pox to run riot with little, if any, restriction, the great bulk of persons suffered from small-pox in childhood and acquired such protection as an attack of small-pox affords. The deaths from small-pox each year were chiefly those of young children or newcomers who were exposed to the constant sources of infection always kept going, and to the effects of which they had not been rendered immune. It is clear that any changes which would have the effect of reducing the chances of infection would diminish for the susceptible the prospects of attack and death by small-pox; while those who had acquired natural or artificial immunity would constitute to that extent a protected class. In so far as vaccination (after the first mistakes of Woodville and Pearson) substituted a non-infectious procedure for the old inoculation, to that extent, and apart from any question of its affording any immunity, it should by checking a fertile cause of the diffusion of small-pox bring about indirectly a reduction of mortality from that disease. Great as such influence must have been, and great as were the efforts which were now for the first time made to restrict the spread of small-pox—by efforts directed against contagion—there were in addition those other influences at work during the last quarter of the 18th century to which we have already alluded, influences which have been continued and intensified during the present century, and which in our opinion must be credited with a considerable share in the reduction of small-pox.

31. Attention has also been directed to the influence of states of peace and war upon small-pox epidemics. Small-pox as well as typhus has not uncommonly been especially prevalent and fatal among armies and nations in a state of war. The privations, crowding, interruptions of regular sanitary organisation associated with sieges and the field of battle are calculated to propagate infectious disease, and such disease under such circumstances is likely to spread far and wide, and regardless of national boundaries to extend to other nations besides those actually engaged in war. The experience of the last century as well as the present indicates a relationship between war and small-pox, and it is not improbable that the fall of small-pox in the earlier part of this century in Europe may have been due in some measure to transition from war to peace, and that certain recrudescences of small-pox during the latter part of the century may have been connected with wars, notably in the case of the Franco-German war of 1870-71. 7994—8021.

32. The lull in small-pox which characterised the early years of this century was, then, probably largely due to the cessation of inoculation in a population whose sanitary condition was beginning to improve, as evidenced by the falling death rate from all causes and from fevers, and who had for the most part received naturally or artificially such protection as previous small-pox is capable of affording. In the 80 or 90 years which separated the introduction and abandonment of inoculation there had been enormous improve-

ments in the healthiness of large towns, the influence of which, upon small-pox in particular, had been interfered with and masked by the propagation of this disease artificially.

33. When inoculation of the small-pox became more general in accordance with the method adopted by the Suttons, failure of the operation was in some cases attributed to the patient having previously suffered from cow-pox. Jenner, who was practising at Berkeley, in Gloucestershire, became impressed with this belief. He found, however, that some who had undergone the cow-pox, on inoculation with the small-pox, felt its influence just the same as if no disease had been communicated to them by the cow. This experience was shared by the medical men in his district. Jenner then proceeded to draw distinctions between what he called the true cow-pox, and other varieties of "spontaneous eruptions" on the teats, which he classed together as spurious cow-pox. The true cow-pox, i.e., that which was protective, he traced in origin to the heel of a horse suffering from the Grease.

34. Jenner's first writing on the cow-pox was a communication intended for the Royal Society in 1797, the original of which, it would appear, exists in manuscript in the library of the Royal College of Surgeons. The communication was not printed in the Philosophical Transactions, but was returned to Jenner, and, with additions, was published in 1798 as "An inquiry into the causes and effects of the Variolæ Vaccinæ." The original paper asserted that "matter of various kinds when absorbed into the system may produce effects in some degree similar; but what renders the cow-pox virus so extremely singular is, that the person who has been thus affected is for ever after secure from the infection of the small-pox; neither exposure to the variolous effluvia nor the insertion of the matter into the skin producing this malady."

35. Jenner states that the observations which led to the publication of his inquiry extended over 25 years. The original paper for the Royal Society contained an account of only one case of vaccination (i.e., inoculated cow-pox); the other instances cited being three cases of casual infection from the grease of the horse, and 10 cases of casual infection from the cow.

Dealing with the 10 cases of "casual cow-pox" first, it must be premised that inasmuch as the disease conveyed by the cow had in nearly all the cases taken place many years before they came to Jenner for inoculation with small-pox, it would be impossible to decide what kind of "cow-pox" it was from which they had suffered. Again, it would appear that these 10 cases had been collected from an experience of inoculation extending over some years. One case was inoculated by Jenner in 1778, another in 1791, another in 1792, two in 1795, three in 1797, and in two the date is not given. The effect of the inoculation of small-pox as applied by Jenner in these cases is recorded as local inflammation, often described as an "efflorescence," in some amounting to "erysipelas," but without any constitutional variolous symptoms. In the three cases of casual horse-grease, the date of their infection is not given. Two of these

were inoculated with small-pox, in one case six years later, in the other, " some years after," with the result of a slight inflammation only in the first case, and in the second a few eruptions on the forehead which did not advance to maturation. The third horse-grease case on exposure to infection of small-pox caught the disease, the nature of which was verified by successful inoculations in others. Jenner quotes this last case in support of his contention that the virus from the horse could not be relied upon until it had been communicated to the nipple of the cow and thence to the human subject.

36. We will return presently to the only case of vaccination mentioned in Jenner's original paper. The other cases may be thus summed up. In the course of several years' inoculation practice, Jenner collected 10 instances of insusceptibility to small-pox in persons who stated that many years or months previously they had suffered from a disease which they called the cow-pox. He added three cases of grease in the human subject, only one of which gave evidence of insusceptibility to small-pox.

37. Jenner's " Inquiry," published in 1798, reproduced the above cases, and added others. The additions were as follows :—

(1.) A case of casual cow-pox (Sarah Nelmes) from whom lymph was taken for the vaccination of Phipps, the only case of vaccination alluded to in the original paper. She does not appear to have been subjected to the variolous test. (2.) A case of insusceptibility to inoculation in 1792 who was reported to have had cow-pox 10 years previously. (3.) The paupers of Totworth, having been inoculated in 1795 by Henry Jenner, eight who proved insusceptible were reported to have had the cow-pox " at different periods of their lives " ; one of them had been attended with the cow-pox in 1782 by Jenner himself. (4.) Three cases of casual horse-grease, in servant men of a farm, two of whom had had small-pox previously ; they do not appear to have been submitted to the variolous test. (5.) A child, John Baker, was inoculated with horse-grease from the hand of one of the foregoing. The pustule appears to have shown a disposition to run into an ulcer, and " the boy unfortunately died of a fever at a parish workhouse " soon after this experiment was made, and before he could be submitted to the variolous test. (6.) Several children and adults were vaccinated directly or indirectly from a cow which had been infected with horse-grease. Three of these were submitted to the variolous test (Summers, Barge and Pead). The reason why the test was not applied to others is thus stated by Jenner :—" After the many fruitless attempts to give the small-pox to those who had had the cow-pox, it did not appear necessary, nor was it convenient to me, to inoculate the whole of those who had been the subjects of these late trials."

38. The original paper and inquiry of Jenner taken together therefore furnish us with four cases in which the human subject had been intentionally cow-poxed, and to whom the " variolous test " had been subsequently applied, viz., Phipps, Summers, Barge and Pead. The facts in regard to these four cases, as given by Jenner, are summarised in the following table :—

Name.	Age.	Date of Vaccination.	Date of Inoculation.	Result.
1. Phipps ...	8 years	May 14, 1796	1. July 1, 1796 2. "Several months afterwards"	"1. The same appearances were observable on the arms as we commonly see when a patient has had variolous matter applied, after having either cow-pox or the small-pox." "2. No sensible effect was produced on the constitution."
2. Summers	5 years	Mar. 16, 1798	(No date), but before June 21, 1798	"He was inoculated with variolous matter from a fresh pustule; but, as in the preceding cases, the system did not feel the effects of it in the smallest degree."
3. Pead ...	8 years	Mar. 28, 1798	(No date), but before June 21, 1798	Inoculated by Henry Jenner, who reported:—
4. Barge ...	7 years	Apr. 19 (?), 1798		"I have inoculated Pead and Barge, two of the boys whom you lately infected with the cow-pox. On the second day the incisions were inflamed and there was a pale inflammatory stain around them. On the third day these appearances were still increasing, and their arms itched considerably. On the fourth day the inflammation was evidently subsiding, and on the sixth it was scarcely perceptible. No symptoms of indisposition followed."

In these four cases, therefore, subsequent inoculation within a few weeks or months gave results upon which Jenner based the claim that insusceptibility to small-pox was conferred by inoculation of cow-pox.

39. The value of this " variolous test," i.e., the failure of inoculation of small-pox to produce the disease in those who had had the cow-pox, as a test of acquired immunity has been disputed. To assess its value, it is necessary to know what results were likely to occur when the test was similarly applied to those not cow-poxed.

40. It is difficult to arrive at any numerical estimate of the proportion of cases of inoculation, in the modified form in which it was practised at the end of last century, in which little or no eruption of pustules appeared upon the body. There can be no doubt that such cases were more common in the practice of the Suttons and of Dimsdale than in the hands of the earlier inoculators. The cause of the mildness has been variously attributed to drugs, to open-air treatment, to taking the lymph early, to using lymph from the " mother pustule," etc., but whatever the cause of the mildness, and even when there was only a local pustule, or merely local inflammation, and constitutional symptoms short of any general eruption, the operation was regarded as effective, and the patients were held by some inoculators to have gone through the small-pox, and acquired protection. Adams, in 1805, operating with a mild variety of small-pox, succeeded in carrying on inoculation, in some cases from arm to arm, in such a form that the results on the arm were described as of " legitimate vaccine appearance " ; and in half his cases there was no eruption. This and other attempts by Adams, at the Small-pox Hospital in the early years of this century, to perpetuate a favourable small-pox, were interrupted by the prejudices of parents in favour of secondary pustules ; although it was urged that " before the discovery of cow-pox, the inoculation of small-pox was sometimes only followed by a pustule at the arm, with the attendant fever." Adams' experiments of arm-to-arm variolation, giving " vaccine " results, received subsequent corroboration from those of Guillou and Thiele. This mild variety of small-pox had been observed by Jenner, and in 1789 he appears to have used it under the name of swine-pox for the inoculation of his son ; and he held that by arm-to-arm inoculation under certain conditions a mild small-pox might be produced at will.

4895, 5008, 4850. 11,144. 11,141. 10,435. 11,150. Vol. I., App., p. 68, footnote. 25,249.

41. The fact that small-pox could be inoculated under certain conditions so as to produce minimum results has an important bearing—

1. Upon the interpretation to be placed upon the " variolous test " as applied to vaccinated persons ; and
2. Upon the nature of a series of inoculations by Woodville at the Small-pox Hospital with what was called cow-pox, which undoubtedly did much to found the belief that vaccination secured immunity towards small-pox.

42. In regard to the first point, it will be necessary to note, in cases where cow-poxed persons were subjected to inoculation to test their immunity, what was the amount of the local and constitutional results to be expected from the method of inoculation adopted, and how far the actual results differed from those obtained in persons who had not previously had the cow-pox. Whether resistance to the " variolous test " implied protection against natural or epidemic small-pox must be reserved for consideration later on. In regard to Jenner's own cases we find in his " Inquiry," after alluding to the mild variety of small-pox, which Adams termed " pearl-pox," he goes on to speak of " the attention that was paid to the state of the variolous matter previous to the experiment of inserting it into the arms of those who had gone through the cow-pox. This," he says, " I conceive to be of great importance in conducting these experiments, and were it always properly attended to by those who inoculate for the small-pox, it might prevent much subsequent mischief and confusion."

43. In one case in the " Inquiry " Jenner does make mention of the source of the variolous matter which he used for his test. In Case 3 (Phillips), he says, " It was taken from the arm of a boy just before the commencement of the eruptive fever, and instantly inserted." It was therefore arm-to-arm variolation from an early " mother-pustule." In regard to the two cases of vaccination by Jenner set out in the foregoing table, the following statements as to the variolation are made :—In Phipps's case " he was inoculated with variolous matter immediately taken from a pustule." In Summers's case " he was inoculated with variolous matter from a fresh pustule." It is not possible to say, therefore, that in these two cases the method employed differed from that adopted in Case 3 (Phillips).

Vol. IV., App. 1, p. 398.

Now the results obtained in these cases were hardly less than the results obtained in some cases by Dimsdale and other inoculators in persons who had not previously been cow-poxed, but who were nevertheless regarded as having thereby received the infection to an extent sufficient to establish immunity.

44. It appears from Jenner's later publications and correspondence that he sometimes met with more definite results from the insertion of variolous matter in the arms of those who had been cow-poxed than in the cases mentioned in the Inquiry ; in some cases a pustule or vesicle resulted, capable of communicating small-pox, and often attended with extensive inflammation and sometimes by a slight eruption. (Baron, Vol. I, 445, Medico-Chi. Trans., Vol. I.) It is also clear that cow-pox lymph from one of the same stocks used by Jenner (the Stonehouse cow-pox), and in his hands stated to be protective, in the hands of neighbouring surgeons, when submitted to the variolous test, failed to prevent the development of inoculated small-pox in the usual way. Jenner's Inquiry was read with interest by leading medical men in this country, and for the most part appears to have been favourably received. Haygarth, Percival of Manchester, Ingenhousz (who was on a visit to England), and others

11,780—1.

254.

11,966.

11,975.

asked for more evidence of the alleged protection. Moseley, who led the opposition to the practice, doubted whether the vaccinated would stand proof against epidemic small-pox, and declared the protection to be non-specific and temporary. Dr. Beddoes, of Bristol, who was not unfriendly to Jenner, thus summed up the position of affairs at the beginning of 1799, in a letter to Professor Hüfeland, of Berlin :—" You know Dr. Jenner's experiments with the cow-pox. His idea of the origin of the virus appears to be quite indemonstrable, and the facts which I have collected are not favourable to his opinion that the cow-pox gives complete immunity from the natural infection of small-pox. Moreover, the cow-pox matter produces foul ulcers, and in that respect is a worse disease than the mildly inoculated small-pox." (Hüfeland's Med. Journal, 1799.) He adds that experiments were to be carried out at the London Small-pox Hospital.

45. Thus the matter stood when, in January, 1799, cow-pox was discovered in a dairy in the Gray's Inn Lane, London, and attracted the attention of the leading medical men in town, and became the subject of experiments on a large scale by Drs. Woodville and Pearson at the Small-pox Hospital. 11,182.

Woodville published the results of his experiments in May, 1799, and Pearson in March of the same year distributed the hospital lymph to some 200 practitioners at home and abroad. 11,185.

46. This was the starting point of the practice of " vaccination " ; for Jenner had lost his strain of lymph. Woodville's cases merit careful attention, as from their number and detail, and from the fact that he had submitted nearly all of them to the variolous test within three months of their " vaccination," and found they resisted it, they produced a profound impression on the mind of the public and the profession. In July, 1800, 33 of the most eminent physicians and 40 distinguished surgeons of the metropolis signed a declaration to the effect that " those persons who have had the cow-pox are perfectly secure from the future infection of the small-pox, and that the inoculated cow-pox is a much milder and safer disease than the inoculated small-pox." ("Morning Herald," July 19th, 1800.)

47. We are unable to find in these early days of vaccination any other evidence on a scale at all comparable to that of Woodville in confirmation of the views advanced by Jenner ; and it is clear that professional authority declared for vaccination mainly upon the experience of Woodville and Pearson.

48. We have received a great deal of evidence on the subject of the nature of the lymph used and distributed so widely at home and abroad by Woodville and Pearson. Its effects differed from those of inoculated cow-pox as described by Jenner, and as observed since, in that in the majority of the cases detailed in Woodville's Reports pustules appeared on the body similar to small-pox pustules ; indeed, Woodville spoke of the cow-pox as an eruptive disease, in one case even as confluent, and as sometimes contagious. It is 4878. 25,234. 25,246. 11,776.

now not disputed that these pustular cases, three-fifths of the whole,
11,239. were cases of small-pox, and that their resistance to the variolous test accordingly proved nothing as to the alleged protection conferred by cow-pox. How was this source of error introduced, and what was the nature of the remaining two-fifths of the cases?

4874. Some, at any rate, of the "vaccinations" appear to have been performed within the precincts of the small-pox hospital, and it has been suggested that the infection was aërially conveyed.

In several of the first cases (Collingridge, R. Payne, Redding, Pink), small-pox matter was inoculated on the "vaccinated" patient a few days after the cow-pox, and this may have led to contamination.

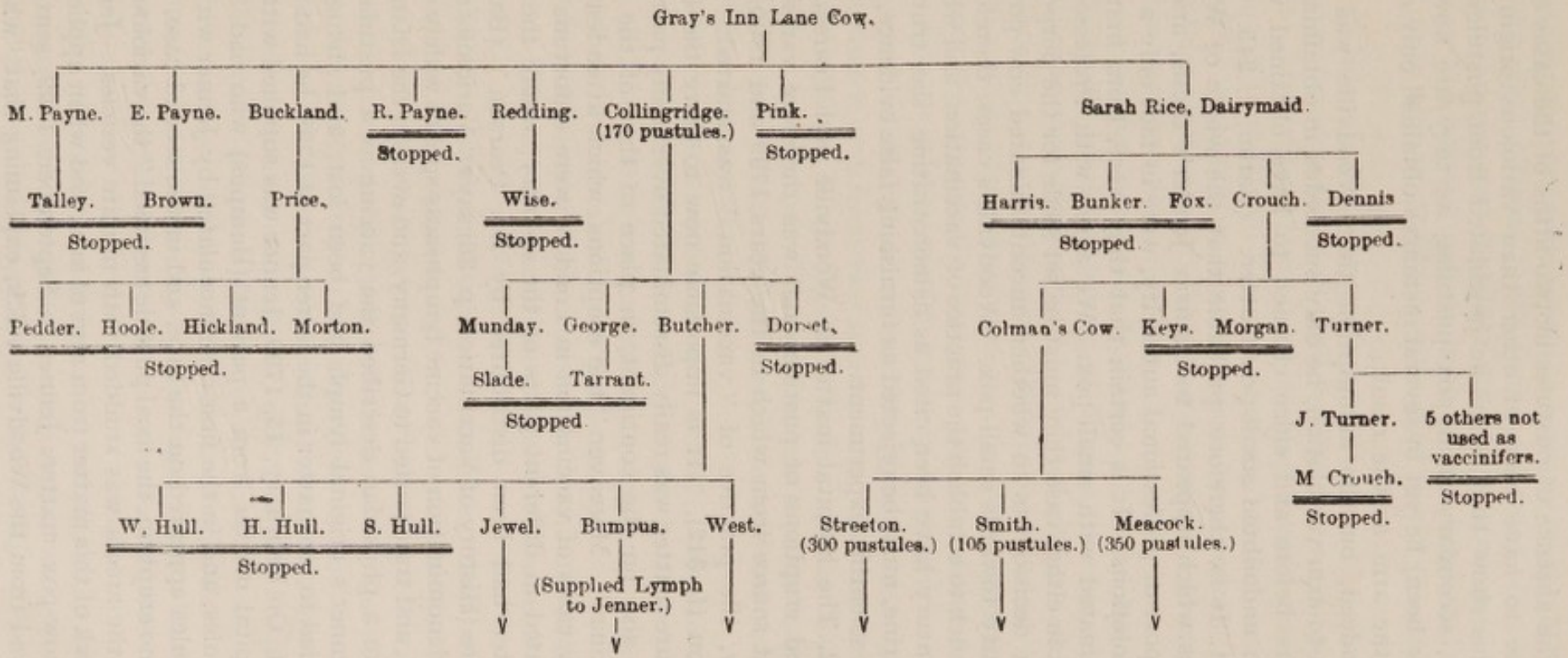
49. But one of the very first cases (Buckland) which Woodville believed he had only inoculated with matter "in a purulent state"
25,224. direct from the cow exhibited all the symptoms (including a pustular eruption commencing on the inoculated arm), which make it in the highest degree probable that this patient was in fact variolated when he was supposed to have been vaccinated.

50. The three persons (Streeton, Smith, and Meacock) inoculated from a cow (Coleman's) which had been inoculated at one remove from a pustule on the hand of a dairy-maid at the Gray's Inn Lane Dairy, similarly at the proper time developed small-pox in a way highly suggestive of its having been inoculated at the place and time of what purported to be vaccination; from these three persons much of the lymph was taken for the subsequent inoculations. The only other case (Collingridge), inoculated direct from the cow, used to any extent for subsequent inoculations, was purposely variolated on the fifth day of her vaccination; it is impossible to establish that the first inoculation in her case was in fact that of cow-pox, and it may well have been, as in the first case mentioned above (Buckland), that what purported to be vaccination was in truth variolation. Her own subsequent symptoms, as well as the results on those inoculated from her arm, support such supposition. Indeed, Woodville's lymph passed exclusively through those suffering from small-pox, for he seems to have avoided carrying on matter from those who exhibited only the local pustule as the result of their inoculation from the Gray's Inn Lane cow, or dairymaid.

Vol. VI., App., p. 619—623.

PEDIGREE OF WOODVILLE'S "HOSPITAL MATTER,"

Showing how the strain continued only through subjects with small-pox pustules.



The absence of pustules in two-fifths of the cases does not prove these to have been of other than variolous origin. Woodville's tables show that when he inoculated from pustules on the body (i.e., secondary small-pox pustules, as they are now admitted to have been) he yet in several instances obtained only a local pustule on the arm as the result.

4895. Indeed, on the assumption that Woodville was dealing with
25,249. arm-to-arm variolation, he only succeeded in obtaining what inocu-
25,265. lators before and since claimed to have obtained when working with undoubted small-pox matter. (Baron, I, 245.)

25,270. 51. It is, therefore, probable that the whole of Woodville's 500 cases which appeared to confirm Jenner's thesis, and secured the support of professional authority, were in fact only a series of mild variolations. It is certain that they were, from first to last, contaminated with small-pox. We agree with Professor Crookshank that in either case they must be set aside for the purpose of arriving
12,089. at a decision as to whether uncontaminated cow-pox confers im-
11,813. munity towards small-pox. Woodville's cases, therefore, which did so much to establish the practice of vaccination, and which for nearly a century have been cited as demonstrating the truth of Jenner's doctrine, must be rejected as furnishing false evidence, and valueless as a scientific experiment.

11,815. 52. The hospital matter of Woodville and Pearson, which produced eruptions of pustules and was therefore variolous, was the great source from which in the years 1799 and 1800, and perhaps later, the practice of "vaccination" was started. According to Baron (I. 312), "It is impossible now to deny the fact that this
11,764. impure matter was really disseminated over many parts of England, and also on the continent, in place of that of the true variolæ
11,192— vaccinæ." Moreover "the eruptions, which attended many of the
11,204. early cases of vaccination in London, were unfortunately also propagated in different parts of the country, where the *contaminated* matter had been distributed by Dr. Pearson" (Baron, I. 339). Moore (History of Vaccination, p. 36) says "Variolous matter, under the denomination of vaccine lymph, was spread widely through England, and transported to Germany, and even to the Island of Madeira, where a physician described the vaccine as a pustular disease."

11,978. Jenner's original lymph had been lost, and though repeatedly applied to for matter in the latter part of 1798, he had none to send.

11,847. 53. On February, 15, 1799, Jenner was supplied with Woodville's
25,276. Hospital matter from a patient (Bumpus) who had 310 variolous pustules, and in the first case inoculated by Jenner with this matter pustules appeared on the face, and in the second case, though there was no eruption, the local pustule assumed "the variolous character," and the areola was studded with minute vesicles. Jenner kept up a stock of this matter from arm to arm, and when applied to by Ring for cow-pox matter, Jenner in September, 1799, sent him matter derived from the Woodville stock, explaining that "when I had the

pleasure of receiving your letter there was no cow-pox matter here in I fit state to send you " (Baron, I, 358, and Crookshank, II 184-6). at would therefore appear that if at that time Jenner possessed any other strain than the hospital matter, such as the Kentish Town lymph alluded to in section 27 of our colleagues' report, it was not fit for use.

54. Writing to Moore in 1812 Jenner accused Pearson of " spreading the small-pox through the land, and calling it the cow-pox " (Baron, II 383). The medical journals of the time furnish evidence that the lymph of Woodville and Pearson, when used in the country, produced variolous eruptions in some instances even proving contagious as it had done in London. Those thus inoculated also proved refractory to the variolous test. 11,192—11,204. 25,303.

55. It is true, as stated in sections 20, 23 and 27 of the majority report, that Woodville speaks of having at various times procured lymph from different cows, and with it inoculated patients in the hospital (" Observations on the Cow-pox," 1800) ; but he adds, " the effects of all the matter I tried were perfectly similar ; and pustules proved to be not less frequently the consequence of these trials than with those made of the matter formerly employed."

56. In the report of the Vaccine-Pock Institution, 1803 (page 4), it is stated that it was from two sources *only*, viz., the Gray's Inn Lane lymph taken by Woodville and Pearson, and the Marylebone lymph taken by Pearson, that the matter used in London and the provinces in or about 1799, to the extent of some four or five thousand inoculations, was derived. 25,219.

57. In the letter which Pearson sent on March 12, 1799, enclosing a thread imbued with matter, to 200 practitioners, he stated that " in many of the cases eruptions on the body appeared, some of which could not be distinguished from the small-pox." 11,185.

This same " hospital matter " was also widely distributed abroad, to Paris, Berlin, Vienna, Geneva, Hanover, and to Portugal and America. 11,190.

58. We read of this matter producing variolous eruptions in distant places as it had done at home, and in some cases the variolous test showed a refractoriness had been acquired. The hospital matter of Woodville and Pearson would appear to have been the chief source of the first stocks of lymph used on the Continent and in America. It is true Stromeyer of Hanover also received matter from Jenner, but as it produced tedious ulcerations he gave it up in favour of Pearson's stock, which he says " produces frequently an eruption of small pimples." We have been unable to trace the extensive use of any matter sent abroad from this country in these early years which can be clearly shown to have had other origin than the stock of Woodville and Pearson. 11,204.

59. Fresh stocks of lymph were later raised by Sacco and others from various sources, such as spontaneous cow-pox, horse-grease, and sheep-pox. Even if we accept Sacco's somewhat sensational

accounts of his work we do not find in it corroboration of the thesis of Jenner that cow-pox derived from the grease of the horse is possessed of specific efficacy such as is not possessed by spontaneous cow-pox or the grease as taken from the horse. And as to the matter used by de Carro and sent by him to the East and used so extensively in India, which our colleagues suggest (sect. 27) establishes the use of cow-pox lymph abroad of other than British origin, we learn from de Carro :—" The source of our cow-pox is partly British, and partly originating from the *grease* of a horse at Milan, without any intervention of a cow. The effect was so similar in every respect that they were soon mixed, that is to say, that it was impossible to say, after several generations, and in the hands of innumerable practitioners, what was equine and what was vaccine. The whole British settlements in India have been *' equinated '* ; for the first liquid drop which I sent 25 years ago to India was the second generation of Milanese equine, transplanted at Vienna." (Letter from de Carro to Monro, " Edinburgh Journal of Medical Science," Vol. I, 1826, p. 284-5.)

11,826. 11,680. 11,847. 12,002—12,018.

60. Apart from the vague statements of Marshall, which must be received with reserve, we are unable to find in the early days of vaccination any large body of definite evidence sufficient to establish the contention of Jenner, that cow-pox, and especially that of equine origin, affords, when conveyed to man, security from the future infection of small-pox.

61. Whatever may have been the nature of the matter used and so widely distributed by Woodville and Pearson, and even if we must regard it all as derived from small-pox, it seems that after a time, whether from attenuation or dilution of the original matter, or the selection of mild cases, or from other causes, the operation gradually ceased to be followed by pustular eruptions, was no longer infectious, and came to assume the local phenomena now observed in ordinary vaccination.

11,204.

62. It is clear, therefore, that the bulk of the cases of " vaccination," which in the first few years of the practice were shortly afterwards submitted to the variolous test, and of which record remains, had been inoculated with the hospital lymph of Woodville and Pearson. It would have been satisfactory to find evidence on a similar scale, and recorded with equal detail, of cases inoculated with cow-pox matter pure and simple, and submitted at subsequent periods to the variolous test or epidemic exposure, and showing immunity towards small-pox. Though much research has been directed to this point, it appears to have been almost entirely barren of result.

11,795.

12,087.

63. We shall adduce reasons later on for thinking that under the one name of " vaccination " matter derived from various sources, and of diverse origins, has been introduced at different times. It is now no longer possible to trace or distinguish these. We, therefore, in using the term " vaccination," must be held to employ it colloquially, and not exclusively as an equivalent for cow-poxing.

64. In the early years of this century it was not unnaturally argued that the renunciation of inoculation was a necessary consequence of the approval of vaccination, and the milder operation was authoritatively urged in substitution of the old practice. In 1808 Jenner contributed a paper to the "Medico-Chirurgical Transactions," in which, after guarding those who thought fit to inoculate after vaccination from unnecessary alarm should a pustule, fever, and a slight eruption ensue therefrom, he concluded thus :—"At the commencement of vaccination I deemed this test of security necessary ; but I now feel confident that we have one of equal efficacy, and infinitely less hazardous, in the re-insertion of the vaccine lymph." Bryce about the same time advocated the same practice, which was adopted by many, and came to be spoken of as "Bryce's test." (Practical Observations on the inoculation of the cow-pox, 1809.) The significance of this test of re-vaccination we shall discuss later on in connection with the modern development of that practice. 11,853.

65. Though in his first essays Jenner merely suggested vaccination as a substitute, in certain cases, for inoculation, there can be no doubt that the claim he originally made for vaccination was one of complete and permanent protection against small-pox. Jenner in his "Inquiry" observed "what renders the cow-pox virus so extremely singular is, that the person who has been thus affected is for ever after secure from the infection of the small-pox."

66. Cases in which small-pox had occurred after cow-pox had frequently been pressed upon Jenner's attention (Gregory's "Eruptive Fevers," p. 208), and in his third publication in 1801 Jenner thus alludes to these objectors :—"Some there are who suppose the security from small-pox obtained through the cow-pox will be of a temporary nature only. This supposition is refuted, not only by analogy with respect to the habits of diseases of a similar nature, but by incontrovertible facts, which appear in great number against it." He claimed that it had been uniformly found that "the human frame, when once it has felt the influence of the genuine cow-pox in the way that has been described, is never afterwards, at any period of its existence, assailable by the small-pox." In his evidence before a Committee of the House of Commons in 1802 he maintained that "it now becomes too manifest to admit of controversy, that the annihila- of the small-pox, the most dreadful scourge of the human species, must be the final result of this practice." In his petition to the House of Commons he states that he had discovered that "the cow-pox admits of being inoculated on the human frame with the most perfect ease and safety, and is attended with the singularly beneficial effect of rendering through life the persons so inoculated perfectly secure from the infection of the small-pox." (Baron, I, 490). 1st Report, App., p. 94.

67. It was not long, however, before cases of small-pox in those who had been vaccinated began to crop up. Goldson of Portsea published some cases in 1804 ; Moseley, Birch and others called attention to failures in London, and in 1809, Brown of Mussel- 25,336. 25,472.

11,853. burgh published a work containing a number of cases of post-vaccinal small-pox which raised doubts as to the efficacy of the practice and suggested that its powers at best were only temporary. There were also reports from abroad of small-pox subsequent to vaccination, especially in Geneva. (Baron, I, 338.)

68. Further failures in London, and particularly one in the family of a nobleman in 1811, excited some opposition to the practice. In 1818 Dr. Monro of Edinburgh published a number of cases observed by himself and others in which small-pox in its perfect form succeeded to vaccination in its perfect form. Small-pox continued to be epidemic in Scotland, attacking many hundreds of the vaccinated in various degrees, and Dr. Thomson wrote a book in 1820 on the varioloid type of the disease. In 1819, nineteen, and in 1825, 147, vaccinated persons were admitted with small-pox into the London Small-pox Hospital.

Vol. I., App., p. 74. 69. Other countries of Europe suffered severely from small-pox about this time, and the theory that ascribed to vaccination the reduction of small-pox in the earlier years of the century, in some places to the point of extinction, received a rude shock. In 1828 a severe epidemic broke out at Marseilles, and 2,000 vaccinated persons caught the disease.

70. In Copenhagen, where the absence of fatal small-pox from 1811 to 1823 had been confidently attributed to the introduction of vaccination, in 1824 there were 41 deaths from small-pox, and in 1835, 434, or 11.2 per cent. of the total deaths. It appears from Dr. Gregory (Lectures on Eruptive Fevers, p. 214), who gives a " Table exhibiting the amount and mortality by small-pox in the well-vaccinated population of Copenhagen, from 1824 to 1835," that of 3,839 persons attacked by small-pox no fewer than 3,093 had been vaccinated. It was these figures that led Dr. Gregory, the physician to the Small-pox Hospital, in 1843, to declare " that some material error had crept into the views originally entertained regarding the power and capabilities of the vaccine inoculation. If small-pox can invade so large a proportion of a well-vaccinated population, it is obvious that all idea of banishing that disease from the earth is vain and illusory."

Vol. I., App., p. 74. 71. The fall in small-pox death rate observed in many places in the first vicennium of this century can hardly be ascribed to vaccination. If the limited and voluntary practice of the operation could be so influential upon small-pox mortality as such a theory demands, it is strange indeed that the more complete and compulsory adoption of it should have been so uninfluential against recurring epidemics as was especially exemplified in the pandemic of 1870-74, and against more recent outbreaks in this country and abroad, in which the vaccinated figured largely among the victims.

22,433. 72. The vaccinated, nowadays, generally constitute the majority of the patients in small-pox hospitals, and in certain limited outbreaks only vaccinated persons have been attacked.

Vol. I., App., p. 116 Thus, Mr. Marson records 3,094 cases of post-vaccinal small-pox treated by him at the Highgate Hospital between 1836 and 1851, and

a further series of 10,661 such cases between the years 1852 and 1867.

Dr. Gayton during the years 1870 to 1883 treated 8,234 cases of small-pox in vaccinated persons in the hospitals of the Metropolitan Asylums Board. At Sheffield in 1887-8, 5,035 vaccinated persons were attacked by small-pox. 1683. 1809. Shef. Rep., p. 191.

It is, however, superfluous to cite further evidence at this stage to prove, what is no longer denied by anybody, that small-pox attacks the vaccinated.

No witness who has appeared before us has maintained the original contention of Jenner and the earlier vaccinators, and the protection now claimed by those who assert such protection is relative, not absolute; temporary and not permanent.

73. It was at one time alleged that even if vaccination did not invariably prevent attack by small-pox, yet such attack was modified and never severe or fatal. There can, however, be no doubt that fatal small-pox and cases of the disease in all its various types of severity occur in persons who have been successfully vaccinated.

74. Dr. Gayton's tables include fatal cases, not only in those stated to be vaccinated but without visible marks, nor only in those whose marks were considered to be imperfect, but also amongst those who exhibited at the time of their attack one, two, three, and four good marks of vaccination. We are not now concerned with the question of relative mortality in the various classes, to which we shall return, but these and numerous other examples suffice to prove, what we believe is no longer disputed by anyone, that severe and fatal small-pox occurs in those who have been successfully vaccinated. As affecting the kind of attack, as well as liability to attack, the influence now claimed for vaccination is a relative one; that is to say, the contention is, that admitting to the full the occurrence of small-pox, and even death from small-pox in the vaccinated, yet the vaccinated are relatively to the unvaccinated in a superior position both as regards the liability to be attacked and the chance of the disease assuming a severe or fatal form. 2nd Report, App. 3, Table A.

75. Restricting our attention in the first instance to the question of liability to attack, it is right to state that in the earlier part of this century, when cases of the failure of vaccination began to multiply, it was urged that inasmuch as small-pox itself did not invariably prevent a second attack, it was unreasonable to expect that vaccination could accomplish more. This view appeared to receive support when experiments seemed to show that the cow-pox was merely the small-pox of the cow, and it was said the vaccinated are protected against small-pox because they have in fact had it. Indeed, the Select Committee of the House of Commons which inquired into the operation of the Vaccination Act in 1871 reported that they had no doubt "that the almost universal opinion of medical science and authority is in accordance with Dr. Gull when he states that vaccination is as protective against small-pox as small-pox itself." 1st Report, App., p. 69.

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76. We have already shown that such protection is by no means absolute, but we cannot recall a single witness who has been examined by us on this question who has not admitted that whatever may be the amount of protection afforded by vaccination it is at any rate less than that conferred by a previous attack of small-pox.

The Registrar-General, in his 43rd Annual Report, thus states the view of "the best authorities" on this point: he says, "it is pretty generally recognised, and this on good grounds, that the immunity derived from vaccination is both less perfect and less permanent than that conferred by small-pox itself; its efficacy diminishing with the lapse of time, while the protective influence of small-pox remains practically unaltered."

654—5. Dr. Ogle thinks there is no doubt that the protection by previous small-pox is greater than that of vaccination.

Dr. Gayton, after quoting a later opinion of Jenner's to the effect that the protection by vaccination was tantamount to that of an attack of small-pox, says, "Proofs are abundant already, and will continue to accumulate, to disprove these statements."

1801. Mr. Marson, in the 16 years following 1836, and when he estimated the number of persons who had been inoculated or had small-pox to be probably about equal to the number of those who had been vaccinated, found that only 47 persons were admitted to the hospital suffering from small-pox after the natural or inoculated disease, whereas there were 3.094 cases of small-pox after vaccination.

3770. Mr. Sweeting is of opinion that vaccination is decidedly less protective than a previous attack of small-pox.

At Sheffield, in the 1887-88 epidemic, Dr. Barry found, as the result of his census, that 18,292 persons, or 6.6. of the enumerated population of the borough of Sheffield, had had small-pox prior to 1887. Of these, 23 were attacked again in 1887-88, and five died. This gives an attack-rate of 13 per 10,000 against an attack-rate of 155 per 10,000 in the vaccinated.

Sheffield Rep., p. 202

p. 180.

77. The evidence leads us to the conclusion recorded by Dr. Gregory, the physician to the Small-pox Hospital, in 1843, viz., "that any attempt to institute a parallel between cases of small-pox after vaccination, and cases of secondary or recurrent small-pox, must fail."

78. The vaccinated, therefore, stand in a position very inferior to that of those who have previously undergone small-pox *quâ* liability to an attack of small-pox. We now proceed to inquire, do the vaccinated stand in a superior position to the unvaccinated?

In other words, is the attack-rate of small-pox amongst the vaccinated less in proportion to their numbers than it is amongst the unvaccinated?

79. Various methods of arriving at an answer to this question have been attempted. A comparison has been made between the ratio of the vaccinated to the unvaccinated of those admitted to hospital with small-pox, and what is estimated to be the ratio of the vaccinated

to the unvaccinated in the general population. If vaccination were an absolute protection we should, of course, find only unvaccinated patients in small-pox hospitals. If the protection were, though not absolute, yet relatively great, we should expect to find the proportion of the vaccinated patients relatively small. And in proportion as the ratio of the vaccinated to the unvaccinated in the hospital approximates to that obtaining outside (assuming the admissions to be a fair sample of the whole cases) we must regard the protection against attack of small-pox as approximately to *nil*.

80. No hospital supplies so large an experience, extending over a long series of years, as the London Small-pox Hospital. We learn from the figures recorded by Mr. Marson and Dr. Munk, and the reports of the hospital, that the percentage of cases of vaccinated small-pox patients to the total admissions has progressively increased with the increase of vaccination among the general population, if not in exact ratio, at any rate in a ratio approximating closely to it.

Munk, R. 0 on S. P. Hosps., 4670.

Years.	Post-vaccinal Small-pox per Cent. of Total.
1826	38
1835-45	44
1845-55	64
1855-65	78
1863	83
1864	84
1878-79	93
1885	93
1888-91 ... (14 cases only)	100

Marson, 1871 Rep., 4190.

9090.

81. We are not aware of any grounds for thinking that at any time more than 90 per cent. of Londoners have been vaccinated. Judging from the vaccination returns the proportion would seem to be less than this, and the evidence derived from local investigations supports the latter view.

The percentage of children not finally accounted for as regards vaccination in London is given as follows by the Local Government Board for the years since 1872 :—

Rep. for 1894—5, p. 2.

1872	8.8	1883	6.5
1873	8.7	1884	6.8
1874	8.8	1885	7.0
1875	9.3	1886	7.8
1876	6.5	1887	9.0
1877	7.1	1888	10.3
1878	7.1	1889	11.6
1879	7.8	1890	13.9
1880	7.0	1891	16.4
1881	5.7	1892	18.4
1882	6.6		

Similar figures are not obtainable prior to 1872, but there is no doubt that if they could be had they would not show less vaccinal

default than do those of later years; and this would be especially true of years prior to the first Compulsory Vaccination Act of 1853.

82. These figures lend no support to the supposition that the number of vaccinated persons* in London exceeds, if indeed it reaches, 90 per cent. of the whole. We are unable, therefore, to infer from the statistics of the London Small-pox Hospital that vaccination has any very marked effect in reducing the liability to attack by small-pox, seeing that the proportion of vaccinated cases to the total has increased with the increasing proportion of the vaccinated in the population.

83. Another method of arriving at the relative liability to attack in the vaccinated and unvaccinated respectively has been by censuses taken in connection with epidemics in particular towns. Such censuses have, as in the case of Sheffield, comprised the whole population, or as in the cases of Dewsbury, Leicester and Warrington, been restricted to particular parts or to the infected houses.

84. The figures derived from these reports have been set out in such detail in sections 176 to 309 of our colleagues' report that it is needless to recapitulate them. We regret that owing to the reports from Dewsbury, Warrington and Leicester having been made by medical men selected by the Commission, opportunity for examination upon them has been precluded. We shall, therefore, merely draw attention to certain points which we think require to be emphasised.

29,333—29,341. 85. In the case of the Sheffield outbreak, Dr. Barry has explained to us the manner in which his vaccination census was conducted. We are unable to agree that a census conducted after an epidemic has reached its height, and after endeavours have been made to get every one vaccinated who has not already had the disease, is of much value in determining the incidence of small-pox upon the vaccinated and unvaccinated classes respectively. It is true that after Dr. Barry's attention had been called to this source of fallacy he made an attempt to correct the effect of it, and the figures so corrected are given in sections 232 and 234 of our colleagues' report. We doubt whether, even in the corrected figures, anything like a sufficient allowance has been made for the transfer from the unvaccinated to the vaccinated class before the date of the census. This transfer had been so great that in one district, that of Upper Hallam, only one person was found unvaccinated in the invaded houses at the time of the census, and he had had the small-pox during the epidemic. This would give an attack rate of 100 per cent. of the unvaccinated in this particular case. This is, of course, an extreme instance, but it serves to exhibit the fallacy we are dealing with. Not only were persons at ages above those of childhood vaccinated for the first time during the epidemic, but children were

Sheffield Rep., p. 161

29,333. 2472. 2376—2432.

* In Marylebone, one of the better vaccinated parishes of London, an examination of 2,838 children attending various schools in 1894 showed 25.6 per cent. were unvaccinated. (*Sanitary Chronicles of Marylebone*, August and September, 1894.)

vaccinated at an earlier age. Indeed, the rush to be vaccinated, and the pressure brought to bear, tended to inflate the vaccinated population and to reduce the unvaccinated population to zero, or at any rate to restrict it to those of them who had survived an attack of small-pox. The result of a census thus obtained is such as one would naturally expect from assessing the cases of small-pox upon a greatly augmented population in the case of the vaccinated, and a greatly reduced population in the case of the unvaccinated. This criticism would apply even more strong in the case of censuses of invaded households.

For these and other reasons, we think that censuses thus obtained are of little or no value in determining the incidence of small-pox on the two classes.

86. Another method of arriving at the proportion of the vaccinated to the unvaccinated in the population would be by reference to the vaccination registers. It is, however, only since 1872 that these have been compiled in their present form.

In Sheffield, we learn from Table XCVII (p. 185 of Dr. Barry's report) that for the years 1878-87, 84 per cent. of the children born during those years were successfully vaccinated, some 10 per cent. died unvaccinated, and 4.5 per cent. remained unaccounted for. But in arriving at a conclusion as to the proportion of the whole population vaccinated on the basis of the vaccination registers, it is necessary to bear in mind that the proportion of the vaccinated amongst those born before the Vaccination Acts of 1853, 1867 and 1871 was in all probability very much less ; thus in 1862, at an inspection of the borough school children by an inspector of the Privy Council, 13 or 14 per cent. were found unvaccinated. It would be hazardous to assert, in view of these facts, that the proportion of the vaccinated in the whole population of Sheffield at or about the beginning of the epidemic much exceeded 90 per cent. Now of the cases of small-pox investigated by Dr. Barry in the epidemic of 1887-88, 4,151 out of 4,703, or 88 per cent., were vaccinated.

Sheffield Rep., p. xv.

At Warrington, which like Sheffield had obeyed the vaccination laws perhaps somewhat better than the average of large towns, the percentage of the births unaccounted for as regards vaccination given for the years 1874-89, in Table VIII of Dr. Savill's report, varied from 1.7 in 1874 to 8.1 in 1883. Having regard to the facts we have already alluded to in the case of Sheffield, we should doubt whether the proportion of the whole population at Warrington who were vaccinated before the commencement of the epidemic in May, 1892, greatly exceeded 90 per cent. Of the 667 cases of small-pox investigated by Dr. Savill, 69 were unvaccinated and 598 were included in the various vaccinated classes, or 89.7 per cent.

2403.

Warrington Rep., p. 25.

p. 28.

In Leicester, which in the beginning of 1893 was described by the medical officer of health as " practically an unvaccinated town," there had been in 1872 to 1875 only 2, 3 or 4 per cent. of the births unaccounted for as regards vaccination, but from 1885 onwards more

Leicester Rep., p. 38.

than half the births were thus unaccounted for, and from 1888 to 1892 the vaccinal default amounted to from 77 to 80 per cent. of the births.

p. 45. If we assume 50 or 60 per cent. of the population of Leicester to have been vaccinated at the time of the outbreak, it is interesting to observe that of the 357 cases dealt with by Dr. Coupland, 158 were unvaccinated (including 4 " under vaccination "), and 199 (including one doubtful vaccination), or 55.7 per cent., were vaccinated.

p. 3. 87. Dr. Coupland remarks that " the natural liability to small-pox, unaffected by vaccination, was not so great as has been supposed." He found the attack rate much the same at different ages, despite the great variations in the proportion vaccinated according to his census :—

p. 3.

	Vaccinated. per Cent.	Attacked. per Cent.
Under 1 year	3.0	21.2
1 to 10	26.0	28.9
10 to 30	84.5	28.1
Above 30	97.3	20.5

Dewsbury Rep., p. 10 88. In Dewsbury for twenty years vaccination has been greatly neglected ; from 1873 to 1876 the vaccinal default was from 22.9 to 35.3 per cent. of the births, from 1877 to 1883 the default was less, varying between 12.6 and 19.8, but for the ten years prior to the outbreak, about a third of the children born remained unvaccinated. It would scarcely be safe to assume that of the whole population in 1891 more than two-thirds, or between 60 and 70 per cent.,

p. 113. were vaccinated. Of the 1,019 cases of small-pox dealt with by Dr. Coupland 367, or 36 per cent., were unvaccinated (including 21 " under vaccination "), and 652, or 64 per cent., were vaccinated (including 25 alleged to have been vaccinated).

89. It would appear therefore that whether as in the case of the London Small-pox Hospital we have regard to the ratio of vaccinated to unvaccinated persons attacked compared with the varying ratio of the vaccinated to unvaccinated in the population at large, or whether we consider the similar ratios in different towns where vaccination has been practised to varying degrees, we find that for the population at all ages the proportion of small-pox attacks on the two classes of vaccinated and unvaccinated respectively approximates closely to the proportion which the two classes bear to each other in the population generally.

90. Whatever influence vaccination may exert against small-pox, then, would appear to lie somewhere between none at all on the one hand, and very considerably less than that of a previous attack of small-pox on the other.

91. We have not received as yet the report of Dr. Coupland from Gloucester, but from the figures contained in section 243 of the report of our colleagues it would appear that from a census made of persons in infected houses 30 per cent. of the vaccinated were attacked, and 46 per cent. of the unvaccinated nearly all of whom were children under ten years of age.

92. The accompanying table serves to show the relative severity in regard to attack rate, mortality, and case-mortality in the various towns from which we have received special reports.

Place.	Date.	Population.	Cases.	Case-Incidence per 10,000 living.	Deaths.	Mortality per 10,000 living.	Fatality per cent. of Cases.
Sheffield ...	1887-88	316,288	6,088	192.4	589	18.6	9.7
Warrington ...	1892-93	54,084	667	123.3	62	11.4	9.3
Dewsbury ...	1891-92	162,596	1,029	63.2	110	6.7	10.7
Leicester ...	1892-93	184,547	357	19.3	21	1.1	5.8

The above table shows that Leicester and Dewsbury in which vaccination had been much neglected came off better as regards both attack rate and mortality than did Sheffield and Warrington in which vaccination had been well carried out. And further, while in Leicester, where only 55 per cent. of the cases of small-pox were in vaccinated persons, the fatality was 5.8 per cent.; in Sheffield and Warrington, where more than 80 per cent. of the cases of small-pox were in vaccinated persons, the fatality was 9 per cent. The fact that only 22 or 25 per cent. of the deaths occurred in children under ten is but small compensation to Sheffield and Warrington for their high attack rate and mortality rate.

93. When we proceed to inquire whether vaccination exerts an influence upon the character of an attack of small-pox so as to render it milder or less fatal than it would otherwise have been, our investigation becomes more difficult. If the influence of vaccination on small-pox be only or chiefly that of mitigating the severity of an attack of that disease, rather than the prevention thereof, an important argument for insisting upon the practice on public grounds is neutralised. It is asserted that mild natural small-pox is or may be as infectious as the severer forms, and indeed it is often found that outbreaks of the disease have been traced to infection from unrecognised small-pox in vaccinated persons, the disease being, it is said, so modified in its features by vaccination. If this be so, vaccination may well be a matter for personal choice, as an agency calculated to ameliorate individual cases of the disease, but, if it exert little or no influence against attack by small-pox, it cannot be insisted on as a means of reducing danger to the public by way of infection.

94. Analogy does not here render us much assistance; there is so far as we are aware no evidence to show that in the case of other infectious diseases, attacks of which are held to confer immunity towards subsequent attacks, such second attacks should they occur are milder than the first. Indeed, there is evidence pointing in the opposite direction.

95. Are we then to institute a comparison between the case-mortality or fatality of small-pox last century and the present? Or between times and places where vaccination has been neglected and

those wherein it has been well carried out ? Or shall we find an answer to the question in the comparison of the fatality in the vaccinated and unvaccinated respectively in recent outbreaks ? If we make the last comparison, are we able to sort the two classes accurately, and is vaccination the only material point of distinction between the two classes ?

96. We have received a great deal of evidence directed to all these points. Broadly speaking, while there has always been considerable variation in the fatality of the disease at different times and in different places, from about 1 in 3 (33 per cent.) to about 1 in 40 (2.5 per cent.), the fatality on a large number of cases averages about 1 in 7 or 8 (14.3 or 12.5 per cent.). This was the average fatality of natural small-pox generally accepted last century, and used by Bernouilli for his calculations in 1760, as stated in section 53 of our colleagues' report.

7057. 8336—7.

Vol III., App. 3, p. 201.

24,802.

Jurin's figures, based upon a large number of cases collected by him during the first half of last century, give a fatality from natural small-pox of 16.5 per cent. of those attacked. We agree with our colleagues that the criticism made upon Jurin's figures, to the effect that deaths under two years of age were excluded, fails to establish the alleged fact.

97. The fatality observed on a total of 60,855 cases of small-pox in the hospitals of the Metropolitan Asylums Board from 1870 to 1894 was 16.7 per cent. This rate includes vaccinated and unvaccinated without distinction. It is important to point out that caution must be observed in comparing the fatality in hospital with cases treated at home, and also in comparing hospital fatality regard must be had to whether all cases are admitted to hospital or only the more severe. Thus in recent years in London, when the great majority of small-pox cases are at once removed to hospital, the fatality has been as low as 7 or 8 per cent., while in earlier years, when the Asylums Board's hospitals were less generally resorted to and the accommodation limited, the fatality was as high as 20 or 21 per cent.

Rep. for 1894.

98. In order to obtain a large aggregate we may add together the London and the provincial figures :—

	Cases.	Deaths.
London (1870-94) ...	60,855	10,183
Sheffield	6,088	589
Dewsbury	1,029	110
Warrington	667	62
Leicester	357	21

Here we have a total of 68,996 cases with 10,965 deaths, or a fatality of 15.8 per cent.

99. The broad result is that when large figures are taken, the fatality of small-pox now, with a large majority of the cases protected by vaccination, is about the same as it was last century, when none of the cases had received any protective rite.

100. It is true that when the cases of small-pox in various epidemics in this country and abroad have been sorted into groups according to whether the patients have been vaccinated or not, the result is almost invariably to show a higher rate of fatality in the unvaccinated than in the vaccinated class. The range of difference is considerable. Fatalities in the vaccinated from 1 per cent. to 18 per cent., but rarely higher, are recorded. Unvaccinated fatalities of 9, 13, 30 and 50 per cent., and even higher, are recorded. In some sets of figures the unvaccinated fatality rate is three, four, and five times that of the vaccinated ; in others, such as the Berlin and Duisburg figures for 1871-72, the rates at various ages are not very different in the two classes.

Table N., App., vol. pp. 240 and 236.

6814.

101. It has been argued that the difference of the case mortality in the two classes is not due, or not wholly due, to the presence or absence of vaccination, and further that the division into the two classes is not properly made.

Vol. VI., App. 14, p. 720.

It is alleged that the unvaccinated differ qualitatively as well as quantitatively from the vaccinated. Thus, this class, it is urged, includes (1) infants under the age of vaccination ; (2) those whose vaccination is postponed on account of poor health in obedience to the instruction to public vaccinators to vaccinate only those who are healthy ; and (3) those of the lowest and most neglected social class. Inasmuch as these, when they constitute a considerable proportion of the whole unvaccinated class, would, from reasons apart from vaccination, raise the case mortality, it is urged that the high fatality of the unvaccinated must not be ascribed merely to the fact of their non-vaccination.

8713.

Objection has also been made to the classification by marks on the skin of cases of a disease whose chief symptom is, and the chief cause of whose fatality is, the abundance of an eruption on the skin. It is claimed that the fact of vaccination or non-vaccination of small-pox patients should be determined by reference to the vaccination registers, not by the visibility of marks on the arm.

8709.

Reference has been made to some of these objections in our colleagues' report, but we hardly think sufficient weight has been attached to them. It is clear that if these objections are well founded, some part of the difference between the fatality of the vaccinated and the unvaccinated is explicable without reference to vaccination. It is difficult to say whether the whole difference can be thus explained.

102. There can be no doubt that in towns where vaccination has been well carried out a considerable proportion of the unvaccinated population consists of young infants. Thus at Warrington it was found by Dr. Savill that of 57 unvaccinated children living in the invaded houses, 22 were under one year, of these 13 were one month or under, and of these eight were attacked, and all of them died ; these eight babies constituted one-third of the total unvaccinated deaths. The inclusion of such cases in the unvaccinated class raises the unvaccinated case mortality, while the vaccinated class is necessarily free from a similar contingent of young infants.

Warrington Rep. pp. 35, 39, 49, 54.

103. A certain number of children are every year reported as having had their vaccination postponed by medical certificate on account of ill-health ; thus, in the year 1892, 13,278 were so reported in England and Wales. It is possible some of the ailments necessitating postponement may not have been very serious, but this again constitutes a sub-class of the unvaccinated class which has no counterpart among the vaccinated, and may have an influence on the case mortality. It is obvious that the importance of the presence of these two classes of the very young and the postponed among the unvaccinated becomes greater in proportion to the strictness with which the Vaccinations Acts are enforced. In towns where the Acts are thoroughly carried out the unvaccinated class should consist almost exclusively of these two sub-classes, in whom it is urged a high fatality rate is to be naturally anticipated. It is certainly curious to note that while the unvaccinated fatality rate is given as 49.6 per cent. at Sheffield and 35.3 per cent. at Warrington, at both of which vaccination has been thoroughly enforced, at Leicester, where the unvaccinated class was much larger and very differently composed, the unvaccinated fatality is recorded as 12.0 per cent. The mere fact of non-vaccination is evidently insufficient to explain this remarkable difference.

1842—3.

104. Dr. Gayton thinks the unvaccinated patients he treated were drawn from a poorer class than the vaccinated, and that this circumstance would tend to make the fatality among them higher than in the vaccinated. It would appear that, except in towns where the Acts are not administered, a not inconsiderable proportion of the unvaccinated is contributed by waifs and strays and paupers. Dr. Stevens, in giving evidence before the Hospitals Commission of 1882 (Q. 3434), thus explained the prevalence of small-pox in London. He said there were three very distinct classes of people who helped to keep up small-pox in London. " First of all from a very large class, viz., immigrants ; and those immigrants I calculate to the extent of two-thirds, are workhouse-born people. I estimate, of course, very roughly, there are about 10,000 children born every year in workhouses and lying-in institutions, and hitherto they have universally escaped vaccination, because once out of the workhouse unvaccinated it is impossible to get at them, no one knows of them, and having lost their birth record they wander about, and to a large extent get up to London and get small-pox. Then just imagine the numbers of years that these unvaccinated workhouse children have been accumulating." That among such persons, apart from vaccination, a high fatality rate should obtain is at least probable. We know that Dr. Murchison, from the figures he collected at the London Fever Hospital, found that social class as well as age had an influence on the case-mortality of typhus fever. He found :—

In paying patients a fatality of	...	...	14.89	per cent.
,, free non-pauper ,,	,,	...	...	18.58 ,,
,, parish paupers ,,	,,	...	...	27.64 ,,

The influence of social class upon case mortality of infectious diseases is also brought out by comparing the statistics of the London Fever Hospital, which now only admits paying or non-pauper patients, with those of the Metropolitan Asylums Board hospitals, which admit pauper and non-paying patients.

Hopwood, Lord's Com 1891, 21,675—21,682.

CASE-MORTALITY IN 1889 FROM

	Scarlet Fever.	Typhoid.	Diphtheria.
London Fever Hospital ...	1.2	5.2	17.6
Metropolitan Asylums Board hospitals	8.85	15.15	40.74

Ann. Rep., M.A.B., p. 18.

We think it probable that social class has an influence upon small-pox fatality in the same direction.

105. Three main varieties of small-pox are recognised—the discrete, the confluent and the malignant. The first is rarely fatal even in the unvaccinated ; the last is almost always fatal even in the vaccinated. It is the confluent variety that mainly dominates the case mortality of the whole. Now it is in the confluent variety that question is most likely to arise as to whether marks of vaccination are present or not. If seen early, before the eruption is complete, no difficulty may be encountered, but in cases not seen until a later stage, in which the eruption is abundant and the liability to a fatal issue great, difficulty has undoubtedly occurred. It is in these worst cases that in the opinion of Dr. Birdwood there is risk of including vaccinated cases in the unvaccinated category. Indeed, so alive to the difficulty of classification by marks is Dr. Birdwood that, after an experience of 12,000 cases of small-pox, he is of opinion that " the evidence of primary vaccination collected in small-pox hospitals should not be relied on. Because—

30,826—37.

1816—20.

30,832—47.

31,230.

31,061.

" (1.) On the outbreak of an epidemic there is necessarily much administrative confusion, and many untrained observers. The early observations are incomplete and faulty.

" (2.) In the worst instances the eruption may be sufficient to, and does, obscure the scars.

31,221.

" (3.) The statement of parents as to primary vaccination, and of adult patients as to re-vaccination, should be accepted even when scars are not seen.

" (4.) Scars produced in infancy grow with the growth of the body, as was pointed out, I understand, by Sir James Paget.

" (5.) In such statistics insufficient allowance is made for other circumstances, such as occupation, intemperance, and the existence of other diseases. An altogether different death-rate might be anticipated if small-pox broke out in a public school, or in the infirm and aged wards of a workhouse. A typhoid fever patient, or an ill-fed baby, catching discrete small-pox and dying, would be counted a death from small-pox, obviously neither vaccination nor its neglect having anything to do with it.

" (6.) The accurate observation and record of clinical details is one of the most difficult duties required of medical men employed in hospitals for infectious disease."

28,461. 2330. 2359. 28,480. 28,744. 31,250. 28,468. 16,447. 16,621.

106. We could have wished, in view of the doubt cast upon the classification of small-pox patients into vaccinated and unvaccinated, that resort had been oftener had to the vaccination registers for corroboration or correction.

We note that Dr. Savill was alive to the difficulties to which we have alluded ; in his report on the Warrington outbreak, he says :—" In nearly all fatal cases the eruption is profuse and tends to hide the vaccination scars if they exist. Hence the doctor's or nurse's evidence ' unvaccinated ' if based solely on their own observation is less valuable than the doctor's statement ' vaccinated.' Such

Warrington Rep., p. 34.

was probably the source of error which arose in Case 473. If the pocks are very plentiful, or are situated over the vaccination scars, or when the congestion and induration of the skin, so characteristic of severe small-pox, is present in large amount, then the plainest of scars, and certainly a faint one, is liable to be described as absent."

He also cites an instance in which reference to the vaccination register sufficed to rectify an important error :—" Cases 79 and 75. The brothers Peter and James L——, æt. 20 and 8 respectively, are very good illustrations of the difficulties which often beset an inquiry as to vaccination in fatal cases. For a long while I was assured on good authority that they were both unvaccinated persons. I was told that no record could be traced of their vaccination, and no marks could be seen during life. The death certificate, of which

Ibid.

I procured a copy, contained the word ' unvaccinated ' in both cases. Both mother and father of these lads were dead, and those members of the family available could give me no definite information. I therefore included them, at first, in the unvaccinated class. But some time later I succeeded in finding an older brother, who stated in general terms that he was sure all his brothers and sisters had been vaccinated except little Walter, another child who contracted the disease and recovered (Case 80). This statement was confirmed by his uncle Sam and an old friend of his mother's. Next I sought an old friend and servant of the family, who said she always ' thought Peter was vaccinated ; but as to Jimmy I used to see his marks thro' washin' 'im so often ; he had two good 'uns.' Finally, I determined to search the vaccination register myself and found that against the name of Peter L——, who was born on May 26th, 1872, the vaccination entries were vacant, but against the name of James L——, who was born on April 12, 1884, was an entry of successful vaccination on August 22, 1884."

107. Dr. Savill also calls attention to the fact that vaccination scars tend to become obliterated with age, and to alter in character with time.

108. In earlier statistics, and in many of Dr. Luff's tables in

M.A.B. Rep. for 1893.

regard to small-pox in London, only two classes appear, viz., those vaccinated and those unvaccinated, apparently no evidence as to vaccination being accepted except the presence or absence of scars on the arms. Dr. Ricketts, of the Small-pox Hospital Ships, calls

especial attention to this class in his report for the year 1893, showing that "an absolute reliance ought not to be placed on this evidence. There is no doubt that cases occur in which vaccination has been successfully performed, although cicatrices are not present when the attack of small-pox supervenes. There is a small class, too, but naturally a very fatal class, in which the rash is too abundant over the upper part of the arm for an assertion to be made that scars are absent." Dr. Ricketts truly observes that "in considering the vaccination statistics of small-pox cases, it is clear that, in comparing the vaccinated with the unvaccinated class, it would never do to leave out of consideration these doubtful cases among which the fatality is so high, a class which includes nearly a quarter of the total deaths." p. 163. p. 138.

109. Attempts have been made to classify cases of small-pox according to their severity as well as according to their fatality. This classification is open to the obvious objection that "no two men could, independently, classify the same series of cases in the same way." When a further division of the severe and mild cases into vaccinated and unvaccinated is made, another source of error is introduced by reason of the inconclusiveness of the evidence as to vaccination. P. 136.

110. When we consider all the sources of error to which we have alluded we are led to conclude that the difference in fatality between the vaccinated and unvaccinated small-pox patients is not as great as is sometimes contended, and that so far as it exists it cannot be due merely to the effect of vaccination, while the fact that the fatality of all cases lumped together is practically the same now as it was in the unvaccinated of last century, when large numbers are taken for comparison, strongly suggests that the inclusion of a large contingent of vaccinated persons has not exerted a mitigating effect on the average fatality of the whole.

111. In view of the fact now recognised, that whatever protection vaccination affords against small-pox is temporary and relative, not permanent and absolute, various attempts have been made to determine what is the shortest period within which an attack of small pox can occur after vaccination. We have shown that the variolous test, or the inoculation of the vaccinated, was largely given up after the first few years of this century, Jenner and Bryce advocating the re-insertion of vaccine lymph as a test of equal efficacy. The records of attempts at producing small-pox by inoculation at various periods after vaccination are, therefore, not very numerous. We shall allude to some of those which have been laid before us. Evidence is also available on the point in question as the result of inquiries which have been made as to the date of vaccination and the onset of subsequent small-pox in various epidemics. Lastly, we have the results of re-vaccination at different intervals of time from primary vaccination.

112. Goldson, of Portsea, in 1804 published cases of the inoculated 95,472—8.

and the natural disease occurring within two or three years of vaccination. In 1809 Brown, of Musselburgh, published his "Inquiry into the Anti-variolous Power of Vaccination," in which he recorded 48 cases of children who had caught small-pox within three four, five, six, seven, eight, nine and ten years of their vaccination. He relates also how he had abandoned inoculation since the year 1800, having been satisfied with the negative results he obtained in those whom he had tested a few weeks or months after their vaccination. The occurrence of small-pox in vaccinated children led Brown to apply the variolous test to some vaccinated children at a longer interval of time; he then found that after the lapse of from three to six years vaccination no longer rendered the variolous tests ineffectual, and he was forced to the conviction "that vaccination even in the most perfect form is not only incapable of imparting permanent security against small-pox, but even of retaining the system in that state of impregnation capable of only allowing it to exercise its influence to a safe or trifling extent." It is a matter of regret that the writings of Brown and Goldson were not received with the attention and courtesy from their contemporaries that they deserved. Had they been then fairly considered much misapprehension and misrepresentation might have been avoided.

11,852.

11,855.

25,479.

25,517—21.

113. A relatively low fatality rate in vaccinated children under ten is, as is shown in the report, a remarkable feature in recent epidemics, and this, if it were constant, might well be urged as a ground for encouraging the practice of infant vaccination when small-pox is prevalent, if no other means for controlling the disease were available. This, however, is not the case, and we believe that, if the measures of prompt detection and isolation we advise were universally and energetically adopted, there would be no excuse for allowing small-pox to run riot or to invade the settled population, and least of all to attack young children.

Sheffield Rep. p. 178.

114. We find that at Sheffield in 1787-88 there were according to the census 353 cases of small-pox in vaccinated children under ten years of age, of whom 121 were under five, of whom 11 were under one. In children vaccinated by public vaccinators we find cases of severe small-pox at six years, three years, two years, and under one year; the first two were fatal. There is a case of very slight small-pox at six months and one 14 days after vaccination.

29,381—2.
29,388.

28,391—2.
29,415.
29,409.

It is usual to exclude cases at a less interval than a fortnight after vaccination from the vaccinated category, on the ground that the vaccination had not at that period exercised its influence on the constitution, although the "success" of vaccination is registered on the eighth day after the operation; there are plenty of instances, in this and other outbreaks, of the two diseases running their courses together in the same person.

29,411.
19,814—5.
28,708.

Dewsbury Rep., p. 114

At Dewsbury in 1891-92 there were 44 cases of small-pox in vaccinated children under ten years of age, of whom 17 were under five.

Warrington Rep., pp. 51 and 54.

At Warrington in 1892-93 there were 33 cases of small-pox in vaccinated children under 10 years of age, of which two were confluent attacks and terminated fatally.

In London in 1892-93 there were 110 cases of small-pox in vaccinated children under ten, 27 of which were under five, and of these seven were under one. London Rep., pp. 6 and 16.

Dr. Browning, medical officer of health for Rotherhithe, writing in 1892, called attention to the fact that children and adults recently vaccinated with humanised lymph, and some showing good marks, worthy of an extra grant from the Government inspector, yet took small-pox within a few days, months, or years of their vaccination. He cited 25 cases of small-pox in vaccinated children under ten, of whom three died. 8429. 12,386. (note).

Dr. Gayton in London between 1870 and 1884 saw 1,306 cases of small-pox in children under 10 stated to have been vaccinated; of these 137 died, 303 of these cases were between the ages of two and five with 56 deaths, 58 were under two with 12 deaths. Vol. I., App., p.245. 1755. 1768.

Dr. Gayton accordingly thinks that "primary vaccination is a very fleeting protection indeed," and that it is not absolutely protective up to any age whatever.

115. It has been argued that, inasmuch as cow-pox is to be regarded as the small-pox of the cow, and as vaccination is to place the vaccinated in the same position as if they had been through an attack of small-pox, the repetition of the operation is to be held to be the equivalent of the old variolous test. That consequently as long as revaccination is successful, it indicates that the person so successfully re-vaccinated had re-acquired susceptibility to small-pox. If this view be correct it would be strange indeed that, while vaccination was unable to protect an individual against the repeated operation of its own poison, it was yet capable of protecting against the operation of the more potent poison of small-pox. 173. 177. 1837—9.

116. The difficulty of this position was early realised by Dr. Pearson and the directors of the Vaccine Pock Institution; in their report for the year 1803 (p. 49) they declared that persons who had undergone vaccination could not undergo it a second time, and that persons who had undergone small-pox could not be infected with the cow-pox. These views are strangely out of harmony with the experience and practice of to-day.

117. If we accept, with Jenner and Bryce, the theory that revaccination is a test of susceptibility to small-pox "of equal efficacy" with variolous inoculation, we then have a means whereby we may gauge the duration of the temporary protection or antagonism conferred by vaccination.

118. The earliest experience of re-vaccination on an extensive scale is recorded by Heim in the Wirtemberg army in 1829. Out of more than 14,000 soldiers who were re-vaccinated about 60 per cent. exhibited perfect or modified success. Another series gave a perfect success in more than 50 per cent. of the re-vaccinations. Moreover, a perfect result was obtained not less frequently in those who presented normal cicatrices than in those in whom the scars of primary vaccination were defective; and again there was no marked difference in Vol. I., App., p. 47.

the success of vaccination on those soldiers who bore marks of small-pox from that which attended the re-vaccination of those who did not.

Vol. II., App. 8, p. 277.

119. The experience derived in recent years from our own army is similar. The table put in by Brigade-Surgeon Nash shows that in nearly half of the re-vaccinations of soldiers and recruits perfect vaccinal pustules are obtained; in about a fourth of the whole a modified success occurs; while in the remainder the operation gives a negative result.

11,606.

Higher percentages of success are recorded by continental observers, 70, 80 and even 90 per cent. being mentioned in the case of military re-vaccinations. In the case of school children in Germany at the age of 13 or 14 the success rate is 70 to 82 per cent.

11,607—11,649. 11,619. 11,626.

120. M. Layet, of Bordeaux, has recorded the results of a large number of re-vaccinations of school children at different ages, with calf lymph. Putting aside the partial or modified results, described by him as *fausse vaccine*, he found that in 41 to 45 per cent. of the whole number at all ages he obtained perfect vaccine vesicles. Moreover, his success-rate was about the same in children of six years old as it was in those over 13. The exclusion of the modified successes or *fausse vaccine* from Layet's figures makes his success-rate appear lower than that of other observers, who included all degrees of success. The striking feature about Layet's figures is that vaccinated children of six show as great a susceptibility, or, as it is argued, as much unprotectedness against small-pox, as do those of 13.

Vol. IV., App. 1, pp. 407-8.

Vol. II., App. 8, p. 277.

121. Similar experience is afforded by the results of re-vaccination of the children of soldiers in this country. The success-rate is greater and the failures fewer in the case of the re-vaccination of children than in that of soldiers or recruits. Inasmuch as the latter are further removed from their primary vaccination, want of success of re-vaccination can hardly be ascribed to the abiding influence of the first operation. Indeed the fact that the success-rate in the re-vaccination of children approximates nearly to that of their primary vaccinations, while the primary vaccination of recruits and soldiers is less successful than that of children, strongly suggests that the failure or modified success of re-vaccination in adults is due not to the abiding influence of a primary vaccination, but to other changes the result of age.

Trans. of Sanitary Institute, Vol. XIII, pp. 116—3.

122. The results of vaccinations and re-vaccinations in the army formed the subject of an interesting paper by Professor F. Smith, of the Army Veterinary School, communicated to the Sanitary Institute in 1892, and entitled "For how long does vaccination confer immunity against small-pox?" He noted that the percentage of successful vaccinations was 92.64 per cent., of successful re-vaccinations 88.37 per cent. Of the 79,591 re-vaccinations, 15,842 had a modified success, and 54,497 had perfect vesicles. In the latter "the vesicles are as perfectly defined as in a primary vaccination. It is important to bear this fact in mind, for no matter what view we take of the modified vesicle, I think there can be no doubt that

a person who develops a perfect vesicle is one who would have contracted small-pox if exposed to the contagion. On examining the 5,832 primary vaccinations it is found that 92.64 per cent. were successful ; these vaccinations were only 4¼ per cent. better than the re-vaccinations. In what way are we to interpret these results ? It is certain that of 79,591 persons only 11.63 per cent. (adopting vaccination as a test) were protected against small-pox, and this number may be further reduced when we consider that many of the failures were due to other causes than protection, for of the primary vaccinations 7.36 per cent. failed. If, therefore, we take these figures as representing the failures due to inert lymph, etc., it leaves only 4.27 per cent. of the adults as protected against small-pox by their previous vaccinations."

Professor Smith further states that within three years of a thorough re-vaccination it is possible for a person to be successfully re-vaccinated, the result produced being naturally of a modified character. He adds : " I can, however, go a step further than this, and affirm that, after a successful primary vaccination, it is possible to successfully re-vaccinate a person 12 months later, the only difference between the first and second vaccinations being that the latter will run a more rapid course, though, excepting for this fact, the character of the vesicle produced is nearly indistinguishable from a primary inoculation."

123. If vaccine is to be regarded as attenuated variola, we are not aware of any ground for anticipating that after immunity towards the weaker virus has ceased, immunity towards the stronger virus should continue. 4540—4552.

124. That even severe small-pox does not prevent the success of subsequent vaccination is shown by the experience of Dr. Scroggie, of Aberdeen, quoted by Mr. Skelton :—

" Although a second attack of small-pox is very uncommon, I re-vaccinated 15 cases who had had the disease,some of them severely, as indicated by the deep and numerous pittings left, and in 13 found them susceptible to the vaccine virus. The disease is usually fatal at the extremes of life, so I have vaccinated from the infant of a few weeks to the adults from 80 to 90 years of age. The re-vaccinations done were 356 in number, and of these 339 were successful." 28,029—30.

125. It would appear from the foregoing facts that while shortly after vaccination there may be a certain amount of immunity or antagonism to the influence of renewed vaccination, or inoculation with small-pox, and therefore, it may be argued, to the natural disease, this soon wears off, perhaps more rapidly in some than in others. It would seem that in the majority of cases susceptibility to re-vaccination is encountered in a few years, though tests at shorter intervals do not appear to have been extensively made. The evidence suggests that insusceptibility towards inoculation is not more lasting ; while cases of natural small-pox are recorded at all possible intervals subsequent to vaccination.

126. Attention is called in section 293 of our colleague's report to the results of some 20,000 cases of small-pox when classified according to the number of marks they exhibited. It must be borne in mind that these cases must be regarded as 20,000 failures of the protective properties of vaccination as originally proclaimed, and that it would not be very remarkable if, speaking generally, it were to be found that in classifying cases of a disease whose fatality is mainly due to the amount of eruption, those cases would on the whole show a higher recovery rate in whom a greater number of scars could be clearly discerned on the skin of the arm.

127. In regard to the manner and degree in which the number and quality of the vaccination cicatrices exert an influence over the liability to or the severity of subsequent small-pox, we have
846. received a good deal of conflicting evidence. It has been argued that if the virus of the vaccine disease be of a self-multiplying character,
11,893. one insertion should, as was originally held, be as efficacious as
11,642. many; and that the nature of the cicatrix being due largely to local causes, or individual peculiarities, this can indicate nothing as to the constitutional effect which the virus has produced. On the other hand, a large collection of statistics, such as those of Marson and others, has been adduced to prove that the mitigating effect of vaccination varies with the number of cicatrices, and that the area and foveation of the scars affect the fatality of subsequent small-pox.

128. There are some points in regard to the late Mr. Marson's
224,301. statistics which it would have been well to have elucidated further, but it has not appeared possible to do so. We refer especially to
841.
30,832—4. his method of deducting deaths due to superadded disease, and to
31,221. his mode of dealing with cases in which abundance of the eruption
31,230
31,235. obscured the cicatrices, cases which occasioned considerable diffi-
11,618.
11,642. culty in classification to his predecessor, Dr. Gregory, and to many later observers. There is a good deal of evidence, especially from France, showing that neither the number nor the quality of primary cicatrices exerts any influence upon the success of re-vaccination; indeed, it is noted by some observers that re-vaccination is more
1706—11. likely to take in those in whom the scars of primary vaccination are large and well marked. Moreover, it would appear that in the practice of the most experienced vaccinators, and with the same lymph of the best quality, the cicatrices vary immensely; some are
11,892. plain, some puckered, some foveated; indeed, one French observer has figured some 70 varieties of scar resulting from vaccination. This
11,893. would tend to show that differences of constitution, age, the mode of performing the operation, the extent of the local inflammation, etc., have an important bearing on the qualities of the resulting scars.

129. We are also struck with the different methods adopted by
1700—1706. different observers in classifying cases of small-pox according to the vaccination marks. Thus, Dr. Gayton, who collected 10,403 cases, informed us that when he found one good mark and three imperfect

marks, he might class them as a case of two good marks, or he would ignore the three imperfect marks and class the case as one of a single good mark.

Dr. Gayton, among his 10,403 cases of small-pox admitted to hospitals of the Metropolitan Asylums Board between the years 1870 and 1884, found 2,085, or 20 per cent. of the whole number, to be what he calls "vaccinated with good marks," while Mr. Sweeting, at another of the Board's hospitals in the years 1880-85, out of 2,584 cases only placed 39, or 1.5 per cent., in the category of "good vaccination." It is evident that such a difference indicates a wide margin for personal discrimination as to what is and what is not "good vaccination." Vol. 2., p. 245, App 3689.

At Dewsbury, Dr. Coupland reports that while small-pox proved fatal in ten cases out of 175 with two marks, no death occurred among the 34 cases with only one mark; and again, while one death occurred among the 42 persons with four or more marks, all the 210 with three marks recovered. Dewsbury, Rep., p. 115

Dr. Luff's figures for London show a higher fatality among those with two marks than in those with one mark; in the former it was 3.4 per cent., and in the latter 2.7 per cent. In Marson's figures the one mark cases were accorded a fatality of 13.8 per cent. in 1852-67. Vol. I., App., p. 116

Dr. Savill does not classify the Warrington cases according to marks, but he gives cases and illustrations to show that small-pox is sometimes more severe in those members of a family who present first class or typically perfect scars than in those who show indifferent evidence of vaccination. Such cases, he was subsequently led to think, were exceptional. Warrington Rep., p. 42.

Mr. Sweeting's figures seem to show that age has an important bearing upon any influence the number of the vaccination marks may exert. Thus over 30 years of age he found that the fatality was— 3717.

With	1 mark,	124	cases with	19	deaths, or	15.32	per cent.
,,	2 marks,	149	,,	20	,,	13.42	,,
,,	3 ,,	105	,,	16	,,	15.23	,,
,,	4 ,,	50	,,	7	,,	14.00	,,
,,	5 or more	27	,,	4	,,	14.81	,,

So that it would appear that after 30 years of age the number of the scars is a matter of indifference as regards fatality of small-pox.

130. We cannot, in view of the diversity of classification adopted, and the abundant sources of error to which such basis of division is inherently liable, attach any great importance to statistics dealing with the number of the cicatrices. As to quality, it seems that the character of scars is largely dependent on conditions other than the nature of the lymph employed, and any relationship between quality of scar and succeeding small-pox may be the result of such conditions and not of the influence of the lymph inoculated.

131. There has been a change in the age-incidence of fatal small-pox; small-pox has been less a disease of childhood than it used to

be. Statistics collected last century, and especially during the inoculation period, when small-pox was almost endemic, seem to show that a large proportion of all children suffered from it, and the deaths from the disease were mostly those of children. Records of the 17th century suggest that the disease at that time was less prevalent and affected adults as well as children. It has been pointed out that " the whole question of the age incidence of fatal small-pox depends on the frequency of the epidemics. If an epidemic comes once in 20 years you will not have the same proportion of
25,743. deaths under five years as you have in a place where it comes in a period of less than five years. It all depends upon that and there is no possibility of getting any general law from isolated places."

132. While it seems to be true that last century in towns and places where, through absence of any precaution against spread, or by promiscuous inoculation, small-pox was kept endemic, the bulk of the small-pox deaths were of persons under ten years of age, this does not appear to have been uniformly the case in the country or in places where the disease was only introduced at long intervals.

24,802. 133. Thus in a most careful account of an outbreak of small-pox in the little parish of Aynho, in Northamptonshire, in 1723-24, preserved in the Royal Society's Library, it is stated that of 132 cases of the disease only 28 were under ten, and of the 25 deaths only four, or 16 per cent., were under ten. In many records from different towns the large proportion of the total deaths from small-pox which occurred in children is brought out, some 80 per cent. of the whole being under five.

134. During the present century, and especially since 1870, the larger incidence of fatal small-pox on adults has attracted attention.
1st Report, App., p. 76. There have been considerable differences in different places and in different epidemics. Thus in Paris in 1842-51 it was observed that 66 per cent. of the total small-pox deaths occurred in persons above the age of 5, while in London at about the same time only 32 per cent. of the whole were above that age. It is obvious that various casues, e.g., the ages of the exposed population and other local considerations, must be borne in mind in arriving at any conclusion as to the cause of the observed phenomena. Thus, small-pox if it spread in a school would necessarily fall upon a different age class from what it would if it spread in a factory or barracks.

135. In sections 171-192 the change of age-incidence has been fully treated in special relation to changes in the law and in regard to vaccination ; in this relation it is therefore unnecessary to labour the point further.

136. It is important to bear in mind that the change we are discussing is not merely a change of distribution of a fairly constant or diminishing number of small-pox deaths as between infants and adults, but that there has actually been in proportion to the popu ation at each age during certain years an increasing death-

rate of adults from small-pox, notwithstanding the increasing use of vaccination and re-vaccination.

137. Thus in the table contained in the 43rd Report of the Registrar-General for England it is shown that if a comparison be instituted between the small-pox death-rate at different ages during the period 1872-80 (when vaccination was as efficiently enforced as it ever has been) with the period 1847-55 (when the practice was voluntary) we find that at every age over 10 years the chance of dying of small-pox was greater in the period of compulsory vaccination.

MEAN ANNUAL DEATHS IN ENGLAND AND WALES AT DIFFERENT AGES PER MILLION LIVING AT EACH SUCH LIFE PERIOD.

	0-	5-	10-	15-	25-	45 and upwards.
1847-53.						
Voluntary vaccination ...	1,617	337	94	109	66	22
1872-80.						
Compulsory vaccination ...	323	186	98	173	141	58

30,871.

These figures are so serious that they have been urged by Dr. Bridges as sufficient ground for a revision of the law; he thinks that if these facts had been generally known at the time the Legislature would have hesitated as to the compulsory law.

138. The London figures are not less remarkable:—

ANNUAL SMALL-POX DEATH RATES PER 100,000 AT DIFFERENT AGES IN LONDON.

Thorne, 1st Report, p. 118.

	0-5 Years.	5 Years and upwards.
1851-60	130	13
1861-70	116	14
1871-80	113	34
1881-88	37	16

Thus, we see that, except in the last period (which has been one of increasing default in regard to vaccination), and then only in the case of those under five years of age, there has been no substantial reduction of small-pox mortality, while at all ages over five the mortality from small-pox has been actually greater in the last three periods than in the first. Such saving of life as there has been in London in the period 1851-88 was most noticeable in the period 1881-88, and was confined to children under five years of age.

139. It has been urged that the observed changes in age incidence of small-pox mortality point to vaccination rather than sanitary reforms as the cause of the difference, since sanitary reforms should operate equally upon all ages, while vaccination might be expected to affect especially the young. There are, however, some considerations which prevent the acceptance of this explanation, at any rate for the whole of the facts. The increased death-rate from small-pox in persons above the age of childhood might with equal

reason be ascribed to vaccination, or at least seems incompatible with the belief that the influence of vaccination against fatal small-pox is of an abiding character. Moreover, it has been pointed out
363. by the Registrar-General in his report for the year 1879 that sanitation operates differently upon the general mortality of persons at different age periods. He calls attention to the fact that " while the mortality in early life has been very notably diminished, the mortality of persons in middle or advanced life has been steadily rising for a long period of years." He adds, " That the sanitary
516. efforts made of late years should have more distinctly affected the mortality of the young is only what might be naturally anticipated ; for it is against noxious influences to which the young are more especially sensitive that the weapons of sanitary reformers have been chiefly directed." He further suggests that the enhanced mortality at later ages may in part be due to the indirect influence of sanitation by preserving from early death a vast number of children of permanently unsound constitution who so diminish the healthiness and add to the death-rates of later ages. At any rate there is evidence to disprove the assertion that sanitation in the wider sense must affect mortality at all ages equally.

140. Again, it has been fairly urged that, in order to ascertain whether the shifting of the age incidence of fatal small-pox can be fairly attributed to vaccination rather than to sanitary reforms, it is desirable to institute a comparison between small-pox deaths or death-rates at different ages and other comparable diseases rather than with the deaths or death-rates from *all* diseases.

141. Dr. Ogle thinks that the zymotic diseases would be the
516. better ones to compare small-pox with, but he truly observes : " It is impossible to make similar comparisons in the case of scarlet fever or measles, and diseases that only affect children. Fever is the only
518. one of the zymotic headings that you can take, because it is the only one that affects all ages to any extent. Fever is, therefore, the only one which it is possible to subject to this kind of investigation."

142. Now in regard to Typhus, which is not at the present time responsible for many deaths under five years of age, we learn that, comparing the earliest quinquennium which the Registrar-General's figures enable us to use with the quinquennium 1886-90, there has been a fall of 46.9 per cent. in the children's share, i.e., from 6.4 per cent. to 3.4 per cent. For the same period in the case of Typhoid fever (even when the necessary correction for varying classification in regard to remittent fever has been made) there is a fall of 51.7 per cent. in the children's share, i.e., from 17.4 per cent. to 8.4 per cent. For small-pox (even without any correction for chicken-pox) there is a fall during the same period of the children's share equal to 36.9 per cent., i.e., from 31.1 per cent. to 19.6 per cent.

Not only then do we find in certain other zymotic diseases comparable with small-pox a shifting of age incidence of the deaths so that the children's share is less and the adults' share greater than

was formerly the case, but the shifting would appear to be somewhat greater in the case of Typhus and Typhoid fevers than in the case of small-pox.

143. The diminution of mortality of infants side by side with increase of mortality of older persons, which has been claimed to specially indicate the influence of vaccination upon small-pox mortality, seems to be also true in a remarkable manner of influenza.

The Registrar-General in his Fifty-fourth Report institutes a comparison between the great influenza epidemics of 1847-48 and 1890-91, and calls attention to the fact that " the epidemic of 1890-91 was distinguished from the equally fatal epidemic of 1847-48 by the greater comparative severity with which it attacked persons of middle age," and the table he gives shows that, while at ages under 15 there was a lower rate in the last epidemic, at ages from 15 to 55 there was an enhanced mortality, while above 65 there was again a reduction.

144. We find in these facts evidence that in diseases other than small-pox, and against which no artificial protective is invoked, there has been a change in the age-incidence of deaths and death-rates in the same direction as, and not very dissimilar in amount from, that which has been asserted to be distinctive of small-pox in consequence of the special influence of vaccination upon it. We are bound to conclude that a theory of causation which takes no account of these phenomena is unequal to an adequate explanation of the whole case.

145. If we are right in our conclusion that causes other than vaccination are operative upon the age-incidence of fatal small-pox, and if, as we hold, sanitary measures are influential upon small-pox mortality, and if it be true that " it is against noxious influences to which the young are especially sensitive that the weapons of sanitary reformers have been chiefly directed," we should naturally expect to find that in sanitary or healthy districts as compared with less sanitary or unhealthy districts the reduction of small-pox mortality would be greater among the young than among the adult population.

146. That this is actually the case has been shown in section 198 of our colleagues' report. It is true that the admitted fact is there referred to the greater opportunity afforded to town dwellers of catching small-pox and catching it early. We are, however, quite unable to agree with our colleagues that overcrowding upon area or within dwellings ought not to be regarded as an insanitary circumstance, and the fact remains that sanitation or environment, or at any rate means other than vaccination, exert a profound influence, not only upon the amount of small-pox mortality, but also upon its age distribution.

147. That vaccination cannot be accepted as an adequate explanation of the shifting of age incidence of fatal small-pox, or at any rate as the sole explanation of the phenomenon, is proved by the fact that a very considerable shifting has been observed in the case of deaths from small-pox of those certified to have been unvaccinated. Now it is only since the year 1881 that the Registrar-General has

classified the deaths from small-pox into three groups, the vaccinated, the unvaccinated, and the "not stated." Confining our attention to the unvaccinated, we learn that of 3,746 deaths in the years 1881-93, 1,483 were under five years of age, or 39.5 per cent. Now it has been repeatedly stated that the normal proportion of deaths from small-pox under five to the total small-pox deaths last century (and vaccination apart) may be taken as 80 per cent. What then is the explanation of the reduction of the proportion by one half? It has indeed been alleged that vaccination may indirectly have produced the effect by reducing the amount of small-pox or controlling its virulence. If this explanation be regarded as satisfactory, it may equally be urged that any measures such as isolation and more efficient precautions against contagion may also exert a powerful influence, not only upon the amount of small-pox, but also upon its age distribution amongst the unvaccinated.

Vol. I., App., p. 76.

973—8.

148. In this connection it is not without interest to note the varying distribution of fatal small-pox according to age in the epidemic year 1871 in different districts of Scotland :—

816—9.

Public Health Reports, No. IV., p. 67.

	Total Deaths.	Deaths under Five.	Deaths under Five per Cent. of Total.
Principal towns (with population above 25,000)	886	195	22.0
Large towns (with population from 10,000 to 25,000)	143	32	22.3
Small towns (with population from 2,000 to 10,000)	209	55	26.3
Mainland rural districts	183	25	13.6
Insular rural districts	11	0	0.0

Ibid., p. 71.

In Dundee the highest proportionate infantile mortality of all was observed, the percentage under five being 28.

26,867—26,875.

6th Report, App., p. 654

We are not aware of any statistics pointing to the more thorough vaccination of the populations in the rural and island districts; indeed there is reason for thinking that default is more common in those parts than in the towns; there is, however, evidence indicating that the greater healthiness of the country districts shows itself in the small proportion of the total deaths which occur under five years.

We learn from the City Chamberlain of Glasgow (Vital, Social, and Economic Statistics of Glasgow, 1891) that while in Glasgow, in 1875-79, 45.02 per cent. of the total deaths from all causes were under five, and in the small towns 35.59 per cent., in the mainland rural districts the proportion was 26.77 and in the insular rural districts 19.90. We think it not improbable that the age distribution of deaths from such a disease as small-pox and the mortality from it at different ages may be largely governed by the extent to which, by precautions against contagion and by sanitary surroundings, the disease is kept within bounds and prevented from securing foothold upon the settled population. Where the contrary conditions prevailed and the spread of the disease was permitted and promoted, as

in London and other large towns last century, the preponderant proportionate mortality of children was what we should naturally expect.

149. The claim that a second vaccination or re-vaccination places a person in better position as regards attack or death from small-pox is based largely on the experience derived from re-vaccination of soldiers, and of nurses and attendants whose duties bring them into close relation to the disease.

It will be seen from the reports made to us that re-vaccination is by no means an absolute protection. At Warrington, of 64 re-vaccinated persons living in houses invaded by small-pox, eight were attacked, giving an attack rate of 12.5 per cent.

In London, of 108 cases of small-pox in revaccinated persons seven were severe, and four, or 3.7 per cent., fatal, a fatality-rate higher than in the once vaccinated class. 345.

150. The army, in obedience to numerous orders, has been very thoroughly re-vaccinated, and, in the opinion of Brigade-Surgeon Nash, " it is as perfect as endeavours can make it," and, indeed, he was unable to suggest any means whereby it could be made more thorough than it is. From the table he put in we learn that from 1860 to 1888 inclusive there were 3,953 cases of small-pox and 391 deaths in the army, giving a case mortality of 9.9 per cent. Considerable variation is to be observed in the attack rate and the mortality in the re-vaccinated soldiers according to where they are stationed. Thus, in the year 1888, the attack rate among troops in the United Kingdom was one per 10,000, in the Colonies 3, in India 15, in Egypt 42, and the death rates were per 10,000 in the United Kingdom .1, in the Colonies 0, in India 1.4, and in Egypt 11.9. The explanation of these differences is to be found in the difference of the degree of exposure to contagion in different places. Thus in Cairo and Assouan in 1889 an excessive amount of small-pox among the troops was traced to this cause. There were 42 cases and six deaths, giving an attack rate of 12.2 per 1,000, and a death rate of 1.75 per 1,000, rates as high as those for the whole population of Warrington during the epidemic. 3559 3560. Vol. II., App. 8, p. 28. p. 278. 3551.

The Army Medical Report for the year states :—

" A detachment of the 1st Battalion Welsh Regiment was stationed at Assouan during the latter part of 1888 and the early part of 1889 ; during that time an outbreak of small-pox occurred among the native population, and the disease broke out among the troops ; two cases also occurred on the voyage from Assouan to Cairo. Notwithstanding all the precautions taken in Cairo, and due regard having been paid to vaccination and re-vaccination, the disease kept on the increase, and in the month of May presented signs of doing so still further. The Welsh Regiment, which suffered most, was in Kasr-el-Nil Barracks, which are situated near a crowded thoroughfare and on the banks of a navigable river. It being more than probable that the disease was derived from natives, the Welsh Regiment, on the recommendation of the principal medical officer, was removed to Abbassi-

yeh, where the situation is healthier and intercourse with the natives could be prevented. Small-pox, the principal medical officer, Deputy-Surgeon-General Jameson, remarks, is always more or less prevalent among the natives in Cairo, and indeed throughout Egypt, and as there exists no means of segregating affected cases it is certain that patients in various stages of the disease are permitted to walk about, and to frequent the bazaars and streets to the great danger of the public."

After these precautions were adopted there appears to have been a considerable reduction in the amount of small-pox among the troops in Egypt.

In the report of the Army Medical Department for 1888, speaking of small-pox mortality in Bengal, it is stated, " The greatest number of cases occurred at Lucknow, 32 with five deaths ; it is stated that all the men had been re-vaccinated, and the cases varied from being very mild to severe and confluent."

1,390a. 22,211—22,222. 31,013.

151. The evidence in regard to the re-vaccination of nurses has been fully dealt with in sections 313-329 of the report. They seem to enjoy a greater immunity from small-pox than re-vaccinated soldiers ; and instances are on record showing that attendants who have not been re-vaccinated have also enjoyed an immunity which has been remarkable. The table given in section 329 of the report compares the liability of taking three infections with the liability of taking one. Cases of small-pox have been instanced in attendants and nurses who have been re-vaccinated ; in such cases it is generally noted that the re-vaccination was not successful. While some hold that an unsuccessful re-vaccination is of no account, others, in accordance with the teaching of Jenner and Bryce, regard it as indicative of insusceptibility and assert that as long as a person is liable to successful vaccination he is liable to take small-pox ; and that, therefore, insusceptibility to re-vaccination indicates protection.

6th Report, App., p. 687

1837—1839. 4734—5.

152. When we consider the large number of attacks and deaths by small-pox which have occurred amongst our thoroughly re-vaccinated army on foreign service, the attack rate of re-vaccinated persons living in houses invaded by small-pox at Warrington and Dewsbury, as well as the number and fatality of re-vaccinated persons attacked by small-pox in London, we are forced to the conclusion that the remarkable immunity recorded in the case of nurses in small-pox hospitals cannot be wholly accounted for by the fact that they have been re-vaccinated. In the hospital at Bicêtre during the siege of Paris, in the midst of a larger accumulation of small-pox patients than has ever been known before or since, the immunity of those attendants and doctors who had neglected re-vaccination was even more marked than in the case of the orderlies, who were nearly all re-vaccinated. We attach considerable importance to the narrative given by M. Colin of his experience as Chief Medical Officer to the Bicêtre Hospital during the siege. The point of his narrative is that

12,389—95.

while 15 of the re-vaccinated or well-protected hospital orderlies took the disease, not one of the 80 who composed the medical and nursing staff, so many of whom had neglected re-vaccination, was attacked. He says ("La Variole," 1873, p. 114) : "Nous avons démontré, en deuxième lieu, que le personel hospitalier de Bicêtre a été peu éprouvé par la variole, dont il ne se manifesta aucune atteinte parmi les quarante medecins et pharmaciens attachés a l'etablissement, ni parmi les quarante religieuses qui soignaient nos malades nuit et jour, et qui habitaient le centre de l'hôpital ; grand nombre de ces personnes cependant n'avaient point voulu céder aux conseils que je leur donnais de se faire revacciner." It is sufficiently clear that M. Colin, though an impassioned advocate of vaccination, was so struck by the complete immunity of the medical and nursing staff, who by their neglect of re-vaccination appeared to offer less guarantees of protection than the orderlies, nearly all of whom had been re-vaccinated under his own eyes, that he thought it necessary to attempt an explanation.

153. The theory he expounds is not original, it has been broached by other authorities, and is applicable to some other contagious diseases. M. Colin (pages 39 and 90) suggests that a certain tolerance is acquired by repeated exposure to contagion, and that in those who are not at once attacked the receptivity to the disease becomes exhausted. The theory may or may not be true, but it has often been observed that in cases in which nurses have taken small-pox from their patients it has been at such interval of time, usually about a fortnight after exposure, as would suggest that those who are very susceptible take the disease at once, and it is possible that, as M. Colin suggests, those who do not thus fall ill acquire the immunity which repeated exposure tends to give. Dr. Gayton has called attention to the fact that many "nurses and servants, persons well vaccinated, suffered from sore throat and headache on their first exposure to small-pox contagion. It is reasonable to believe that their illness was the result of small-pox poison," but he doubts whether it would be correct to say that they had small-pox. Vaccination, especially if with matter of variolous origin, may, when performed at such a time prior to exposure as to pre-occupy the system, operate in the same direction.

Homerton Report, 1875.

154. With a view to prove the truth of the theory that cow-pox is the small-pox of the cow—variolæ vaccinæ—and also to establish fresh lymph supplies, numerous attempts have been made by several observers in various ways to infect bovine animals with the virus of human small-pox. In the majority of the experiments the results have been negative. In a few, when the small-pox matter has been diligently rubbed into scarifications, or denuded surfaces, or punctures, certain results have been obtained which have been variously interpreted. The positive results have generally been redness, tumidity, or papules at the points of insertion. In some of the successful cases, appearances approaching what may be described as vesicular have been obtained; a few, indeed, have exhibited the

168.

169.

12,283.

physical appearances of vaccine inoculated on the calf ; such vaccine results have sometimes appeared not at the points of insertion but at some distance from them. In none of the experiments have the usual signs of natural cow-pox been found to result.

5129. 155. Some of the cases in which vesicular results were obtained
24,091. are certainly open to the objection that under the circumstances under which the experiments were made, there was the possibility, and even the probability, that vaccine virus (accidentally communicated) accounted for these results.

171-2. 156. Matter obtained from the local products of such variolations of animals, when inoculated on human beings, in the hands of Chauveau and others, gave rise to small-pox, which proved to be
12,292. infectious. In the hands of others, matter taken from the local results, even when these bore no resemblance to vaccine vesicles, after serial inoculations on animals and human beings, approximated so closely to the vesicles of ordinary vaccination as to be indistinguishable from them ; in such cases there does not appear to be any ground for believing that the communicated disease, whatever its nature, is any longer infectious.

157. In order to obtain local results on human beings similar to those of ordinary vaccination, by the application of matter derived from human small-pox, it does not appear necessary to resort to
Vol. I., App., p. 68 (note) the cow as an intermediary. One of the earliest experimenters who succeeded in variolating the cow, Dr. Thiele, of Kasan, described a method of storage and dilution of small-pox virus, whereby he was enabled to cultivate lymph giving results indistinguishable from vaccine. Dr. Walker, who carried on a large vaccination practice in London, in the beginning of the century, appears to have entertained similar views, and practised the dilution with water of the small-pox virus.—(Memoirs of Lettsom, Vol. iii, p. 351.)

158. Adams, in 1805, had already succeeded in obtaining perfect vaccine results, without rash, with small-pox lymph taken from a mild variety of that disease. Guillou, in 1826, again records the fact
4895. that all the local appearances of vaccination could be obtained with lymph of undoubted variolous origin. Indeed, results approximating to these appear to have been arrived at by some inoculators in the previous century, who claimed to give small-pox without fever or eruption, and with no other symptoms than those occurring on the inoculated arm ; it was, however, pointed out that such modified variolation did not give the same immunity as that which usually occasioned an eruption.*

24,891—24,907.

159. While it is probable then that the insertion of small-pox matter into the skin of a calf can produce vesicles similar in some cases to those obtained by the inoculation of cow-pox matter, we

* Cf. Mudge, Dissertation on Inoculated Small-pox, p. 20 ; Bromfield on Inoculation, p. 44 ; Adams, A Popular View of Vaccine Inoculation, 1807.

are not aware of any evidence to show that the inoculation of the pox of the cow on the human skin has ever produced small-pox. In this sense then cow-pox and small-pox are not convertible, and we think it is incorrect to speak of cow-pox as the small-pox of the cow.

160. Moreover, there is a considerable amount of evidence showing that morbid fluids derived from other and apparently distinct diseases can when inoculated give rise to vesicles like those of vaccine, not only in the cow but in the human subject. The virus of cattle plague, of horse grease and horse-pox, of sheep small-pox, and of syphilis, and it has been alleged the application of tartar emetic, have given rise to vesicles when intentionally or accidentally inoculated which differ from vaccine vesicles less than these differ amongst themselves. Matter obtained from some of these sources, other than cow-pox, has been at various times used to start fresh strains of lymph for vaccination. If from such varied sources vaccine results can be obtained, it by no means follows that because from human small-pox a vaccine vesicle can under certain circumstances be raised, there is, therefore, any special or essential inter-relation between cow-pox and small-pox.

12,295. 12,174—12,233. 11,594. 11,604. 11,540—5. 21,975. 11,484—7. 27,142. 8894—8900.

161. Various more or less speculative views have been advanced to account for the ascertained facts in regard to immunity towards disease, whether natural or acquired. It has, indeed, been suggested that acquired immunity is in some way connected with the chemical results upon the tissues of the febrile process by whatever means occasioned. This subject needs fuller investigation, but there is some evidence which at least suggests that diseases held to be specifically distinct may exert some kind of temporary antagonism towards one another.*

12,414. 12,236. 24,181—3. 25,995. 4619—4622.

162. Though small-pox and cow-pox still occur in many parts of the country, such outbreaks do not appear to be in any way associated as cause and effect, though special attention has been directed towards the discovery of such relationship. We, therefore, conceive the correct view to be, that among the various morbid fluids whose inoculation into the calf's skin can produce a " vaccine " result, small-pox matter is one, but this fact no more implies the identity of cow-pox and small-pox than does a similar result from the inoculation of other viruses imply the identity of either small-pox or cow-pox with the diseases furnishing such viruses.

163. The question very naturally arises whether, seeing that lymph from various sources has been from time to time set going, there is any difference to be observed between the various stocks in their influence upon subsequent small-pox. Unfortunately it is no longer possible to distinguish between the various stocks now in circulation. Neither is it possible, in view of the law against inoculation, to submit the present or fresh stocks to the variolous test. It has

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* Jenner employed vaccination to render dogs immune against distemper, and De Carro claimed it as antidotal to the virus of the plague.

been plausibly conjectured that vaccine lymph of variolous origin, such as Woodville's, or that of Ceely and Badcock, and of other experimenters in the variolation of cows, may be of superior efficacy to that derived from cow-pox, horse-grease, cattle plague, etc.

164. It is by no means clear that lymph from sporadic cases of cow-pox obtained from time to time has been derived from the true cow-pox of Jenner as distinguished from those varieties which have been termed " spurious." We know that Jenner attached the greatest importance to such discrimination. Spontaneous cow-pox, which produced no erysipelas, and showed no phagedenic disposition, he regarded as spurious. " This disease," he said, " is not to be considered as similar in any respect to that of which I am treating, as it is incapable of producing any specific effects on the human constitution. However, it is of the greatest consequence to point it out here, lest the want of discrimination should occasion an idea of security from the infection of the small-pox which might prove delusive."

165. It was the cow-pox derived from the greasy heel of the horse that gave the true cow-pox, according to Jenner ; matter from the horse direct, he found, did not impart immunity towards small-pox.

In a later publication he stated that he " found that some of those *who seemed to have undergone the cow-pox*, nevertheless, on inoculation with the small-pox, felt its influence just the same as if no disease had been communicated to them by the cow. This occurrence led me to inquire among the medical practitioners in the country around me, who all agreed in this sentiment, that the cow-pox was not to be relied upon as a certain preventive of the small-pox. This for a while damped, but did not extinguish my ardour ; for as I proceeded I had the satisfaction to learn that the cow was subject to some varieties of spontaneous eruptions upon her teats ; that they were all capable of communicating sores to the hands of the milkers, and that whatever sore was derived from this animal was called in the dairy the cow-pox. Thus, I surmounted a great obstacle, and in consequence was led to form a distinction between these diseases, one of which only I have denominated the *true*, the others the *spurious* cow-pox, as they possess no specific power over the constitution.

166. Investigations carried out under the medical department of the Local Government Board, and especially by Dr. Klein, have served to show the number and variety of the diseases of the teats and udders of cows, and the difficulty of accurately discriminating between them. In reporting on some of these diseases in 1887, Dr. Klein observed :—

27,125.

L. G. B. M. O. Rep. 1888—89 and 1887-8.

" In view of this second differentiation of a definite disease from among the mass of cow diseases that show sores on the teats, the old division into true and spurious cow-pox has become manifestly insufficient. It is seen that the name ' spurious cow-pock ' has in all probability been used to cover a variety of sores, having essential differences in natures, just as until the time of Jenner the name ' cow-

pock ' had covered along with various other things the disease which we know as vaccinia. But it is one thing to have learnt the essential nature of those sores in the cow that are concerned with vaccinia or scarlatina in the human subject, and another thing to affirm the distinguishing characters by which those sores may be recognised from other sores that once on a time laid claim to being equally with them ' cow-pox ' or ' spurious cow-pox.' Our new discontent with the name ' spurious cow-pox ' does not at once give us a knowledge of the nature of those sores which remain on the list ; and we are now learning that there are many different kinds of such sores."

167. It is evident that the diagnosis of the various diseases which have been collectively termed cow-pox is no easy matter ; and it is to say the least doubtful whether the many new stocks which have been put in circulation have been all of the same species. It is certain that several stocks have been derived from so-called " spontaneous " cow-pox, as for instance, that of Laforet, from which the National Vaccine Establishment was supplied, when the calf lymph station was inaugurated. 27,129—27,132. 4278-9.

168. We regret that in the course of our inquiry we have not obtained from the experts who have favoured us with their views any satisfactory definition of " vaccination." No definition of the term appears in any of the Vaccination Acts. Our late and much regretted colleague, Mr. Bradlaugh, we know attached great importance to this point.

169. Mr. Ceely, so far as we are aware, was the last in this country to apply the variolous test to a new stock of lymph. He thus tested 21 persons who had been inoculated at periods varying from 5 to 31 months previously with his matter got by variolating the cow. In every case some effect resulted ; in nearly all papulo-vesicular elevations or " mother-pustules " appeared at the insertions. In a few there was slight fever which, in one case, proved to be infectious, and in one child with four fine scars, the result of the inoculation five months previously, there was an eruption of hard warty papules over the whole body, several of which suppurated. These experiments were held to prove that a certain amount of immunity had been conferred by the previous inoculation, although no control experiment was made to show the effect of the matter inoculated in the same way upon unprotected persons. 12,303-4. Vol. IV., App. 1, p. 412.

170. It is impossible now to distinguish the various stocks of vaccine in use ; it is, however, clear that much of that now current in this country and abroad is not derived from cow-pox at all, and probably still less is derived from that speical variety of cow-pox which Jenner regarded as the true or protective variety. It is scarcely probable, unless indeed it be held that all viruses that will give rise to the physical appearances of a vaccine vesicle when inoculated are identical, that one and all should be endowed with precisely the same effects *quâ* immunity towards small-pox. If we had to express a preference for lymph derived from any of the sources

described we should give it to that of variolous origin, provided always it has been rendered incapable of giving rise to infection.

171. In section 361 of our colleagues' report, an analogy is suggested between vaccination against small-pox and Pasteur's protective inoculations of animals with attenuated viruses to protect them against certain epizootics.

We have already given our reasons for doubting the assertion that the cow-pox is the small-pox of the cow, and it should be remembered that M. Pasteur, in borrowing the term " vaccination " to describe his inoculations, was careful to point out that the difference is great in some respects between the two classes of facts. (" Lancet," November 6, 1880.) If, however, the view which regards vaccination as analogous to the Pasteur inoculations be correct, it may be of interest to follow out the analogy into practice.

172. The chief diseases of flocks in which protective inoculations have been tried on a large scale are anthrax and pleuro-pneumonia.

Board of Agriculture Rep. under C. D. Animals Acts for 1894.

10,984.

173. Experience, however, seems to prove that the protective inoculation of anthrax, while it gives rise to a certain amount of immunity for an indefinite period towards subsequent " experimental " inoculation with the virulent material, leaves the " vaccinated " animals still liable to infection in the natural way. Experiments in this country, in France and in Germany have not confirmed M. Pasteur's original contentions. The tendency of modern opinion and practice appears to be rather in the direction of the adoption of the " stamping-out system " by the pole-axe, destruction of infected carcases, and disinfection rather than of reliance upon the " stamping-in " system of protective inoculations. In the last report of the chief veterinary officer of the Board of Agriculture, we read that " Dr. Klein's reports appear in the Report of the Medical Officer of the Local Government Board for the years 1881-82, but the results which followed his investigations were in direct conflict with the statement made by M. Pasteur, since all the sheep vaccinated by Dr. Klein either died as a result of the injection of the vaccine material, or succumbed to anthrax when inoculated with the virulent material, after being what was considered immune to the disease."

26,007—26,014.

Ibid

It is further stated in a report by Professor Muller, of the Royal Veterinary School of Berlin, that " preventive inoculation of anthrax has not many, I may even say no, friends in Germany," and that " preventive inoculation was practised from 1882 till 1885 or 1886 in the provinces Saxony and Posen by four or five great landowners or farmers who have suffered great losses every year by enzootic anthrax, and were induced to try inoculation by the apparent good results gained in Parkisch. The virus was obtained in all cases directly from Paris. In the beginning these inoculations were repeated every year, but little by little they were discontinued. I believe that preventive inoculation is now fully abandoned in Prussia, and has not been practised during the last five or six years."

On the other hand we learn from Professor Muller that "the general opinion of scientific authorities in Germany is that the best measures against anthrax are a careful destruction of carcases, and a most careful disinfection, and that inoculation will have no effect in lessening the loss caused by this disease."

174. In regard to pleuro-pneumonia, the experience seems to be very similar and to point to the conclusion that, while the "stamping-out" system of slaughter and disinfection appears to be adequate to the eradication of the disease altogether, such result cannot be obtained by protective inoculations.

The report of the Departmental Committee of 1888 on pleuro-pneumonia is to the effect that protective inoculation "cannot be depended on as an efficient means of exterminating pleuro-pneumonia." The Committee attached especial importance to the experience of the rival methods in the Netherlands. They stated :—

"We have, with your Lordship's approval, and the sanction of Her Majesty's Treasury, summoned before us M. Lameris, one of the Government veterinary surgeons, residing at the Hague. In view of the fact that Holland is the only country in the world from which, after having obtained a good foothold, pleuro-pneumonia has been eradicated, the evidence of this gentleman possesses considerable interest and importance."

"From the evidence of M. Lameris it appeared that for many years inoculation was practised by owners of cattle, and so impressed were they by the benefits which appeared to result from that operation, that they petitioned the Government to make the inoculation of cattle in Holland universal and compulsory. The Ministers, however, declined to accede to this request, not only on the ground of expense, but because of the difficulties attendant on the carrying out of such a law, and of obtaining sufficient inoculating material."

"In 1871 an order was issued for the compulsory slaughter of all actually diseased animals, compensation being paid out of the Royal funds. After three years, compulsory inoculation of suspected cattle was also employed, though not universally. These combined methods of treatment, however, although reducing the disease, failed to eradicate it, and therefore the system of stamping out was adopted, and since 1885 the Netherlands have been practically free from pleuro-pneumonia."

"M. Lameris was very decided in his opinion that compulsory vaccination could not have cleared his country of disease; that stamping out was the safest and most certain way of attaining this result, and proved, in the long run, to be the cheapest."

175. In the case of sheep small-pox, which more closely resembles the small-pox of man than does any disease of the lower animals, and in which accordingly it was hoped, and declared by Sacco and others, that protection might be artificially secured, Dr. Seaton stated the accepted view when he said "no fact is more conclusively established than the utter worthlessness of vaccination for saving sheep from small-pox." (Handbook of Vaccination, p. 42.) 10,969.

25,927—25,983.

176. Attention has recently been directed to protective inoculations against cholera, with more or less successful results ; but while such protection may be a matter for individual choice, the sanitary vigilance carried out under public authority seems to have been strikingly successful in preventing the disease from spreading in this country.

Reference III.—The Objections Made to Vaccination on the Ground of Injurious Effects Alleged to Result Therefrom.

Simon, 1857 Papers p. lxvii. Vol. I., App., p. 93.

177. It was at one time officially maintained that against "the vast gain" by "vaccination there is no loss to count. Of the various alleged drawbacks to such great advantages the present state of medical knowledge recognises no single trace."

The Select Committee of 1871 reported "that if the operation be performed with due regard to the health of the person vaccinated, and with proper precuations in obtaining and using the vaccine lymph, there need be no apprehension that vaccination will injure health or communicate any disease." Even more recently this view has been re-affirmed in a pamphlet, entitled, Facts concerning vaccination for heads of families, "revised by the Local Government Board, and issued with their sanction," which states that "as to the alleged injury from vaccination, all competent authorities are agreed that, with due care in the performance of the operation, *no risk of any injurious effects* from it need be feared."

21,853.

1871 Committee, 3210

We agree with our colleagues that, notwithstanding repeated and emphatic assertions to the contrary, the admission must without hesitation be made that risk attaches to the operation of vaccination.

178. The statements contained in sections 399-421 of the Report appear to us to give ample reason at least for hesitation in retaining compulsory vaccination in any form. We allude especially to the following statements, in which we generally concur :—

Section 399.—"It is not open to doubt that there have been cases in which injury and death have resulted from vaccination."

Section 409.—"It must not be forgotten that the introduction into the system of even a mild virus, however carefully performed, is necessarily attended by the production of local inflammation and of febrile illness."

Section 410.—"It is established that lymph contains organisms, and may contain those which, under certain circumstances, would be productive of erysipelas."

In section 413 we are told that vaccination may become exceptionally risky, through special circumstances over which, in our opinion, the parents can have little or no control, such as the prevalence of disease in the neighbourhood.

Section 417.—"It may, indeed, easily be the fact that vaccination, in common with chicken-pox, measles, small-pox and other specific fevers, does occasionally serve as an exciting cause of a scrofulous outbreak."

Section 418.—" It is freely to be admitted that vaccinia, like varicella, does occasionally cause an irritable condition of skin which may last long, but it is exceedingly improbable that it is responsible for any substantial increase in the number of chronic skin diseases in children." And again, " Amongst the inconveniences connected with vaccination is the production of contagious forms of eruption, such as have been classed under the names of porrigo and impetigo contagiosa. These eruptions are not attended with any risk to life, nor by any permanent injury to health, and they are usually curable by simple measures. References to these eruptions have been made by many witnesses. Their occurrence has no doubt not unfrequently caused prejudice to the practice of vaccination." And in section 419 is recited the case of " a child previously in good health and vaccinated with calf lymph by means of a needle which had never been used before, who died about six weeks afterwards with severely ulcerated arms, and ulcers in several parts of the body and limbs. No precaution had been neglected, and the event could only, as in other similar cases, be attributed to what is known as idiosyncrasy on the part of the child, a peculiarity of health attended by exceptional susceptibility to the specific virus of vaccinia."

22,876—22,903. 23,029. 23,064—23,067.

In sections 420 and 421 it is pointed out that " It was at one time doubted whether syphilis could result (from vaccination), and it was even confidently asserted that it could not," but that " Facts which were, not long after the issue of Mr. Simon's report, brought before the profession, and which were carefully investigated, made it certain that the negative conclusion which had been arrived at was a mistaken one, and from that time no doubt can have been entertained by any that it is possible to convey syphilis in the act of vaccination."

179. Putting together all these admitted elements of danger, though each may be slight in itself, we think that the sum of them constitutes a very serious objection even to the modified form of compulsion favoured by our colleagues.

180. It appears to us that the case for even this modified compulsion is practically surrendered in section 437, where our colleagues insist on the right of parental option as to the lymph to be used, on the ground that the risk of syphilis from arm-to-arm vaccination, however slight, is " naturally regarded by a parent with abhorrence." We cannot understand on what principle a parent is entitled to refuse arm-to-arm vaccination, because he regards its risks with abhorrence, but is not entitled also to refuse the not unreal risks of calf lymph, though he also regards these with abhorrence.

181. We are not prepared to attach much weight to figures put in by Dr. Ogle, instituting a comparison between Leicester and the whole of England and Wales in regard to the changes in the infantile mortality from various diseases. To make such comparison valuable it would be, as Dr. Ogle seemed inclined to admit, better to compare an urban population similar to that of Leicester, but in which vaccination was thoroughly carried out. If we want to ascertain by the method of differences whether vaccination exerts a detrimental effect

27,197. 27,199—204.

by increasing the mortality from certain infantile diseases, it is surely imperative to see that the places or times compared differ as little as possible in respect of circumstances other than vaccination.

Vol. IV., App. 3.

182. In the statistics which Mr. Biggs furnished we do not find any evidence that the increasing disuse of infantile vaccination in Leicester has prejudicially affected the mortality of young children; on the contrary, there has not only been a marked reduction of the general death rate since 1875 but a reduction in the death rate of infants under one year, a rate which reached its highest point since 1838 in the period 1868-72, when vaccination was most thoroughly enforced.

3887. 28,016—38,021.

183. We must remember that though machinery exists for registering the success of vaccination, there is no system for notification of untoward results, or any means other than the certificate for obtaining official information of the total number of deaths directly or indirectly due to vaccination. In Scotland there appears to be even less provision for inquiry into alleged ill-results than is the case in England.

184. Our colleagues hold that though some of the dangers said to attend vaccination are undoubtedly real and not inconsiderable in gross amount, they are relatively few in proportion to the amount of vaccination that is done. They suggest an analogy with railway accidents, as an example of a risk that is every day disregarded. They quote the figures given by Dr. Ogle as showing one death to 14,159 primary vaccinations.

Sect. 434. Sect. 379. Sect. 403. 6th Report, p. 647.

We give reasons for thinking the number of deaths underestimated, but accepting the ratio as correct, it is interesting to compare it with that of the number of railway passengers killed to the total number of passengers.

Accidents on Railways, Board of Trade Report, 1894.

Year.	Number of Passengers Killed from causes beyond their own control, from Accidents to Trains in the United Kingdom.	Number of Passenger Journeys (exclusive of Journeys by Season-ticket Holders).	Proportion returned as Killed (from causes beyond their own control) to Number carried.
1881	23	622,160,000	1 in 27,050,435
1882	18	654,838,295	1 in 36,379,905
1883	11	683,718,137	1 in 62,156,194
1884	31	694,991,860	1 in 22,419,092
1885	6	697,213,031	1 in 116,202,171
1886	8	725,584,390	1 in 90,698,049
1887	25	733,670,000	1 in 29,346,800
1888	11	742,499,164	1 in 67,530,000
1889	88*	775,183,073	1 in 8,808,875
1890	18	817,744,046	1 in 45,430,224
1891	5	845,463,668	1 in 169,092,733
1892	21	864,435,388	1 in 41,163,589
1893	17	873,177,052	1 in 51,363,356
1894	16	911,412,926	1 in 56,963,307

* Including 80 killed and 262 injured in collision near Armagh.

Number of season-tickets issued in 1894, 1,185,000.

ENGLAND AND WALES: DEATHS ASCRIBED TO VACCINATION, 1881-91.

Year.	Number of Deaths.	Primary Vaccinations.
1881	58 ...	766,179
1882	65 ...	764,518
1883	55 ...	763,092
1884	53 ...	766,338
1885	52 ...	758,992
1886	45 ...	755,337
1887	45 ...	735,536
1888	45 ...	720,991
1889	58 ...	708,919
1881-89	476* ...	6,739,902*
1890	43	(Not yet published.)
1891	43	(Not yet published.)

* One death to 14,159 primary vaccinations.

We cannot help thinking that if railway statistics showed one death to 14,159 passengers, a railway journey would be a much more anxious affair than it is at present.

185. We are deeply impressed with the sad cases of severe illness and suffering and death which the investigations of medical men appointed by the Commission have, after rigid scrutiny, failed to disconnect from vaccination. We are also struck with the fact that under the circumstances which must obtain in the houses of the poor, additional risks to health and life are encountered, and that the operation cannot be regarded as free from even the more avoidable risks, except under conditions and precautions it is perfectly impossible to secure. To compel vaccination under such circumstances, even if its value were greater than it is, is in our opinion morally indefensible. It is with a sense of shame and amazement that we hear of instances in which parents who have lost one child from the effects of vaccination have been prosecuted and fined for refusing to submit another child to the operation. Appendix. 6745. 13,743.

186. Drs. Barlow and Acland found that about half the cases of vaccinal injury investigated by them (93 out of 189) were of inflammatory or septic origin, and other cases in which the question of syphilis had been raised (38) in many instances proved to belong to the inflammatory or septic category. They further state that "there are a certain number of cases in which, from causes which cannot at present be foreseen or prevented, serious results ensue

from cutaneous eruptions, such as generalised vaccinia, impetigo, eczema, etc.," though in their experience the number is small. They " are of opinion that a certain proportion of children will always suffer after vaccination from various forms of cutaneous eruption. These seem to be more frequent after vaccination with calf lymph, and are for the most part free from danger, though often giving rise to considerable distress." They also think that " calf lymph as now usually employed tends to produce more severe inflammatory reaction than that which has been humanised."

In regard to the mode of vaccinating Drs. Barlow and Acland state they " have seen many cases of severe inflammation, abscess, erysipelas, and septic infection which have followed the use of some mechanical vaccinator," and further, that they " have frequently seen ulceration result from the insertions being placed too near together, so that the vitality of the tissues between them has been destroyed, and a slough produced."

187. Among the 32 fatal cases investigated by Dr. Luff, in which vaccination was a determining cause or factor in the fatal event, there were 22 of erysipelas, three of cellulitis, three of septicæmia, three of pyæmia, and one from exhaustion.

188. Dr. Coupland deals with injuries due to the quality of the lymph, and to septic infection, and adds a third category which he terms " Cases of deranged health, and even serious symptoms, evolved by the constitutional disturbance induced by vaccination in weakly or predisposed subjects." In reference to these cases he suggests that " unless small-pox were prevalent at the time it might often be preferable to defer vaccination for several months than to adhere too rigidly to the statutory age, irrespective of the condition of the child and its surroundings. In particular, he deprecates the vaccination of very young infants, as is the practice in regard to workhouse children and those born in lying-in institutions."

3963-6. 189. We were surprised to learn that this highly objectionable practice has been approved and encouraged by the Local Government Board.

190. Erysipelas in varying degrees of severity is the most frequent of the ill results arising from or accompanying vaccination. It may amount to little more than an inflamed arm, or an extension of the areola which surrounds the vesicles on the eighth to the twelfth day, or it may be widespread and severe, affecting the cellular tissue, and may terminate in death. Deaths from " erysipelas after vaccination " were separately classified by the Registrar-General for England and Wales during the years 1859-80; there were 390 in all so certified. There is ample reason for believing that many other such cases have occurred, but in which no mention of vaccination appeared on the certificate of death.

14,796. 13,835. 13,839. 14,819. 14,453. 15,270. 15,355.

Years.	Deaths from Erysipelas after Vaccination.	Years.	Deaths from Erysipelas after Vaccination.
1859	5	1870	20
1860	3	1871	24
1861	2	1872	16
1862	3	1873	19
1863	11	1874	29
1864	13	1875	37
1865	10	1876	21
1866	10	1877	29
1867	4	1878	35
1868	9	1879	32
1869	19	1880	39

Vol. IV., App. iii, Table 3.

191. At an inquiry held by inspectors of the Local Government Board into certain deaths alleged to have been caused by vaccination at Norwich in 1882, it was shown that eight children suffered from erysipelas "due to some abnormal peculiarity or contamination of the lymph"; four of these died; in only one was vaccination mentioned on the certificate of death. 5,222. Vol. IV., App., p. 478

Another inquiry was made by the Local Government Board into cases of erysipelas following upon vaccination at Gainsborough in 1876, of which six died; in none of these was vaccination mentioned on the certificate of death, though the searching investigation which was subsequently made failed to dissociate the operation from the fatal erysipelas. 14,819. Vol. IV., App., p. 466

Other inquiries have been made by the Local Government Board; in 1886 into three cases of fatal erysipelas after vaccination at Sudbury; in 1887 into a fatal case of erysipelas at a military hospital; and in 1889 into a fatal case of post-vaccinal erysipelas at New Humberston. 14,149. 15,337.

192. In addition to the above series of published reports of injuries of an inflammatory or septic character arising from vaccination, we find in a memorandum prepared by Dr. Ballard a selection of cases found among the older records of the Local Government Board. These include:—

1. A series of 19 cases of erysipelas from vaccination at Warrington, with five deaths, in 1871.

2. A case of serious erysipelas from vaccination with National Vaccine Establishment lymph at Stoke Newington in 1871, in which inquiry elicited that violent inflammation had occurred in others vaccinated with lymph from the same vaccinifer; the vaccinifer having an inflamed arm on the thirteenth day and a small abscess in the axilla.

3. Six cases of serious inflammation and three deaths in a series vaccinated with ninth day lymph from one vaccinifer at Appleby in 1873.

4. Several cases of erysipelas and inflammation with five deaths in a series of vaccinations at Chelsea in 1875.

5. Twelve cases of excessive inflammation, six of erysipelas with three deaths, two cases of axillary abscess, and one large ulcer in a series of vaccinations at Plomesgate in 1878.

6. Ten cases of erysipelas or abscesses with four deaths and several cases of eczema in a series of vaccinations at Clerkenwell in 1879, in which "it is clear that erysipelatous contagion was imparted at the time of vaccination."

7. Three cases of extensive erysipelas from vaccination at Blandford in 1883.

8. Three fatal cases of erysipelas from vaccination at Sudbury in 1883.

193. Between 1st November, 1888, and 30th November, 1891, 132 cases of inflammatory or septic disease (mostly erysipelas), following vaccination and terminating fatally, were the subject of inquiry by the Local Government Board. They have been classified as follows by Drs. Acland and Coupland :—

Appendix.

Cases in which vaccination was followed by glandular abscess	3	Cases LXXXI., CXXXIII. and CLXIV.
Cases in which vaccination was followed by cellulitis or sloughing and in which there is ground for supposing that the lymph or vaccinator were at fault ...	3	Cases LX., XCIV. and CXCII.
Cases in which vaccination was followed by cellulitis or sloughing, in which there is evidence of some extraneous source of danger	9	Cases XLII., LXXX., CIII., CXXVI., CXXXII., CXLVI., CXLVIII., CLXXVI., and CCIII.
Cases in which vaccination was followed by erysipelas in which no extraneous cause was found	14	Cases XXIII., XXVIII., XXX., XXXVII., XLI., XLIV., LXXI., LXXXIX., XCVIII., CIX., CXXXV., CXXXVII., CXLIV. and CLXXVIII.
Cases in which vaccination was followed by erysipelas, in which there is evidence to show that either the vaccinator or the lymph were at fault	32	Cases XVI., XXXI., XXXIV., XXXV., XL., LXV., LXIX., LXXXIII., LXXXIV., LXXXV., C., CI., CIV., CVIII., CXVI., CXVIII., CXX., CXXVIII., CXLI., CXLII., CLV., CLXVI., CLXVIII. CLXIX., CLXXII., CLXXIV., CLXXIX., CLXXXV., CLXXXIX., CXCVII., CXCVIII. and CXCIX.

Cases in which vaccination was followed by erysipelas, in which there is evidence to show that there were extraneous sources of danger apart from the method of vaccination or the lymph ...	43	Cases XV., XVII., XX., XXI., XXIV., XXIX., XXXII., XXXIII.,XXXVIII.,XXXIX, XLIII., LXII., LXVII., LXXXVI., LXXXVII., LXXXVIII., XCII., CVI., CXIV., CXVII., CXXII., CXXIII., CXXIV., CXXXI., CXXXIV., CXXXVI., CXXXIX., CXLV., CXLIX., CLI., CLII., CLVI., CLIX., CLXVII, CLXXV, CLXXVII, CLXXX., CLXXXII., CXC., CXCI., CXCV., CC., and CCII.
Cases in which vaccination was followed by erysipelas, in which the vesicles were irritated or the scabs injured	8	Cases XVIII., XXII., XXV., LXVIII., CXIII., CXV., CL., and CLIII.
Cases in which vaccination was followed by ulceration of vesicles	4	Cases CLXXIII., CLXXXVIII., CXCIII. and CCI.
Cases in which vaccination was followed by pyæmic or general septic infection and in which there is ground for suspecting that the lymph or the vaccinator were at fault	5	Cases LXXXII., XCVII., CVII., CVII. (*a*) and CXXI.
Cases in which vaccination was followed by pyæmia or general septic infection, in which there is evidence of insanitary surroundings or other sources of danger.	11	Cases XXVII., LIV., LIX., LXX., LXXVIII., LXXIX., XCI., CV., CXII., CXXV. and CCIV.
Gangrenous, or phagedænic ulceration	1	Case XIX.

194. Numerous cases, and two or three series of cases of post-vaccinal erysipelas, have been investigated by medical men appointed by the Commission. (See Cases 23, 115, 181, Appendix.)

Thus at some villages in Norfolk in 1890 there occurred a series of injuries from vaccination, which were investigated by Dr. Barlow on behalf of the Commission. In the course of March in that year some 16 children suffered from inflamed arms, several exhibiting secondary abscesses in the axillary glands, with subsequent wasting and great disturbance of health. Three terminated fatally; in one of these the death was certified to be due to "convulsions," in another to "pyæmia," and in the third to "asthenia, tabes mesenterica." Dr. Barlow's conclusion on these cases is as follows:— 14,890.

"Analysis of these cases shows that the progress of the vaccination in some respects diverged from the typical course.

" In the majority there was a premature development of the vesicle, which within two or three days after insertion formed, broke, and discharged.

" In several there was prolonged ulceration with free discharge, but not in the cases I saw any very deep loss of substance.

" There was early and inordinate amount of inflammatory redness of the affected limb, and in some cases of the whole body.

" In one case (XIII) there was definite and severe erysipelas.

" In two cases there was a large diffuse secondary abscess of the leg, which was very serious indeed, and accompanied by great exhaustion. I am informed that this condition was also observed in one of the fatal cases (C. W. W.).

" In one case (No. II) the local condition was, I am informed, distinctly subsiding, and there was no indication of secondary abscess ; but the child died from convulsions. Also in XII the local condition had quieted down, so that the vaccination sites were very small and scabbed over, and there were no indications of secondary abscess. But the child had sunk into a condition of marasmus with vomiting, and latterly green loose evacuations had been present. He succumbed the day after I saw him.

" I think it important to observe that in both II and XII the feeding of these infants had been very bad.

" For the most part, however, it is clear that the children had been previously healthy, and with two or three exceptions the mothers seemed to me to have been healthy. In two cases (VI, XIII) there was reason to believe the mothers suffered from local inoculations from attending on their infants.

" I saw no reason to think that the other children in the several cottages were unhealthy, with one slight exception (XIII).

" The cottages were fairly wholesome. There was no proof of the family health having suffered previous to the vaccination. The infants vaccinated were, with a few exceptions, well tended.

" I could not ascertain that there had been any infectious fever prevalent in these villages which could have modified the vaccination in an adverse way.

" To sum up from the brief provisional investigation that I was able to make of these cases, it appeared to me obvious that some septic material had been introduced at the time of the
9835—8844. insertion of the vaccine lymph, and that this was mainly responsible for the untoward results obtained."

(See also cases Nos. 5, 6, 7, 11, 14, 21, 27, 28, 30, 32, 36, 38, 39, 54, 72, 73, 81, 83, 86, 87, 88, 91, 96, 100, 104, 105, 106, 107, 108, 112, 114, 115, 116, 117, 118, 121, 122, 124, 125, 126, 135, 137,
Appendix. 156, 158, 161, 162, 165, 167, 169, 171, 175, 177, 179, 181, 183, 184, 185, 188, 189, 190, 197, 199, 200, 203, 204, 206, 207, 208, 211, 213, 215, 217, 218, 219, 220, 221, 235, 236, 239, 241, 242, 244, 245, 247, 248, 249, 253, 257, 258, 259, 260, 261, 262, 267, 268, 271, 312, 318.)

195. An account of a somewhat similar series of cases of septic poisoning occurring in the course of some vaccinations at Asprières (Aveyron) in 1885, in which several deaths occurred, will be found in Appendix IV to the Third Report, p. 210.

196. The question has been much debated whether the erysipelas which accompanies or follows vaccination is due to accidental contamination, or is in some way incidental to or provoked by the changes which result from the insertion of the lymph. The question is not a new one. Jenner described " erysipelatous inflammation " as characteristic of the true as opposed to the spurious cow-pox. When this opinion of his was criticised, he replied, " In calling the inflammation that is excited by the cow-pox virus, erysipelatous, perhaps I may not be critically exact, but it certainly approaches near to it." And, indeed, he records an instance in which, in his opinion, the true cow-pox was excited in a herd of cows, and communicated to milkers, by matter derived from " an extensive inflammation of the erysipelatous kind, appearing without any apparent cause upon the upper part of the thigh of a sucking colt."

197. The areola around the vesicles when at their height varies a good deal, and it does not seem possible to discriminate with precision between an exaggerated or indefinitely extended areola and erysipelas or erythema. We learn from bacteriological investigations that vaccine lymph contains a great variety of germs or micro-organisms, some of which are accounted to be pathogenic or disease-producing, and though none of them has been identified as the active principle of the vaccine disease, it seems clear that in some specimens germs believed by high authorities to be those of erysipelas have been encountered.

4402. 13,073. 13,083—6. 11,218—25. 27,133. 29,112—29,131. 11,059—11,111.

198. In view of these facts we are unable to regard vaccination as being as innocent of erysipelas as a prick of a pin or any ordinary surgical wound. While doubtless the treatment of vaccinated arms is frequently careless, and the surroundings of vaccinated infants often insanitary, and such circumstances may well provoke or aggravate untoward results, the evidence leads us to believe that vaccine lymph or the vaccine process is not unfrequently proximately related to erysipelas, inflamed arms, ulceration, sloughing and axillary abscess.

199. Attempts have been made to discriminate cases of erysipelas following vaccination in which the disease is due to contamination of the lymph, from others in which some extrinic cause is alleged. It has been suggested that the interval which elapses between the vaccination and the appearance of the erysipelas may enable the discrimination to be made. But the duration of the incubation period of erysipelas is variously given by authorities from a few hours to several days or a fortnight. In certain series of vaccinations, where several of the children vaccinated at or about the same time have been affected, and in which, therefore, the lymph was the probable medium of infection, the interval has varied from one or two

Vol. IV., p. 478.

Norfolk series. (Case 23).

days to two weeks, or even longer. It is therefore not possible to exonerate the lymph with certainty by means of any such criterion.

Cases 189, 200, 203.

It has also been argued that in cases in which one or two children only out of a group of several children, vaccinated from one and the same vaccinifer, subsequently develop erysipelas, that the lymph must be held blameless. But it has been specially remarked by Mr. Hutchinson that in cases of vaccino-syphilis it is not usually the case for all the co-vaccinees to be infected, though in such occurrence it is held that the lymph contains and imparts the superadded disease. (Illustrations of Clinical Surgery. Fasc. VI.) It is not at all improbable that the power of resistance in different children to the infection of erysipelas varies considerably, and it may well be that vaccine which usually evokes an areola or erythema of varying extent may in certain constitutions develop erysipelas or cellulitis.

See Case 115 (series) in Appendix.

200. In a memorandum which accompanies the report of the German Vaccination Commission, it is stated that :—

9957—61.

"At the time when the vaccination law was promulgated the opinion prevailed generally that the dangers connected with vaccination to the life and health of the patient were unimportant, or rather, did not exist at all. Thus it is set down in No. 4 of the final conclusions of the opinion drawn up by the Royal Prussian Scientific Deputation for Medical Affairs, dated February 28th, 1872, which document formed the principal basis for the projected law, 'that there existed no warranted fact in favour of a deleterious influence of vaccination upon the health.' It was, however, seen subsequently, very clearly, that this thesis could not be upheld. In fact, very serious damage by vaccination has occurred anything but rarely, both before and after the promulgation of the vaccination laws. The more recent publications enumerate a great many cases of the transmission of contagious diseases by vaccination. Thus, up to the year 1880, 50 cases have become known in which syphilis inoculated with the vaccine caused illness to about 750 persons (Lotz on Small-pox and Vaccination, 1880, page 113). A few separate cases of vaccine syphilis may perhaps be looked upon as being uncertain, but, on the other hand, others were not made publicly known, so that the figures quoted above are likely to be less than the number of cases that happened in reality. Still greater dangers than those connected with vaccine syphilis are threatened by vaccine erysipelas, which, as is now generally admitted, are far from uncommon. It is true that in many cases erysipelas may not be absolutely ascribed to vaccination, notably in the case of separate illness or the so-called late-erysipelas. However, a number of cases of general illness taking place *en masse* have been registered, which happened immediately after vaccination, and, in accordance with the latest experience derived from the etiology of erysipelas, admit of no other explanation beyond their having been caused by vaccination direct. Other diseases also have been transmitted by vaccination, or at least the possibility of such transmission must be admitted."

201. In regard to vaccine syphilis, in the pamphlet revised by the Local Government Board, and until recently widely circulated, it was stated :—

" The fear that a foul disease may be implanted by vaccination is an unfounded one. Such mischief could only happen through the most gross and culpable carelessness on the part of the vaccinator ; and as all medical men now receive special training in vaccination, no risk of this kind need be at all apprehended. Of course, vaccination. like everything else, requires a reasonable amount of care in its performance. *The alleged injury arising from vaccination is, indeed, disproved by all medical experience.*" 21,854.

It was not only maintained that care could prevent all ill results, but it was asserted on high authority that " a well-formed vaccine vesicle is certain proof of a pure and unmixed vaccine lymph " ; that a syphilitic vaccinifer must betray evidence of disease sufficient to forewarn the careful, and it has been stoutly maintained that it was the presence of blood in the lymph that occasioned the danger of transmitting syphilis, and that as all lymph sent out in tubes from Whitehall was microscopically examined so as to exclude the presence of blood cells the danger was infinitesimal. Simon's 1857 Papers, p. 138. 21,853.

202. We agree with our colleagues that the possibility of vaccine syphilis, formerly denied, has been fully established.

203. In this connection we recall the words of the late Sir Thomas Watson, F.R.S., late President of the Royal College of Physicians. Alluding to the risk we are considering he said (" Nineteenth Century," June, 1878) : " I can readily sympathise with, and even applaud, a father who, with the presumed dread or misgiving in his mind, is willing to submit to multiplied judicial penalties rather than expose his child to the risk of an infection so ghastly." Section 420.

204. We agree with Mr. Hutchinson that " it is absurd to assert that inherited syphilis is always to be detected, and it is a cruel injustice to imply that all accidents (of this kind) have been the result of carelessness." Sir J. Simon has published a later view in which he states that " it is certain that the vaccine lymph of the syphilitic infant may possibly contain the syphilitic contagium in full vigour, even at moments when the patient, who thus shows himself infective, has not on his own person any outward activity of syphilis." Archives, October, 1890. 30,943-4. Quain's ' Dictionary of Medicine,' 182.

205. A committee consisting of Dr. Bristowe, Professor Humphry, Mr. Hutchinson and Dr. Ballard, reporting upon a well-known case, said " it is conclusively proved that it is possible for syphilis to be communicated in vaccination from a vaccine vesicle on a syphilitic person, notwithstanding that the operation be performed with the utmost care to avoid the admixture with blood." And it is recorded that in this case the vesicles from which the lymph was taken were described as " normal in appearance and not inflamed." 30,971. Report, L. G. B., 1882-3. M. O. H. supplement

206. Dr. Husband, of the Vaccine Institution of Edinburgh, has established the fact that all lymph, however pellucid, does really 27,327-9. Sect. 430.

contain blood cells. This not only disposes of the theory that lymph may be rendered innocent of harm if blood be excluded, but appears to render somewhat superfluous the labours of the microscopical examiner of lymph at the National Vaccine Establishment at Whitehall. Such microscopical examination of lymph, being directed mainly to the exclusion of that which according to Dr. Husband is omnipresent, and being admittedly insufficient to detect and identify micro-organisms of pathogenic nature, it is not surprising that it affords no guarantee of the purity of lymph.

4059—70.
4140.
4159.
4173.
4199—4200.

207. There is ground for believing that other cases have occurred which circumstances have prevented others from making public. Mr. Ward in giving evidence on the Leeds case incidentally referred to other cases.

208. A list of cases of vaccino-syphilis will be found on page 617 of our Sixth Report. Not only is the danger of vaccine syphilis now admitted to be " real and very important," but the safeguards which have been laid so much stress upon are now known to be illusory. It remains to be considered whether the use of calf lymph will, as has been suggested, obviate the occurrence of syphilitic symptoms as the result of vaccination.

10,215.
23,666.
21,854.

209. This subject is closely connected with what is known as the Leeds case of vaccino-syphilis. In view of the publicity which has been given to, and the importance of the issues involved in, this case, we think that the mode in which it has been dealt with in section 427 of our colleagues' report can scarcely be regarded as satisfactory.

The child in question was vaccinated in March, 1889, and died at the Leeds Infirmary on July 1 in the same year. An inquest was held at which Messrs. McGill, Ward, Littlewood and Dr. Barrs, all members of the infirmary staff, testified to the fact that the child died from vaccino-syphilis. The verdict of the jury was that the child " died from syphilis acquired at or from vaccination," and a rider was added to the effect that " when a parent requests calf lymph it is the duty of the medical man performing the operation to supply it if obtainable, or to explain to the parents his inability to comply with their request."

On July 17, 1889, Dr. Ballard, one of the medical inspectors of the Local Government Board, received instructions, in the usual way, to inquire into the case, and he reported to the Board.

On February 27, 1890, in reply to a question in the House of Commons, Mr. Ritchie, then President of the Local Government Board, stated that " an inquiry had been made by an inspector of the Board with regard to the case. His conclusions are not the same as those arrived at at the inquest. He states that the child in question was the only sufferer from subsequent syphilis among all the children he reached and whom he saw that had been vaccinated with the same or any other lymph in the whole course of the vaccinator's March vaccinations; and further, that the entire

23,686.

family to which the alleged vaccinifer belonged were, as far as he could discover by examination of them, free from any syphilitic taint or suspicion of such taint. The report of the inspector will be at the disposal of the Royal Commission on Vaccination."

The above reply implies, and the report of Dr. Ballard states, that the child died from hereditary syphilis. He alleges that the family of the diceased child was "a syphilitic family." He adds, 23,701.
"This conclusion is the direct contrary to that arrived at by the coroner's jury, as also by the surgeons at the Leeds Infirmary. Both the jury and the surgeons formed their opinions on the evidence and statements they received. If both came to an incorrect conclusion, as I hold they did, it was because they had not before them the whole story, as I have discovered and narrated it, and they were consequently misled."

210. Here the matter would probably have terminated as far as official inquiry went had the Commission not been sitting.

It was, however, agreed to ask Dr. Barlow to make an independent inquiry into the history of the case and the health of the family. He has reported to us that there is "no evidence of syphilis" in either parent of the child, and there is "no evidence of inherited or acquired syphilis" in either of the two elder children, and further, he adds, "nor does the history of the third (deceased) child suggest to me that it was the subject of inherited syphilis." On June 18, 1891, the results of Dr. Barlow's inquiry were stated by the President of the Local Government Board in the House of Commons in reply to a question by Mr. Herbert Gladstone.

We have since examined Messrs. Littlewood and Ward and Dr. Barrs, who adhere to the opinion that the child died from syphilis acquired by vaccination, and confirm the opinion of Dr. 23,701-3. 23,838-47.
Barlow that there was no suspicion of syphilis in the parents of the child or their elder children.

Mr. Hutchinson has also in a publication (Archives of Surgery, Vol. 1, No. 2) added the weight of his testimony to the fact that there is no evidence of syphilis in any of the family.

211. What then was the nature of the disease from which the child died? This question involves the larger question of the relationship of cow-pox and syphilis, between which diseases Dr. Creighton suggests that there is a close analogy.

212. Our colleagues hold, in accordance with the opinion on the Sect. 427.
case which Mr. Hutchinson published, that "it may probably be classed with a few others as examples of gangrene and blood-poisoning, the direct result of vaccination, which are not to be explained by supposing the introduction of any syphilitic or other poison."

213. It has indeed quite recently been recognised that it is possible for vaccination, even when the matter has been derived from the 21,989.
calf, to give rise to a certain train of symptoms (including snuffles, thrush, eruptions on the genitals, bubo in the arm-pit, phagedænic sores and nodes), symptoms which have hitherto been regarded as

peculiar to syphilis, and which in some cases have been benefited by mercurial treatment. The real nature of such cases has given rise to much dispute; well-experienced surgeons, who saw these symptoms and examined them carefully, thought they could be none other than those of syphilis. Others of high authority regard them as "vaccinia" in a severe form. Dr. Creighton explains all such cases, as well as those of vaccino-syphilis, as due to cow-pox without contamination by human syphilis. Whatever their real nature, it is impossible to refuse to recognise them as the direct consequences of vaccination. Fuller knowledge is required to explain them, but when the assertion is made that the *transmission* of syphilis by vaccination is exceedingly rare, it must be borne in mind that the fact that vaccination with calf lymph, and therefore independent of venereal contamination, is capable of evoking symptoms indistinguishable by experienced surgeons from those of syphilis, has only recently been brought to the notice of the profession.

Mr. Hutchinson says these cases look to him quite as much like vaccinia as syphilis, and were so closely parallel that, were syphilis conclusively proved in any one, he would be prepared to admit it in the others.

Archives of Surgery, Oct., 1889. 21,989.

The publication of these cases brought to light others of a similar kind, including several cases in the practice of a public vaccinator in which the four vesicles merged into one deep ulceration and took months to heal up, and another series in which the lymph had been taken from a child who was vaccinated from calf lymph from the Local Government Board. In this last series there was not the same gangrenous inflammation as in the others, but a persistent formation of scabs. (See also Cases 11, 21, 31, 35, 39, 113, 162, 167, 169, 175, 177, 183, 199, 202, 204, 206, 207, 208, 214, 241, 258, 326.)

Do., Jan., 1890.

Appendix.

214. In view of the fact alluded to in our colleagues' report that these abnormal results may follow vaccination *with calf lymph*, the following words of Mr. Hutchinson are significant:—"The final supposition is that it is possible for vaccination independently of any syphilis, whether implanted or hereditary, to evoke symptoms which have hitherto been regarded as peculiar to the latter malady, and which are apparently greatly benefited by specific treatment."

Archives of Surgery, Jan., 1891.

21,975.

215. This view of the affinity and results of cow-pox is that which was foreshadowed in the writings of Auzias-Turenne, and which in this country has been chiefly advocated by Dr. Creighton.

11,451. 21,973. 5573.

216. The remarkable increase of infantile syphilis, which some statistics show since 1853, has not received an adequate explanation. There is much to be said against setting the increase down to vaccination. We should only have expected vaccination to be to a very slight extent the cause of deaths from syphilis, and likely to be overshadowed by more potent influences, unless indeed there were ground for believing, as has been alleged on high authority, "that a large

10,205.

proportion of the cases of apparently inherited syphilis are in reality vaccinal."

217. As regards leprosy, the evidence is conflicting. It appears to be a general opinion that among the various means by which the disease is propagated, inoculation is one ; and this is held to be rendered more probable by the discovery of a bacillus which many authorities recognise as the cause of leprosy. This bacillus has been found by Arning in vaccine lymph. Several cases are on record in which the disease seems to have been conveyed to healthy persons by discharges from lepers gaining access to raw surfaces ; and there are a certain number of individual cases in which medical men of experience have concluded that vaccination has been the means of such communication. There is no doubt that in the West Indies, and in other leprous countries, a general suspicion exists that native lymph may transmit leprosy ; but evidence of wholesale propagation by this means is scanty and inconclusive, the most suggestive instances being those related by Arning in the Sandwich Islands.

9991. 10,109. 18,895. 19,104. 10,094. 19-164-6. 9993. 18,106.

218. In addition to inflammatory and septic complications, vaccination not unfrequently gives rise to skin eruptions. These vary immensely in character, and it is only in the most exceptional cases that a vesicular or pustular eruption like that of variola occurs. It has indeed been remarked that " the wonder is not that vaccination should sometimes produce an exanthem, but that it should ever be without one." (Hutchinson, Lectures on Clinical Surgery, I, i 18.)

These secondary skin eruptions evoked by vaccination have by the French pathologists been termed *vaccinides*. They may be roseolous, or papular (Lichen or Prurigo) or eczematous or impetiginous in type. (Fournier, Lécons sur la Syphilis Vaccinale, pp. 129-33.) They may be very transient and trivial, or may become chronic and persistent, and in a few cases have caused death. (See Cases 12, 14, 25, 29, 35, 82, 95, 98, 109, 120, 129, 130, 138, 173, 180, 193, 196, 208, 214, 240, in Appendix.)

219. In reference to the possibility of consumption, tubercle or scrofula being communicated or occasioned by vaccination, it is necessary to bear in mind the prevalent belief that these diseases are due to a specific organism, and the fact that it has been found that tubercular disease can be readily conveyed from infected animals to healthy animals or persons by the medium of infected animal products such as milk. It seems that in a few cases a local development of tubercle in the form of lupus has taken place at the site of vaccination (see case 26, also evidence of Mr. Dakers, VI Report, 21,219-83). In a few other cases the question has arisen whether constitutional infection of tubercle has not been evoked by vaccination. In a larger number of cases strumous symptoms, following upon the disturbance of health occasioned by vaccination, have raised the question of the relationship of the one to the other (see Cases No. 128, 52 (?) 89 ; and 131).

Thus Professor Felix von Niemeyer has expressed the view that—

22,648—50. "The injurious influence which diseases have on the constitution, and thereby on the tendency to consumption, manifests itself most frequently and in the most lasting manner in earliest infancy. It is fortunate if children escape disease, particularly in the first years of their life, during which by far the most rapid development of the body takes place, and when by favourable or unfavourable external circumstances the foundation is laid, in a great measure, for a strong and robust, or a weak and delicate, health. Even vaccination may, by the febrile disturbance preceding the eruption, as well as by that accompanying the suppuration, both of which are never absent, and, according to my numerous thermometrical observations, sometimes reach a very high degree, considerably weaken, more especially those children who are not very strong, and may leave behind it the germs of a disposition to consumption."

22,714. The experiments of M. Toussaint indicate the possibility of inoculating tubercle upon animals by vaccination. A paper by M. Dumontpallier on a series of casualties from vaccination in Paris in the "Rapport sur les vaccinations pratiquées en France," 1875, tends to suggest a similar possibility in the human subject. While cases of this kind would appear to be rare, we have little doubt the explanation quoted from Dr. Niemeyer would hold good in a larger number of cases.

220. It will have been observed that the diseases which have been alleged to have been conveyed by vaccination are those which modern pathology has shown to be inoculable, and we are bound to conclude that it is possible in the act of vaccination to convey any disease whose cause can reside in the inflammatory lymph of a vaccine vesicle.

Reference II.—Means other than Vaccination for Diminishing the Prevalence of Small-Pox.

770. 930. 221. We are quite unable to agree with those who have maintained that sanitary measures have little or no influence upon small-pox. We have already given our reasons for thinking that the teaching of the early sanitarians, like Howard and Haygarth towards the close of last century, initiated a new line of thought in the prevention of disease, and we believe the general improvement of the public health which then set in was due, in a large measure, to a greater sanitary activity, and that the falling off in the death rates of fevers and small-pox, as well as in the general death rate, is confirmatory of this view.

222. In speaking of sanitation we use the word in its widest sense; we are not speaking merely of drainage improvements, but we include the prevention of overcrowding on areas, or within houses and rooms, the proper construction of dwellings, so as to permit thorough ventilation; the promotion of cleanliness by ade-

quate water supply and the prompt removal of filth accumulations. Related to these measures, but in a somewhat different category, are means directed against contagion, the speedy separation (in suitable hospitals) of the infected from the healthy, the disinfection of persons and things, and the prevention of the propagation of the disease by inadvertent carelessness or by intentional inoculation.

223. If the view that attributes small-pox exclusively to contagion be well founded, it might indeed be possible to keep out the disease even from insanitary places by rigid isolation; but experience shows that some, even of the contagious diseases, are dependent for their extension and severity upon influences other than contagion. The Royal Commission on Infectious Hospitals in 1882, in their report, called attention to the fact that the opportunity for contagion which the presence of a small-pox hospital might afford to a particular neighbourhood is insignificant as compared with other deleterious influences from which London suffers. The returns and maps showed "that a healthy neighbourhood in which a hospital has been planted, though to a certain extent injured, may yet be favourably compared as regards prevalence of small-pox with those localities in which from overpopulation and neglect of sanitary precautions the predisposing causes of disease are more deeply seated."

Report of R.C. on S.P and Fever Hosps., p. xxiii.

224. We agree with the epidemiologist Hirsch that "small-pox, as well as typhus, takes up its abode most readily in those places where the noxious influences due to neglected hygiene make themselves most felt." (Hist. and Geo. Path., Vol. 1, p. 481.)

225. We find our own great sanitarian, Edwin Chadwick, in formulating his conclusions on the prevention of epidemics, while urging the separation of the unaffected from the affected when an outbreak occurs, yet maintained "that cases of small-pox, of typhus, and of others of the ordinary epidemics, occur in the greatest proportion, on common conditions of foul air from stagnant putrefaction, from bad house-drainage, from sewers of deposit, from excrement-sodden sites, from filthy street surfaces, from impure water, and from overcrowding in private houses and in public institutions."

"That the entire removal of such conditions by complete sanitation and by improved dwellings is the effectual preventive of diseases of those species, and of ordinary as well as of extraordinary visitations."

226. There is evidence to show that in countries where, at the present time, sanitation has not made much advance, or where overcrowding, filth accumulation, non-isolation of the infected, and, in some cases, the continued practice of inoculation prevail, small-pox is still rife, in fact endemic, and its persistence is attributed to these causes, and that where these causes exist vaccination entirely fails to neutralise them.

227. Thus in the official sanitary reports from India, published annually, we find frequent references to the influence of such causes upon the prevalence and mortality from small-pox :—

In the Report on Sanitary Measures in India, in 1879-1880, p. 142, it is stated :—" The vaccination returns throughout India show the same fact, that the number of vaccinations does not necessarily bear a ratio to the small-pox deaths. Small-pox in India is related to season and also to epidemic prevalence ; it is not a disease therefore that can be controlled by vaccination in the sense that vaccination is a specific against it. As an endemic and epidemic disease it must be dealt with by sanitary measures, and if these are neglected small-pox is certain to increase during epidemic times."

Again, in the report of the Army Commission of the Punjab for 1879, p. 186, it is stated ; " Vaccination in the Punjab, as elsewhere in India, has no power apparently over the course of an epidemic. It may modify it and diminish the number of fatal cases, but the whole Indian experience points in one direction, and this is that the severity of a small-pox epidemic is more closely connected with sanitary defects, which intensify the activity of other epidemic diseases than is usually imagined, and that to the general sanitary improvement of towns and villages must we look for the mitigation of small-pox as of cholera and fever."

It is stated again in the Report for the Central Provinces, p. 206 : " The past comparative immunity of the population had been attributed to efficient vaccination, and the people had accepted this protection, but their confidence has been shaken by the reappearance of a severe form of this disease. The sanitary commissioner states that he directed a special report on the subject to be made with the following result : ' During the early part of the year there had been a good deal of chicken-pock in Sambulpur town ; that when small-pox broke out later on it attacked those who had been inoculated, vaccinated, and had previously had small-pox or chicken-pock ; 301 persons who had been inoculated took the disease ; that 577 vaccinated persons were attacked and 729 unprotected persons, or 1,607 in all '."

Again in the Report for 1884-85, p. 203, referring to the sanitary measures of the North-West Provinces and Oudh, it is noted : " The facts already stated show conclusively that the small-pox of 1884 was one of the most severe epidemics on record, and by far the most severe in these provinces since deaths were registered. We are thus brought face to face with the fact that notwithstanding the existence of an active vaccination service, small-pox swept over the provinces just as if there had been none. No doubt attacks and deaths had been prevented by the service, but it is clear that it has been incompetent to deal with the disease in its epidemic form."

Again, it is stated that, " as a matter of fact, the total vaccinations at all ages performed by this staff amounted to less than three

times the number of deaths, and the operations under one year of age were not one and a half times the total deaths. These remarks are not intended to call into question the utility of vaccination. But in presence of the facts the question is a perfectly relevant one, namely, whether dependence can henceforth be placed on vaccination as a protection against a small-pox epidemic. The question of course, answers itself. In ordinary years lives are no doubt saved, and lower small-pox death rates may be co-existent with numerous operations. But this and similar experience appears to show that the remedies, if such be available, will have to be extended beyond vaccination, and will have to deal with epidemic causes affecting localities and their inhabitants. If sanitary work be neglected no more dependence against small-pox epidemics can be placed on vaccination than can be placed on quarantine against invasions of cholera. The true remedies lie elsewhere altogether."

Inoculation is still practised in India, in many places, and in association with religious observances, in honour of Sitla, the goddess of small-pox. In Persia inoculation is still to a large extent the custom; small-pox is endemic and the majority of children suffer from the disease at an early age.

228. In Nubia and the Soudan inoculation is still practised, the disease being regarded as a necessity, and the mortality is stated to be high, especially among the blacks.

8128.
Vol. VI., App., p. 756.
P. 747.

In Algeria small-pox is said to be endemic; the Arabs still practise inoculation, the most elementary precautions against contagion are neglected, and the treatment of the disease is like that in vogue here before the time of Sydenham.

8128.

229. There can be little doubt that social position and sanitary environment have a potent influence on the prevalence as well as on the fatality of small-pox.

Dr. Farr, before the days of compulsory vaccination, pointed out the effect on causes of mortality of the selection exercised by insurance companies. Death from the eruptive fevers among such selected lives was rare; among 4,095 deaths in the Equitable Society, during the years 1801-32, only one was from small-pox.

In the Norwich epidemic of 1819, Crosse noted that the epidemic was almost exclusively confined to the very lowest orders of the people.

The late Earl of Shaftesbury, in the debate on the Compulsory Vaccination Bill of 1853, observed that "it was perfectly correct that the small-pox was chiefly confined to the lowest class of the population, and he believed that with improved lodging-houses the disease might be all but exterminated."

230. In 1875 Dr. Farr constructed life tables based upon the vital statistics of, (1) All England, (2) Liverpool, and (3) healthy districts, in order to ascertain what effect healthy environment had upon zymotic diseases. His figures showed that—

For Every Million Born Alive there would Die, According to the Life Tables :—

	In Healthy Districts.	In England.	In Liverpool.
By small-pox ...	2,359	6,521	8,141
By fevers	28,146	38,107	76,563
By measles	6,912	12,865	26,973
By whooping-cough ...	10,234	15,161	34,021
By scarlatina ...	21,403	30,021	38,302

Supplement to 35th Annual Report of Registrar-General.

Dr. Farr, commenting on these remarkable figures, states his opinion "that healthy sanitary condition as to food, drink and cleanliness of person, house and city, stands first in importance; after it, but subordinately, come quarantine, vaccination, and other preventives, as means of subduing mortality; for the mere exclusion of one out of many diseases appears to be taken advantage of by those other diseases, just as the extirpation of one weed makes way for other kinds of weeds in a foul garden."

231. That the difference observed between the figures for Liverpool and the healthy districts is not merely due to the denser population of the former affording greater opportunity for infection, is, we think, shown by the fact that in industrial dwellings, where there is a considerable aggregation of persons upon area, but under superior sanitary supervision, there has been a marked immunity from small-pox. Dr. Southwood Smith long ago called attention to this fact (Results of Sanitary Improvements, p. 17), and we learn from the Secretary of the Improved Industrial Dwellings Company that, in 1880-82, there were but two deaths from small-pox among more than 15,000 tenants, while there were 3,268 small-pox deaths in those years in London with a population of 3,800,000.

232. At Warrington in 1892-93 Dr. Savill notes that a relation existed between small-pox rate and house rate. All but 11 of the 455 infected houses were rated at less than £16 per annum, and 406 of them at £8 and under; with the exception of these eleven, the small-pox was absolutely confined to the lower, or artisan, or working classes, whose gregarious habits pre-eminently favour the spread of the disease from person to person.

Warrington Rep., p. 87.

233. At Dewsbury we learn from Dr. Coupland's report that the sanitary condition of the union was anything but satisfactory. In 1878 a disproportionately high mortality from fever had occasioned a special investigation. It was found that the mean death rate from this cause had been 8.3 per 10,000 in Dewsbury, against 4.1 in London and 5.4 in the large towns of England. Although some improvement had taken place since that time there is much still to be done, especially in the matter of excrement disposal and house construction. The back-to-back system of dwellings is still the rule, especially in Batley. With but few exceptions the in-

Dewsbury Rep., p. 10.

cidence of the disease fell upon members of the working-class community. Associated with the staple industry of weaving is a very extensive rag trade: the rags come from all parts of the world, and consist of cast-off wearing apparel in all degrees of filthiness.

Dr. Coupland observes that in the higher part of Batley, which is mostly residential, but few cases of small-pox occurred. Of the 266 houses in Batley that were invaded, and of which particulars were obtained, 171 had no through ventilation, 122 of these were back-to-back and seven were cellar-dwellings. In Dewsbury more than 70 per cent. of the invaded houses had no through ventilation. At both places the proportion of cases of small-pox was larger in the houses where there was no through ventilation.

234. In reference to the question of the relation of sanitary measures to small-pox our attention was specially directed to an outbreak of the disease on board the steamship "Preussen" in 1886. It was suggested that in such a case the influence of vaccination could be measured without the disturbing influence that sanitary circumstances are alleged to exert. The case appears to have attracted considerable attention, and was quoted by the President of the Local Government Board, in the House of Commons debate of July 22, 1887, as strikingly showing the efficiency of vaccination (Hansard 22, VII, 1887, p. 1799).

It was stated in evidence "that the Local Government Board in 1886 took some pains to get the figures as to the steamship 994
'Preussen,' bound for Australia, on board of which small-pox broke out. You have, of course, on a vessel, people living under the same sanitary circumstances, eating very much the same food, and in all respects practically alike, with the one solitary exception of vaccination. There were 312 persons on board this vessel. Of persons both vaccinated and re-vaccinated there were 55: four of those were attacked by small-pox, none died. Of persons vaccinated but not re-vaccinated there were 209; 45 of whom were attacked by small-pox and three died; 13 persons had previously had small-pox, of whom three were attacked by small-pox and none died. Of persons stated to be vaccinated but showing no scars, there were 16, two of whom were attacked by small-pox, and none died. Lastly, there were 19 persons unvaccinated; 15 of these were attacked by small-pox, and nine died. This evidence is in expansion of that I gave, showing that sanitary circumstances have little or no control over small-pox when compared with the condition of vaccination or no vaccination."

235. Having examined Dr. MacLaurin, of Sydney, who had personal knowledge of the case, and the official reports from Melbourne and Sydney, we find:—

1. That the vessel was greatly overcrowded, carrying in all 5945-6.
723 passengers; the overcrowding led to a most insanitary state 5952.
of things on board, and the vessel when inspected at Sydney was

pronounced to be the filthiest ship the authorities there had ever had to do with.

2. In addition to the cases of small-pox referred to in reply to Question 994 there were 29 cases among some 235 passengers who were disembarked at Melbourne. Of these cases 21 were vaccinated (nine with one mark, four with two marks, eight with three marks) of whom one died ; seven were " doubtful " or " not stated " as to vaccination, of whom two died ; one was unvaccinated and recovered.

5959—69.
5971—5.

3. There were also, in addition, the crew, numbering 120, who had been vaccinated and re-vaccinated ; of these fourteen were attacked and one died.

The official report from Melbourne states " it is impossible to doubt that the ordinary rules for the preservation of health and enforcement of decency were neglected, and we fear the most obvious precautions against the spread of small-pox were omitted." Dr. MacLaurin, in his official report to the Sydney Board of Health, says, " Had the authorities at Albany, immediately on the ship's arrival, removed the small-pox patient to the shore, and suitably disinfected the ship, it is reasonable to conclude that the terrible amount of suffering and danger which has since ensued might have been almost, if not altogether, averted."

The facts do not appear to us to indicate that means other than vaccination have not a very potent influence over the spread of small-pox ; and in this particular case it would seem that while small-pox paid little respect to vaccination or re-vaccination sanitation was conspicuous by its absence.

236. We believe that the growth of knowledge in regard to the mode of propagation and control of contagious diseases, both amongst animals and men, which has signalised the last hundred years, has a most important bearing upon the history and mode of dealing with small-pox.

237. In the earlier years of this century, attention was repeatedly drawn to the great danger of spreading small-pox by carelessness in regard to contagion, and especially to the practice of inoculating out-patients at the small-pox hospital, and then allowing them to wander about in all stages of the disease. Mr. S. Bourne, M.P., in the House of Commons said, " If we were to prescribe a mode of spreading the contagion of small-pox, it would be difficult for human ingenuity to devise anything better adapted for the purpose than to inoculate out-patients at the small-pox hospital to the amount of 2,000 in a year, and for these out-patients to resort there twice a week to be inspected." The objectionable practice of inoculating out-patients was at last given up at the hospital in 1808.

In 1813 Lord Boringdon introduced into the House of Lords a Bill " for more effectually regulating the spread of infection from

the small-pox." He read documents from which it appeared that "owing to the constant open exposure of those who were inoculated with the small-pox in all stages of the disorder, great numbers were infected." Lord Ellenborough, in the debate which followed, pointed out that such exposure might be dealt with by indictment under the common law.

In 1815 the National Vaccine Establishment prosecuted in the King's Bench for the exposure of a small-pox patient after inoculation, whereby eleven persons were infected. The Court, in view of this being the first indictment of the kind, sentenced the offender to only three months' imprisonment. Moore, History of Small-pox, pp. 305-6.

238. The writings of Rast, Haygarth, Faust and others, published before the advent of vaccination, showed the enormous change which was taking place in the minds of medical men in regard to the part played by contagion, and therefore also in regard to the amenability of epidemics to human interference (see sections 456-458 in the report of our colleagues).

239. Some of these writers, like Rast of Lyons, denounced the practice of inoculation as not only fundamentally wrong in principle, in that it tended to keep alive the contagion, but also as a failure in practice, in that it had actually increased the share of the total mortality borne by small-pox. He proposed in 1763 a system of isolation in extra-urban hospitals very like that which we have seen adopted in our own day. Haygarth's writings did much in this country and abroad to familiarise the public and the profession with the possibilities of hospital isolation as a preventive as well as a therapeutic agency, alike in the case of fevers and small-pox.

240. Thus we find in the Medical and Chirurgical Review for the year 1796 (the year in which Jenner performed his first vaccination) a criticism of a work by Faust, of Leipzig, entitled :— 11,015.

"'An essay on the Duty of Man to separate persons infected with Small-pox from those in Health, hereby to effect the Extirpation of that Disease equally from the Towns and Countries of Europe,' in which it is stated . . . Thus it is proved that the small-pox is not a necessary or unavoidable evil of mankind ; it can be annihilated and ought to be ; it is a sacred duty to deliver from its ravages the present and future generations and we commit a heinous crime in not using the means in our power to put an end to so dreadful an evil. The question is by what means can this be effected ? The whole mystery is explained in a single maxim. The first person ill in a place is the only source from which all the rest, perhaps hundreds and thousands, become affected ; let him be put immediately into a situation where he cannot injure by contact those who have not had the disorder. It is the duty of the individual and of the community ; it is a duty owed to society and to the human race. We observe this duty when a maniac becomes

dangerous to society, and shall we omit it here where the danger is infinitely greater, and perhaps causes the deaths of thousands? And in the former, the separation lasts for years, and perhaps during life, whilst in the latter it is only necessary for a fortnight or three weeks; for the infectious period lasts only from the time of eruption to the complete falling off of the pustules. The principal means which M. Faust, therefore, points out for the execution of this great plan, are :—1. That people of all conditions should first be instructed by sensible writings that the small-pox is not necessary nor unavoidable, that its existence depends on our will, and that it is our duty to annihilate it. 2. A description of the disease with good ideas thereof should be circulated in all villages, in order that it may be immediately recognised. 3. Near each great town a moderately large house should be erected for the small-pox, and an inspector appointed. 4. All the inhabitants of towns and villages should contribute to its support. 5. As soon as any person is attacked with the disease he should be immediately removed to a house of this description . . . . If these rules are duly followed, continues M. Faust, it may with certainty be depended on that in five or six years the small-pox will no longer be found to exist in the civilised part of Europe, just as the plague itself is extirpated."

10,893. 241. Even after vaccination had been publicly announced, we find in the same leading Medical Review, in 1799, an article on establishments for the extirpation of the small-pox in which mention is made of " the ravages of small-pox since its first appearance in Europe," and it is stated that " since the year 1721 its mortality in Germany has been endeavoured to be lessened by the practice of inoculation. But the lists of mortality show that this desirable end is far from having been fully attained. Plans for total extirpation of the small-pox, therefore, have been suggested by philosophers of various countries, and the probability of being able to effect it is amply shown. To do this, however, the exertions of the physician are incompetent, unless they be aided by the powerful hand of Governments, but this has hitherto been witheld. *The grand means, however, of extirpating this destructive malady is an early and strict separation of the infected from those that are sound.* In the year 1796 the Prussian College of Physicians made a favourable report to the King on this project, when it was resolved to establish a house for the purpose in the city of Halberstadt. It is to be hoped that other countries will at length open their eyes to their true interest, and adopt a plan which cannot fail materially to affect the population of Europe. It will not be necessary then to attempt to disarm one disease of its powers by the introduction of another, the consequences of which cannot be fully known for a series of years to come."

242. Since vaccination was asserted to give the same protection as inoculation without spreading contagion, a point on which much stress was laid in the report of the House of Commons Committee on Jenner's petition, its acceptance in lieu of the old practice ap-

peared to offer a simpler and surer method of exterminating small-pox than the isolation methods which were being advocated, and these for a long time remained in abeyance while vaccination became the State-adopted method of dealing with small-pox.

243. In 1868 attention was again recalled to the value of isolation in dealing with small-pox by Sir James Simpson in a paper entitled a "Proposal to stamp out small-pox and other contagious diseases," in which the success which had attended the stamping out system in dealing with certain animal pests was cited as an illustration of what might be accomplished by an analogous system applied to the infectious diseases of mankind. 10,984.

The paper, which will be found at page 40 of the fourth vol. of our reports, is worthy of careful perusal. Sir J. Simpson's contention in brief was :—"For all that appears necessary for the purpose is simply the methodic temporary seclusion, segregation, or quarantine of those affected with small-pox, until they have completely passed through the disease and lost the power of infecting and injuring others. The poleaxe was the chief and leading measure required to stamp out rinderpost. *Isolation is the chief and leading measure required to stamp out small-pox.*" And he proceeded to show that by the Public Health Scotland Act, of 1867, and less satisfactorily by the Sanitary Act of 1866 for England, the Legislature had for the first time made such action possible to local authorities.

244. It has been largely in consequence of the experience derived from the great epidemic of 1870-72, in which the failure of the compulsory infantile vaccination system became so apparent, that attention has again of late years been directed to the necessity of providing proper hospitals for isolation, and to the enormous influence of such isolation in limiting outbreaks of the disease. Dr. Seaton, the Medical Officer of Health for Surrey, in alluding to the experience of 1870-72 (Brit. Med. Jour., Feb. 29, 1896, p. 521), says : "The way in which the disease was seen to spread by the sometimes unavoidable and sometimes careless exposure of infected persons and things at public-houses, laundries, provision shops, etc., as well as in the workhouses and common lodging-houses, forced attention to the question of isolation. This had hitherto been kept in the background by the habit of relying wholly on vaccination as the great preventive measure against small-pox. Under the influence of panic small-pox hospitals so-called were erected, but this did not take place anywhere until the disease had got firm hold of the population, and consequently they were little or no use in preventing epidemic diffusion."

245. It is instructive to compare the behaviour of small-pox, typhus, and scarlatina in London during the years of registration for which the figures are available for each of these diseases. The following table enables us to trace the influence which sanitary reforms and hospital isolation have had upon each of these zymotic diseases :— M. A. B., Report for 1895, and Reg.-Gen. Report for 1894.

Years.	Estimated Population in the Middle of each Year.	Annual Death Rate per Million.		
		Smallpox.	Typhus.	Scarlatina.
1838	1,766,169	2,161	—	—
1839	1,802,751	352	—	—
1840	1,840,091	671	—	—
1841	1,878,205	561	—	—
1842	1,917,108	188	—	—
1843	1,954,041	224	—	—
1844	2,033,816	887	—	—
1845	2,073,298	438	—	—
1846	2,113,535	122	—	—
1847	2,202,673	434	—	—
1848	2,244,837	722	—	—
1849	2,287,302	228	—	—
1850	2,330,054	214	—	—
1851	2,373,081	448	—	—
1852	2,416,367	480	—	—
1853	2,459,899	86	—	—
1854	2,503,662	277	—	—
1855	2,547,639	408	—	—
1856	2,591,815	205	—	—
1857	2,636,174	59	—	—
1858	2,680,700	90	—	—
1859	2,725,374	425	—	1,277
1860	2,770,181	324	—	726
1861	2,815,101	77	—	846
1862	2,860,117	128	—	1,221
1863	2,905,210	687	—	1,706
1864	2,950,361	185	—	1,097
1865	2,995,551	214	—	727
1866	3,040,761	457	—	622
1867	3,085,971	436	—	470
1868	3,131,160	191	—	929
1869	3,176,308	87	225	1,839
1870	3,221,394	302	147	1,875
1871*	3,267,251	2,421	118	582
1872	3,319,736	537	52	276
1873	3,373,065	33	82	191
1874	3,427,250	16	91	773
1875	3,482,306	12	37	1,056
1876	3,538,246	207	45	651
1877	3,595,085	709	44	439
1878	3,652,837	387	41	495
1879	3,711,517	120	19	717

Years.	Estimated Population in the Middle of each Year.	Annual Death Rate per Million.		
		Smallpox.	Typhus.	Scarlatina.
1880	3,771,139	124	20	820
1881	3,824,964	617	24	553
1882	3,862,876	110	14	519
1883	3,901,164	34	14	514
1884	3,939,832	307	8	362
1885†	3,978,883	347	7	181
1886	4,018,321	5	3	172
1887	4,058,150	2	5	356
1888	4,098,374	2	2	295
1889	4,138,996	—	4	190
1890	4,180,021	1	2	206
1891	4,221,452	2	3	142
1892	4,263,294	10	3	273
1893	4,306,411	48	1	369
1894	4,349,166	22	1	222
1895	4,392,346	13	—	—

* Opening of Metropolitan Asylums Board Hospitals.

† Small-pox cases isolated out of London.

These figures confirm the conclusion to which the other evidence points, that while sanitary reforms have been followed by a reduction of the mortality from small-pox and fever, the recent development of proper hospital isolation has been most strikingly effectual in reducing almost to insignificance the mortality from those diseases in the case of which it has been most largely resorted to.

246. Prior to 1867 organised removal and isolation of infectious disease in London did not exist. The Metropolitan Asylums Board was then formed, but the epidemic of 1870 had begun before any approach to adequate accommodation had been provided. At first admission to hospital was dependent on the order of a relieving officer, accompanied by a certificate of a district medical officer; but these restrictions have been removed and the Metropolitan Asylums Board's hospitals are now free to any person reasonably suspected to be suffering from small-pox, fever or diphtheria. 29,166—75.

The effect of these increased facilities for treatment of small-pox in isolation hospitals has been that while in 1871-72 only 31 per

cent. of the small-pox deaths occurred in hospitals, in 1893 87 per cent. took place therein.

247. On November 16, 1881, a Royal Commission, of which two of our colleagues were members, was appointed to inquire into the nature, extent, sufficiency, advantages and disadvantages, etc., of the Metropolitan Asylums Board's hospitals for small-pox and fever, and generally as to the operation of the Acts providing for the establishment thereof. In their report the Commissioners contrast the case of London with that of the provinces in regard to small-pox mortality ; they say :—

"We find that from 1871 to 1880 inclusive, the amount of disease in London relatively to the population, though less than that in several other great towns, has always been greater than that in England generally, and its rate of diminution has been slower. In London, however, as in the country, till about the year 1860, that diminution was always going on. Then a change took place. While the general provincial mortality continued to decrease, the quinquennial average mortality of London will be seen by the table to have risen from its minimum of 195 per million in 1861, to 396 in 1867, and to have continued at a somewhat lower but still comparatively high rate till the statistics of metropolitan small-pox were disorganised by the exceptional visitation of 1871, and the reaction amounting to virtual immunity of the years 1873, 1874, and 1875. During the six following years, 1876-81, the London rate of mortality has gradually risen, on the quinquennial average, to 393. Comparing this average with that of 1861, we seem for the last 21 years to have been grappling with an evil influence which is fitfully but sensibly gaining ground upon us . . . .and which Dr. Munk, the experienced physician of the Small-pox Hospital at Highgate, believes to be increasing in the severe character of its attacks."

They made certain practical recommendations, several of which have been carried out ; such as compulsory notification, disconnection from the poor law, removal of small-pox patients out of London, and the disuse of the intra-metropolitan hospitals for small-pox. The Commissioners were led to hope " that the immediate and complete isolation which ought to be secured by these means will greatly diminish the amount of small-pox, scarlet fever, and typhus in London."

They calculated that if their suggestions in regard to notification, etc., were acted on and produced the desired effect, three-fourths of the small-pox cases would find their way to hospital, and three-fourths of the deaths occur there, and thus both the average and maximum number of cases and the mortality from small-pox would be greatly diminished. This calculation has been more than realised : more than 80 per cent. of small-pox deaths in London now occur in hospitals.

They, however, state that, having regard to the 43 years of registration statistics, " if we assume for the moment that the past

is our best measure of the future, it would seem that we have to expect once in about 30 years an absolute mortality varying from 8,000 to 10,000 deaths, and apart from these extraordinary outbursts, that the sickness of the remaining 41 years will be indicated by a mortality ranging—

In	3 years	from 2,800	to 3,600
,,	17 ,,	1,000 ,,	2,800
,,	13 ,,	400 ,,	1,000
,,	8 years being under 400		
	41 years		

and that an accommodation for 2,700 small-pox patients would accordingly be a more than safe estimate.

248. The actual deaths from small-pox in London in the years which have elapsed since the Commission of 1881 reported have been as follows :—

1882	430
1883	136
1884	1,236
1885	1,419
1886	24
1887	9
1888	9
1889	0
1890	4
1891	8
1892	41
1893	206
1894	89
1895	55

It is in the highest degree satisfactory to find that the forecast, based upon the experience from 1838 to 1881, has not been verified by that of the subsequent years. London has not for two centuries been so free from small-pox as during the last ten years. In 1889 not a single death from that disease was registered in London ; in 1887, 1888, 1890 and 1891 there were less than 10 per annum, and in not one of the last 10 years has the 400 minimum limit, which the Commissioners anticipated would be exceeded in 33 years out of 41, been surpassed. London, instead of comparing unfavourably with provincial towns in regard to small-pox mortality, has come to show better results.

249. To what cause is this remarkable decline of small-pox in London attributable ? The excess of London small-pox in the past has been attributed to the relatively large proportion of the births that are unaccounted for as regards vaccination. Has the proportion become less of late ? On the contrary, the returns to the Local Government Board show that the proportion of births

not finally accounted for as regards vaccination in London has steadily increased from 4.3 per cent. in 1881 to 18.4 per cent. in 1892. We agree with our colleagues in thinking it impossible to attribute the decline to vaccination. In 1885 the Metropolitan Asylums Board began to convey small-pox patients by steamer to the floating hospitals on the Thames at Long Reach. In 1889 notification became compulsory in London, and nearly all the reported cases of small-pox have been promptly isolated in such a manner as not to occasion infection from hospitals in crowded neighbourhoods. The comparative immunity that London has enjoyed of recent years is no doubt due to this policy which has been so vigilantly carried out by the managers of the Asylums Board.

Sect. 472 of Report.

72,915. 1009–1013.

250. There are 400 beds in constant readiness at the ships, and additional accommodation is available at short notice at Gore Farm. On receiving telephonic or other communication at headquarters an ambulance proceeds with a nurse to where the patient is, and on receiving the certificate that the case is one of small-pox, and without any compulsion, the patient is conveyed to the wharf where the ambulance steamboat is in readiness. Here the patient is seen by a medical officer of the Board, to confirm the diagnosis or otherwise. There are three ambulance steamers comfortably fitted up so as to carry 100 acute cases at a time.

29,173.

29,299.

29,174.

251. It is a matter of experience that it is easier to secure notification and isolation in the case of small-pox than in the case of any other infectious disease. The promptness and ease with which an outbreak of small-pox in Marylebone was dealt with successfully by the Board in 1894 afforded a striking illustration.

658. 798. 29,224-5.

252. The Asylums Board has no jurisdiction in regard to disinfection or vaccination, nor is there in London any machinery for quarantining the inmates of infected households. Investigations which have been made in London and elsewhere have emphasised the local and personal infectiveness of small-pox, and the pedigrees of localised outbreaks have been definitely traced to single importations.

29,301.

253. Attention has been of late drawn to the part played by tramps in the spread of small-pox. Mr. Scovell, of the Metropolitan Asylums Board, pointed out the need for greater supervision of "shelters," and for the enforcement of greater cleanliness on the part of the vagrant population who use them. "Small-pox," he says, "is usually found to be rife among the lower and more uncleanly portion of the population." Dr. Birdwood, who speaks from the experience of some 12,000 cases of small-pox, believes that attention to cleanliness and frequent ablutions prevent the spread of small-pox and diminish the amount of eruption; he cites the successful precautions taken against the infection of visitors to the small-pox ships, and the occurrence of discrete small-pox in babies, who are frequently washed, as evidence of the truth of his views.

29,232.

29,274.

31,376.

254. In the last report of the Metropolitan Asylums Board

we read, in reference to the recrudescence of cases of small-pox in June, 1895, that " the causes which produced this sudden spread of the disease were not far to seek. Of the 35 patients admitted during June, only six possessed a fixed home. Of the remaining 29, three were infected in a London infirmary where small-pox had been introduced by some undiscovered means in May, and seven were infected in another infirmary by the agency of a vagrant who developed small-pox shortly after his admission there. The remaining 19 were vagrants who possessed no lodging or no fixed lodging, or other persons of the lowest class of society, all of them sleeping, when they slept under a roof at all, in common lodging-houses Salvation Army shelters, or the like."

M. A. B. Report for 1895, p. 152.

255. The experience of Glasgow shows in a striking fashion how influential are hospital isolation and sanitary reform upon the prevalence and mortality of typhus and small-pox, and how relatively slight is the effect of these agencies at present upon whooping-cough and measles.

During the last half century probably no large town has witnessed so great a change in its sanitary condition as Glasgow.

So late as 1842 the condition of its population was reported by Mr. Chadwick to the Poor Law Commissioners to be the worst of any he had seen in any part of Great Britain. Sanitation in the modern sense of the term scarcely existed. Typhus and small-pox epidemics devastated the city. In 1794 the Royal Infirmary was opened, and fever and small-pox were received into its wards, more from philanthropic motives than from any preventive intention. In 1862 the first municipal fever hospital was opened, and in 1876 the hospital treatment of infectious diseases passed wholly into the hands of the municipal authority, while hospital accommodation was made available for all classes in 1881. Meanwhile a City Improvement Act, and, in 1867, the Scotch Public Health Act had been passed, and in 1870 the first sanitary inspector was appointed. Since then extensive improvement schemes have been carried out, and municipal lodging houses and a municipal washing and disinfecting establishment erected.

The vital statistics bear testimony to the effect of these reforms.

Deaths per 1,000 from :—

	All Causes.	Zymotics.
1855-64	30.0	7.8
1865-74	30.5	7.3
1875-84	26.8	5.0
1885-94	23.1	3.8

256. No diseases have shown so remarkable a decline during the period under review as typhus and small-pox have done. Their parallelism is best seen in the two accompanying tables taken from a report of Dr. Russell, the able Medical Officer of Health for Glasgow.

Evolution of Public Health Administration, Glasgow, 1895.

GLASGOW—DEATHS AND DEATH RATES PER MILLION FROM TYPHUS for 40 Years (1855-94), showing Number and Per-centage which took place in Hospital for 30 Years (1865-94).

Year.	Deaths.		Death Rate per Million.	Per-centage of Total Deaths in Hospital.
	Total.	In Hospital.		
1855	460	—	1,291	—
1856	439	—	1,211	—
1857	549	—	1,487	—
1858	504	—	1,340	—
1859	381	—	995	—
1860	408	—	1,047	—
1861	475	—	1,194	—
1862	533	—	1,313	—
1863	671	—	1,621	—
1864	1,138	—	2,705	—
1865	1,177	612	2,749	52.0
1866	596	273	1,361	45.8
1867	497	219	1,112	44.1
1868	367	184	806	50.1
1869	970	507	2,089	52.3
1870	544	282	1,154	51.8
1871	284	117	577	41.2
1872	182	90	368	49.5
1873	68	35	136	51.5
1874	113	59	227	52.2
1875	96	51	192	53.1
1876	92	61	183	66.3
1877	70	52	139	74.3
1878	39	33	77	84.6
1879	55	45	108	81.8
1880	39	28	77	71.8
1881	48	37	94	77.1
1882	31	26	60	83.9
1883	50	36	96	72.0
1884	26	22	49	84.6
1885	15	11	28	73.3
1886	24	20	44	83.6*
1887	20	17	37	85.0
1888	22	17	40	77.3
1889	16	12	29	75.0
1890	14	12	25	85.7
1891	27	27	47	100.0
1892	10	9	15	90.0
1893	10	9	15	90.0
1894	9	9	13	100.0

The above percentages are as given by Dr. Russell. On the basis of the figures given in the second and third columns the percentage for the year 1886 is 83.3.

GLASGOW—DEATHS AND DEATH RATES PER MILLION FROM SMALL-POX for 40 Years (1855-94), showing Number and Per-centage which took place in Hospital for 30 Years (1865-94).

Year.	Deaths.		Death Rate per Million.	Per-centage of Total Deaths in Hospital.
	Total.	In Hospital.		
1855	203	—	570	—
1856	127	—	350	—
1857	399	—	1,080	—
1858	113	—	300	—
1859	201	—	525	—
1860	347	—	890	—
1861	131	—	329	—
1862	27	—	67	—
1863	349	—	843	—
1864	300	—	713	—
1865	26	3	60	11.5
1866	104	17	237	16.3
1867	32	5	72	15.6
1868	3	—	7	—
1869	2	—	4	—
1870	25	4	53	22.2*
1871	184	89	374	43.4*
1872	149	92	301	67.2*
1873	228	170	461	76.2*
1874	214	163	429	73.8*
1875	2	—	4	—
1876	8	6	16	85.7*
1877	13	10	26	90.9*
1878	2	—	4	—
1879	—	—	—	—
1880	2	2	4	100.0
1881	2	1	4	50.0
1882	—	—	—	—
1883	7	5	13	83.3*
1884	11	10	21	83.3*
1885	6	6	11	100.0
1886	2	2	4	100.0
1887	—	—	—	—
1888	—	—	—	—
1889	—	—	—	—
1890	—	—	—	—
1891	—	—	—	—
1892	6	5	9	83.3
1893	26	24	39	92.3
1894	5	5	7	100.0

The above per-centages are as given by Dr. Russell. On the basis of the figures given in the second and third columns the percentages for the following years are:—1870, 16.0; 1871, 48.4; 1872, 61.7; 1873, 74.6; 1874, 76.2; 1876, 75.0; 1877, 77.0; 1883, 71.4; and 1884, 90.9. And for the quinquennia 1870-74 and 1890-94, they are 64 and 92 respectively.

257. Grouping the figures for small-pox into quinquennia Dr. Russell obtains the following figures :—

——	Total Number of Small-pox Deaths.	Number of Deaths in Hospital.	Death Rate per Million.	Per-centage of Total Deaths in Hospital.
1855-59	1,043	—	565	—
1860-64	1,154	—	568	—
1865-69	167	25	76	15
1870-74	804	518	324	65*
1875-79	22	16	10	73
1880-84	22	18	8	82
1885-89	8	8	3	100
1890-94	37	34	11	89*

and he adds, " These results are sufficiently striking without reference to a standard population. In the 10 pre-sanitation years there were 2,197 deaths from small-pox ; in the 30 sanitation years 1,060. In the 10 years of imperfect isolation in hospital there were 971 deaths ; in the 20 years of perfect isolation, 89." Dr. Russell holds that " prevention is the aim and the *raison d'être* of hospitals and sanitary organisation, and the evidence of the success of prevention, in so far as isolation is concerned, is and may be formulated as an increasing proportion isolated of a diminishing total quantity of disease existing."

258. While sanitary reform has been so strikingly successful in the case of typhus and small-pox, measles and whooping-cough show a steady persistency. " The preventive utility of hospital isolation in the case of measles and whooping-cough is limited by various circumstances." Dr. Russell finds " the preventive results of the isolation of measles in hospital are in any case small," and the same seems to be largely true of whooping-cough. " Taking the last five years, after sanitation has done its best, whooping-cough is still left in the position of the most fatal disease, with a mortality of 979, but now very closely followed by measles, 941."

Death Rates per Million from :—

	1855-94	1890-94
Whooping-cough ...	1,350	979
Measles	796	941

259. At Warrington, where in 1892-93, according to Dr. Savill, the Vaccination Acts had been so thoroughly carried out that more than 99 per cent. of the people, according to his census, are vacci-

nated, the want of proper isolation accommodation was held accountable for the extent of the epidemic. Dr. Savill says :—" It will be gathered from the foregoing narrative that insufficient or imperfect isolation was an extremely important factor in the causation of the Warrington small-pox epidemic 1892-93. This was owing partly, in some instances at the commencement, to a non-recognition of the cases ; but it was due chiefly to an absence of hospital accommodation sufficient for the reception and isolation of the patients as soon as they were attacked and identified.

" The sanitary authority had neglected to act on the recommendations of their medical officer of health in this matter of hospital provision. The purchase of additional land for that purpose was contemplated in the summer of 1890, but it was not carried out until October, 1892.

" It is rendered evident from a close examination of the facts of the epidemic that if the town of Warrington had possessed adequate hospital accommodation for infectious disease the epidemic would probably never have reached the dimensions it did, and the disease would in all probability have been limited to a few cases in certain quarters of the town."

Warrington obtained notification by a Private Act in 1879, and in the epidemic of 1892-93 only 16 cases out of the 667 escaped notification.

At the commencement of the epidemic the total provision for the hospital isolation of infectious diseases was 30 beds, or less than half the very lowest estimate of that required. As a consequence of this only 13 cases could be received into the Borough Fever Hospital by dangerously overcrowding every available space.

The Hospital is situated in a rather thickly-populated part of the town.

It appears that an outbreak of small-pox in May, 1892 (consisting of three imported cases and one secondary case) was effectually dealt with by isolation, disinfection and quarantine ; but on the 18th of the same month the medical officer of health reported to the sanitary authority that " up to the present time we have been able to cope with introduced cases notified from the borough, but, as I pointed out in February, 1889, there is very great danger in treating small-pox cases in close proximity with a populous neighbourhood as Aikin Street is, and two full wards of scarlet fever in our own grounds."

It was not, however, until the epidemic had established itself in the town that additional accommodation was provided in September, 1892, at some disused Iron Works in Dallam Lane. These were situated near the northern fringe of the populated part of the town, but there appears to have been ample opportunity for communication with the outside world, at any rate, during the height of the epidemic.

Owing to deficient hospital accommodation, 91 cases were left at home, either altogether, or for periods varying from two to 22

days after the appearance of the rash. The limit of hospital accommodation was twice reached, viz., on August 23, when the old hospital became full, and on November 12, when the new hospital was also full. Dr. Savill traces 308 and 102 cases respectively to lack of hospital accommodation at these periods of arrest of removal. The spread of the disease within the hospital and workhouse are also attributed to insufficient isolation and overcrowding.

In the preliminary outbreak in May, 1892, the whole family was quarantined, and this may be the reason why this outbreak spread no further. With this exception, no measures for the actual removal and isolation of the healthy members of an infected household were adopted in the case of the Warrington outbreak, and though persons were enjoined to avoid contact with the infected, there is reason for thinking little care was exercised in this respect, and no efforts at regular daily inspection and supervision, such as those adopted at Leicester, appear to have been made.

In view of the limited provision for isolation, we agree with Dr. Savill, that "it is not to be wondered at that on this account the small-pox epidemic of 1892-93 reached the alarming proportions which it did."

260. The facts in regard to the methods adopted at Leicester and Sheffield will be found in sections 480-487 of the Report.

261. In regard to Gloucester, although we have not yet received the complete report of Dr. Coupland, we learn from him that the following circumstances contributed to the extension of the disease :—

1. "A main factor was the introduction of the disease into some of the public elementary schools."

2. The large and increasing proportion of cases retained at home ; especially as "quarantine," which in the early periods was under supervision, came to be more a matter of advice than of control. Dr. Coupland believes that "the facilities of intercourse between neighbours will account for a great deal—in other words, the failure of isolation."

3. The hospital is situate within the city and was crowded to excess, there being at one time two and even four in a bed ; it is possible that the hospital contributed to the spread, but it is difficult to prove this. On the other hand "there had been aroused a deep feeling against the hospital ; the mortality amongst the children admitted into it had been very high, and this feeling could not be eradicated, although the accommodation was extended and the organisation improved. Thus it happened that the majority of persons remained in their homes up to the last weeks."

4. The small sanitary staff was overtaxed ; and Dr. Coupland reports there were serious defects in hospital administration.

5. The hospital accommodation was afterwards increased and the administration improved ; that these efforts were not more

immediately successful was owing to the unwillingness of the people to enter the hospital which had so suffered in reputation.

6. Dr. Coupland, in comparing the experience of Gloucester with that of Leicester, points out that Leicester has the advantage of being better organised in its Sanitary Department, and its Medical Officer is not, as at Gloucester, engaged in private practice. There is more "sanitary vigilance" at Leicester and its sanitary staff is more numerous.

262. It is evident from the experience of Sheffield and Warrington that the most thorough carrying out of the vaccination laws will not prevent serious epidemics of small-pox, and that well-vaccinated towns cannot afford to neglect the provision of hospital isolation in order to prevent small-pox running riot in their midst.

263. The evidence leads us irresistibly to the conclusion that the simplest and most successful method of limiting and stamping out small-pox outbreaks is and always has been to separate the diseased from the healthy, and to disinfect infected places, things, and persons.

264. In so far as this is practised small-pox is restricted and extinguished; in so far as this is neglected it tends to prevail, i.e., to become epidemic.

265. The principle to aim at, then, is that of universal exclusion from opportunity of infection. It is the opposite of the principle underlying the practice of inoculation, which is that of universal acceptance of the disease and its artificial "sowing" or "buying."

266. The method of isolation or exclusion, although it had been suggested by a few, had not received much attention until after inoculation and vaccination had been tried, without achieving that success which it had been confidently hoped and asserted by the advocates of each was likely to result therefrom.

267. The history of dealing with small-pox, where it has been a matter of any concern, has been the history of passage from superstitious fatalism, or passive indifference, through the paralysing acceptance of "epidemic constitution" as the all-sufficient explanation, to active attempts, by inoculation or vaccination, to anticipate the disease.

268. During the practice of these latter methods, and side by side with them, there has gradually grown up a mass of evidence proving the efficacy of early isolation of notified cases of small-pox, disinfection, and quarantine, in controlling outbreaks.

269. There is also evidence showing that certain countries, by virtue of their geographical isolation, have enjoyed practical immunity from small-pox. The experience of places so dissimilar as the Continent of Australia, the town of Leicester, and the County of London shows that, even with a considerable and increasing number of unvaccinated persons, an isolation system may be carried out with remarkable success.

1770.
2988. 270. Infantile vaccination as now enforced in the United Kingdom does not prevent epidemics.

5833.
5820. 271. Notification and isolation appear to be accepted even in places where the greatest hostility to vaccination has been manifested.

272. Those who trust to vaccination say :—Vaccinate your child before it is three months old, and so render it less liable to have small-pox badly if it should happen at some future date to come in the way of it. Those who trust to isolation say :—Small-pox is notified to be here, now. Let the healthy be separated from the sick, let the latter be isolated at home, or, if they cannot be properly attended to there, let them be removed to a suitably isolated hospital. There can be no doubt that the latter is the stronger position of the two ; and in practice it has been found to secure the intelligent co-operation of the public.

273. In accordance with the sub-head No. 2 of the reference to the Commission, we would suggest the following as the means other than vaccination which should be employed for protection of a community from small-pox :—

1. Prompt notification of any illness suspected to be small-pox. Improved instruction in the diagnosis of small-pox.

2. A hospital, suitably isolated, of adequate accommodation, in permanent readiness, and capable of extension if required. No other disease to be treated at the same time in the same place.

3. A vigilant sanitary staff ready to deal promptly with first cases, and if necessary to make a house-to-house inspection. The medical officer of health to receive such remuneration as to render him independent of private practice.

4. Prompt removal to hospital by special ambulance of all cases which cannot be properly isolated at home. Telephonic communication between Health Office and hospital.

5. Destruction of infected clothing and bedding, and thorough disinfection of room or house immediately after removal of the patient.

6. Daily observation (including, where possible, taking the temperature and inspection for rash) of all persons who have been in close contact with the patient during his illness ; such supervision to be carried out either in quarantine stations (away from the hospital) or at their own homes.

7. Closure of schools on the occasion of the occurrence of small-pox among the scholars or teachers.

8. Hospitals and quarantine stations to be comfortable and attractive, and so administered as to secure the confidence of the public. Hospital treatment to be free to all classes, and compensation to be paid to those detained or otherwise inconvenienced in the public interest, at the public expense.

9. Tramps entering casual wards to be medically inspected, their clothing to be disinfected, and bath provided. The measures

for detection and isolation of small-pox in common lodging-houses suggested in section 507 of the Report to be carried out.

10. International notification of the presence of small-pox, and special vigilance at sea-ports in communication with infected places, after the plan adopted in the case of cholera.

11. Attention to general sanitation—prevention of over-crowding, abundant water supply, and frequent removal of refuse.

Reference V.—Alterations in the Provisions of the Vaccination Acts with Respect to Prosecutions for Non-Conpliance with the Law.

274. It must be obvious from what has been already said that we necessarily consider the legal enforcement of vaccination as inexpedient and unjust. We see no sufficient reason for withdrawing this particular medical prescription from the personal option which attaches to all other medical prescriptions or surgical operations; we do not think that medical authority or advice is likely to gain in confidence or respect by the adventitious aid of the police, and fine and imprisonment. But even if vaccination were a more effective and trustworthy prophylactic than we hold it to be, we should still think the continuance of compulsion at the present time to be an anachronism. The Final Report of the majority of our colleagues appears to us to show this conclusively. The view there expressed of the value of vaccination differs very considerably from the opinion prevalent in and before 1853, the date of the first compulsory law. Whether such limited and conditional confidence in vaccination as is expressed in the report of the majority would have been held by the Parliament of 1853 to justify compulsion is, of course, a matter of opinion; but when we recall the unqualified assurances then given that universal efficient vaccination would secure universal immunity from small-pox, we must say, in our opinion, it would not.

685. 1755—71. 275. Our inquiry has shown that medical opinion as to the degree of immunity afforded by efficient primary vaccination has been modified since 1853, the date of the first compulsory Vaccination Act. At that time the Epidemiological Society used its influence to get the Act passed on the ground that the whole medical profession was agreed on the certain efficacy of vaccination as a preventive. The evidence we have received shows that this agreement no longer exists. Amongst the professional witnesses who have favoured us with their views there are marked differences of opinion as to the length of the period during which primary vaccination is effective. But not one of them has maintained Jenner's first claim that vaccination conferred a lifelong protection.

12,919. 1755. 12,913—22. 276. It is apparent from the history of legislation on this subject that the assumption underlying every amendment of the law was a strong and general belief that, if only the absolute univer-

sality of efficient primary vaccination could be secured, epidemics would be prevented, and practical immunity would be secured for the whole population throughout life. On the other hand, we have it in evidence that the epidemic of 1871-73 was as severe and widespread as any experienced during this century, and that in the course of this epidemic "a very large proportion of the total small-pox deaths of adults was amongst people who had at some time or other been vaccinated."

685.

277. It would seem, therefore, that there is a certain amount of discrepancy at the present day between the theory on which the compulsory law is based and the actual state both of fact and opinion.

278. Under these circumstances it has been suggested to us that the obvious remedy is to amend the law by making re-vaccination compulsory. But though such a course might receive a good deal of support from medical opinion, the evidence we have as to the condition of public feeling shows that it would be impracticable.

100—2, 118, 156.

11,635.

279. This condition of things can hardly be considered satisfactory. The law as it stands enforces, under penalty of fine or imprisonment, a practice once thought to be an effectual preventive of epidemics, and a practical safeguard for every individual vaccinated. But this prescription of the law is now generally recognised as insufficient unless primary vaccination be supplemented by secondary or repeated vaccination. The question thus arises whether it is just or expedient to enforce at the cost of much local discontent a preventive which does not secure the end proposed, and which confessedly cannot now be supplemented by the only measures which, according to the medical opinions quoted, could make it effective.

280. In support of a continuance and reinforcement of the present law it is urged that if primary vaccination be not an infallible preventive, at least it always lessens the severity of the disease, if caught, and diminishes the mortality. It is, however, doubtful whether such results as these would have been held to justify compulsion when it was first proposed. And we cannot shut our eyes to the fact that this shifting of the ground of compulsion has re-opened the whole question in the minds of many who accept this modified view of the Jennerian practice. As Commissioners commanded to consider and report on "provisions of the Vaccination Acts with respect to prosecutions for non-compliance with the law," we cannot avoid a reconsideration of this issue, which has very much to do with the unsettlement of public opinion on the Acts in question.

18,042-3.

13,065.

13,143.

281. It cannot be denied that the law as it stands is of a very exceptional character. It is the only instance under our Constitution of the universal enforcement by fine and imprisonment of a surgical operation. In all other cases preventive sanitary law affects only outward circumstances, such as light and air, sewerage, overcrowding, public exposure of infected persons, and the like. In all such cases the social interests are so direct and predominant,

and the individual claims affected are so slight, or so merely mercenary—as in the case of owners of insanitary premises—that the reasons for compulsion are simple and uncomplicated by any delicate question of personal rights. But compulsory vaccination goes beyond outward circumstances, and invades the integrity of the healthy body. It requires a wound, however slight, to be inflicted on every healthy infant born, and the contraction of a disease, however slight, of the successful cultivation of which the vaccinating surgeon must satisfy himself. The law gives the parent or guardian no option as to incurring the possible dangers of the operation. In all other cases he is allowed to decide on his own responsibility whether he will follow a particular medical prescription or not. But in this he must accept the operation with all its dangers, real or imaginary, at the dictation of the law. He may believe that he has lost previous children through the effects of vaccination. But nevertheless he must run the risk again, or be treated as a criminal. It may fairly be conceded that a compulsory law of this nature requires justification different both in kind and degree from that of laws affecting ordinary nuisances.

282. The case as put before Parliament in 1853 seemed exceedingly strong. But, unfortunately, it did not receive much discussion. It rested, as we have seen, on the practical unanimity of the medical profession in the opinion that universal primary vaccination would extinguish small-pox. It was argued that the plague of small-pox was such as to justify exceptional measures. It was believed that vaccination had already come into such general vogue that only carelessness accounted for occasional neglect. And, finally, it was assumed that there were no dangers to be feared such as might perplex the consciences of parents.

283. The evidence we have received shows that the same position cannot be held now. Eminent medical men, some of whom have appeared before us, are now maintaining that the protection supposed to be afforded by vaccination, even though repeated, is almost entirely illusory. Some allow, indeed, that the disturbance of the constitution set up by vaccinia may during its brief continuance prevent the development of small-pox from inoculation. But in their opinion this protection is so exceedingly brief in its duration that it is of no appreciable value as a prophylactic against epidemics. Whether that opinion be scientifically justified or not, the fact that it is held by medical men of great scientific reputation has recently done much to encourage resistance to the law. Where doctors differ it seems difficult to resist the claim of parents to be allowed to choose for themselves which opinion they will follow.

11,843. 11,848. 11,855.

284. In 1853 there were few or no signs of opposition amongst the population when called upon to submit to the law. There was a general acquiescence in the assumption that the abatement of the virulence of small-pox from the commencement of the 19th century had been due almost entirely to the voluntary and partial

adoption of vaccination. Those who neglected it were reasonably suspected of doing so, not from any conscientious conviction, but from mere carelessness and indifference to social welfare. It seemed right in the opinion of the time, therefore, that they should be compelled to adopt an apparently harmless precaution, which was believed only to need universal enforcement to secure the whole nation against a deadly disease. If these anticipations had been realised there seems no reason to doubt that the law would have continued to be enforced with little or no friction.

285. But in no year after the enactment of compulsion was the number of deaths reduced below 1,500 until the year 1875. It was during the eighth decade of this century that resistance to the law began to spread widely ; and the main point on which recalcitrants insisted was that experience proved the impotence of vaccination to prevent epidemics.

286. The case of Leicester, on which we have had a large amount of evidence, illustrates most clearly the origin and growth of local resistance to the law. It is proved that down to 1872 Leicester was what is usually considered a well-vaccinated town. During the years immediately preceding that date not more than 5 per cent. of the children born in each year were " unaccounted for." In other words, 95 per cent. were reported as satisfactorily vaccinated. In 1871, the year of the worst epidemic during the present century, the condition of Leicester was exceptionally good. Out of the whole 4,446 children born there in that year, only 15 were found to be neglected, and in every one of these 15 cases the parents were prosecuted. It appears, therefore, that there was very little, if any, opposition to the law in Leicester at that time, and public opinion in its favour seemed to be confirmed by experience ; indeed, the Medical Officer of Health of the borough, in his reports for the years 1869 and 1870,was able to state that vaccination had been " sedulously attended to," and he claimed the immunity of the town from small-pox as evidence of the effect of vaccination. While the epidemic in the country at large carried off 23,126 people in 1871, Leicester only lost 12. But in 1872 the town was not so fortunate. The deaths from small-pox suddenly rose to 346.

287. According to the evidence we have received, it was experience of this epidemic that fostered the rapid growth of opinion in Leicester adverse to vaccination. The ground taken was that vaccination had not protected either the population at large or the individuals vaccinated, and that therefore it ought no longer to be enforced. There were other reasons, such as the growth of a belief that the operation is injurious and sometimes fatal. But the origin of the movement was the disbelief in vaccination as a prophylactic. The election in 1887 of a board of guardians, of whom a majority were opposed to compulsion, led to the entire abandonment of prosecutions, and the law has since that time been locally in abeyance. Experience of a more recent outbreak in 1893-94 has not changed local opinion. On the contrary, it is alleged that the cessation of vaccination, together with

the adoption of sanitary and isolation measures (to which we have referred in a former part of this report), have been much more effective in saving life than was the enforcement of the law at the period of the previous epidemic.

288. The prevalence of this opinion is by no means confined to Leicester. In December, 1891, we issued to all boards of guardians in England and Wales a number of questions concerning their mode of carrying out the law, the enforcement of which rests with them. The replies showed that in 122 unions compulsion had either been temporarily suspended until the report of the present Commission, or had been entirely abandoned, independently of our inquiry. These unions include, in addition to Leicester, a number of important towns, such as Reading, Falmouth, Derby, Darlington, Gateshead, South Shields, Colchester, West Ham, Gloucester, Burnley, Bury, Oldham, Lancaster, Wigan, Wolverhampton, Ipswich, Eastbourne, Coventry, Hull, York, Middlesbro', Scarborough, Bradford, Dewsbury, Halifax, Keighley and others.

289. The law is also in abeyance by resolution of the guardians, in the following Metropolitan Unions, viz., Camberwell, Hackney, Islington, Lambeth, Mile End, St. Olave's, St. Saviour's, and Shoreditch. Making allowance for the fact that in about 46 of the 122 unions the suspension of the compulsory law is professedly only temporary until this Commission shall have reported, we cannot regard without anxiety and fear the painful conflict that would be inevitable if an attempt were made to revive and re-enforce the compulsory law in these localities against the prevalent opinion of the inhabitants.

290. Indeed, even to make the attempt would be impossible without a considerable change in the law. For at present the duty of enforcement lies with the guardians, and it is made a test question in their election. If we could suppose that the evidence laid before us would have the effect of changing local opinion, we might count on the future election of guardians willing to carry out the law. But a large part of that evidence has been published already, and there is hitherto no appearance whatever of any change in the local opinion of the unions above mentioned, except in the rare cases in which epidemic has occasioned panic. Each year of our labours has witnessed not an increase, but a decrease in the numbers of guardians elected in these unions by the supporters of compulsion.

291. It appears, therefore, that, if the present law is to be made really effective, this can only be secured by imposing the duty of its enforcement on the police under the direction of inspectors of the Local Government Board. There is too much reason, however, to fear that even this would not be sufficient without a material increase in the severity of the law. The evidence received as to the prevalence and strength of conscientious objections on the part of parents convinces us that a considerable number could not be compelled by any penalties of fine or imprisonment to bring their children for vaccination or to allow the operation at their own

6052—6764.

homes. People who show this spirit are considered martyrs by their neighbours, and a few such cases soon create a local agitation against the law. The only way of enforcing the law without prosecution of parents would be to empower public vaccinators to seize children by the aid of the police and vaccinate them by force. But the attempt would probably create an agitation such as no Government could withstand.

292. The difficulty of compulsion is greatly enhanced by the undeniable fact that vaccination is attended by an appreciable amount of danger. The constitution of a child is always more or less disturbed by it ; and though the number of cases in which this disturbance assumes a painful or fatal form bears small proportion to the number of infants vaccinated, yet a certain amount of risk remains undeniable ; and the question whether this risk should be encountered or not is naturally regarded as a matter of parental responsibility. We are unable to report that this risk is infinitesimal or unimportant.

293. The degree of risk which parental feeling may justly be compelled to encounter is scarcely susceptible of statistical statement. If we were in a position to affirm that there is absolutely no danger, our task might be much simplified. But when once the reality of appreciable danger is proved, as we hold it to be, it becomes a very delicate question how far the law is morally justified in interfering with the discretion of parents. It may be urged that a very great danger to the community might justify the enforcement of a proved and indispensable safeguard even at some risk to individuals. But the danger from small-pox to any community using such precautions as we have recommended is not now great enough, nor is the safeguard of sufficient certainty to fulfil these conditions.

294. It is true that in a considerable number of the cases examined for us the injury or death is reported to have been only indirectly due to vaccination. Insanitary surroundings and parental ignorance or even parental neglect are assigned in some cases as the causes of complications. But even in such cases it is clear that, apart from the vaccination, the contributory causes alone would not have produced the results admitted. An operation which for its safety requires complete sanitation, with care and skill on the part of every mother, would seem to be scarcely a fit matter for universal compulsion.

295. On this point we may quote the language of M. Depaul, for some time superintendent of the vaccination service in France, as reported and approved by the late M. Lefort, himself a strong advocate of vaccination but an opponent of compulsion. In his final reply on a long discussion in the Académie de Médecine, M. Lefort said : "A law to make vaccination compulsory seems to me vexatious, ineffective and impracticable. I cannot put out of my mind the offensiveness of such a law to free men ; nor can I any more put out of my mind that the father of a family also has rights of which he can hardly be disposed to deprive himself in order to entrust them

to the Government. Still, if we could—not indeed entirely suppress small-pox—but at least diminish it substantially by violating this liberty, I could even assent to this notwithstanding my repugnance ; but as it is not so I cannot assent to this compulsion." " Here, gentlemen, it is not I who speak, but it is M. Depaul, for long the director of our vaccine service, who uttered these words on this platform on March 20, 1881." (Bulletin de l'Académie de Médecine, 3me série, Tom. xxv, No. 7, séance du 17 Février 1891, p. 270.)

296. On the whole, then, we are of opinion that a resolute and universal enforcement of vaccination is neither possible, nor expedient, nor just. It is not possible, because there exists a sufficient amount of conscientious opinion opposed to it to give recalcitrants the credit of martyrdom, and because in great centres, such as Leicester, it is questionable whether even the police could carry out compulsion without the aid of the army. It is inexpedient, because it concentrates attention on a safeguard proved to be insufficient in itself, and leads to the neglect of sanitation and isolation, which our evidence shows to be more effective. It is unjust, because to meet a danger often remote by a defence at best uncertain, it overrides parental responsibility and disregards parental feeling.

297. The proposal of our colleagues is that, while abandoning the attempt to enforce vaccination upon those who honestly object to it, we should continue to press it by force of law upon the indifferent and negligent. In the matter of re-vaccination, however, their proposal is different ; they are impressed with the transient influence of vaccination, and recognise the need of re-vaccination as early as nine or ten years of age, and advise its repetition at intervals, but they do not suggest that the repeated operation, which they regard as essential, should be pressed upon the indifferent and negligent as in the case of the primary operation.

298. Now the whole principle of securing the protection of a community from small-pox by the artificial production of a mild disease (whether it be inoculation or vaccination) is based upon the thoroughness of the procedure in two directions :—1. In applying the inoculatory process to *every* individual ; and 2. In securing to each individual operated upon the maximum of protection the process is capable of securing.

299. The proposals of our colleagues appear to us to fail upon their own showing in both directions. They recognise the impossibility of securing the primary vaccination of every person, and open a means of escape for objectors. They are also not prepared to recommend that re-vaccination should be pressed in the same manner as the primary operation at a time when the vaccinated have lapsed into susceptibility to small-pox.

This serves to prove that any such system must at best be a broken reed on which to rely for the protection of a community from small-pox epidemics.

300. We believe the methods of isolation of the infected, disinfection, and the observance of strict cleanliness are both more suc-

cessful and more legitimate methods for the State to encourage. They have the advantage of applying the preventive only where it is required; and they do not necessitate an operation upon the person of every healthy individual.

301. We, therefore, recommend that the law be amended by the repeal of the compulsory clauses of the Vaccination Acts. But in consideration of the prevalent belief in the value of vaccination as a prophylactic for an indefinite period, we suggest that in other respects the law should be left as it is, subject, however, to such modifications as are recommended for the diminution of attendant risks. The precedent established in the case of the abolition of compulsory church rates might be followed with advantage. In that case all machinery for laying and collecting the rate was left intact though the power of enforcement was taken away. The effect of our recommendation, if adopted, would be that vaccination would continue to be provided as at present for those who desire to avail themselves of it, but efforts to secure vaccination would be limited to moral influence—in a word, the whole country would be in a position of those unions in which the guardians have abandoned compulsion.

302. The grounds on which we object to the enforcement of vaccination by penalties necessarily lead us also to object to any method of indirect compulsion. We regard as both inexpedient and unjust exclusion from any branch of the public service because of the refusal to submit to vaccination or re-vaccination. The injustice is perhaps most severely felt in the case of candidates for employment as pupil-teachers in public elementary schools. There are now districts in which, owing to the general opposition to vaccination, scarcely a girl or boy can be found who is legally eligible, and candidates have to be brought in at great inconvenience from surrounding districts. The existence of an exceptional case or cases in which such rejected candidates have at some time afterwards taken small-pox is in our view no justification for the continuation of this grievance. Statistics furnished to the Commission prove that large numbers of vaccinated or re-vaccinated persons have taken the disease; and we are not aware of any evidence to show that vaccinated pupil-teachers have any special immunity. If our recommendations were carried out the danger of contagion would be greatly diminished, in schools, as elsewhere.

303. On the whole, then, while there is much in the report of our colleagues from which we dissent, and we have accordingly abstained with reluctance from adding our signatures to theirs, we are at one with them in holding that it is unwise to attempt to enforce vaccination on those who regard it as useless and dangerous. We, however, go further, and agree with our colleagues, Mr. Whitbread and Mr. Bright, that it would be simpler and more logical to abolish compulsory vaccination altogether.

W. J. COLLINS,
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