The evolution of the function of public health administration : as illustrated by the sanitary history of Glasgow in the nineteenth century, and especially since 1854, with an exposition of results / by James B. Russell.

THE EVOLUTION

OF THE

FUNCTION OF PUBLIC HEALTH ADMINISTRATION

AS ILLUSTRATED BY

THE SANITARY HISTORY OF GLASGOW

IN THE NINETEENTH CENTURY,

AND ESPECIALLY SINCE 1854,

WITH AN EXPOSITION OF RESULTS,

BY

JAMES B. RUSSELL, B.A., M.D., LL.D.,

SENIOR MEDICAL OFFICER OF HEALTH.

Submitted to the Police Commissioners, 2nd September, 1895, and ordered to be printed.

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PREFACE.

THE Scotch Registration Act came into force on 1st January, 1855. We have therefore now an accurate record of the vital statistics of Glasgow for exactly forty years. When we look back upon the history of municipal administration as regards the public health, we find that, speaking generally, the first ten of those forty years represents the period of awakening and groping for an instrument and a method, the remaining thirty, the period of resolute endeavour, working through a developing organization, and becoming year by year more precise in direction, so that every ten years represents a stage in administrative progress. This in itself suggests that the time is convenient for an enquiry into results. The anticipated revision of the whole internal administration of Glasgow in 1896, the approaching removal of the Sanitary Department from the somewhat dingy premises in which it has dwelt for a quarter of a century, and which it has long outgrown, and the sense of quickening life which is felt in the city, and seems to foretell an era of new departures, all mark the opportune occasion for a retrospect.

In order to estimate the magnitude of the task which was passed on to those forty years, it is necessary to form some idea of what the sanitary state of Glasgow was in the first half of the century. We have provided ample material in the contemporary words of citizens and official visitors, words not written in private diaries or letters, and published long years after, or concealed in confidential documents, but read as we now read them by the men responsible for the affairs of the time. In tracing the evolution of the function of public health administration, we also discover the inertness of the public conscience, and measure the inertia of the administrating mind.

J. B. R.

Sanitary Department,
1 Montrose Street,
August, 1895.

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PART I.

Review of the Sanitary History of Glasgow in the Nineteenth Century.

The whole story of the sanitation and the health of Glasgow is displayed in chronological charts prefixed to each period, which exhibit the current of local effort and the current of local health side by side, with special fulness of detail in the forty years of national statistics. We shall give a brief general survey of the periods in succession, keeping in prominence a coherent reading of the moral of the narrative.

The inconsistency and irreconcilability of the earlier statements of the population of "Glasgow" are most bewildering. The object of local statisticians was to get the population within the area of the Bills of Mortality, these being the return of burials in the grave-yards of the community. The discrepancy was partly removed by the extension of 1846, and the necessity for adjusting the population ceased with the Registration Act. The population of "Glasgow and Suburbs" at each Census prior to that date, *within the area which was adopted for*

the Bills of Mortality in 1821 was as prefixed to the following Table:—

1800-1854.

POPULATION.

1801,	83,805	1831,	202,426
1811,	110,460	1841,	280,602
1821,	147,043	1851,	347,001

SANITATION.	HEALTH.
1800. *First Police Act.*[1]	
1806. The Glasgow Waterworks Company constituted. Works, Dalmarnock. Clyde Water.	
1807. *Second Police Act.*	
1808. The Cranstonhill Waterworks Company constituted. Clyde Water.	
	1818. Typhus Epidemic.
1821. *Third Police Act.*	
1830. *Fourth do.*	
1832. THE CHOLERA ACTS.	1832. Do. First Cholera Epidemic—2842 deaths, or 14 per 1000. Death-rate, 46.
	1837. Typhus Epidemic — 2180 deaths. Death-rate, 41.
1837. *Fifth Police Act.*	
1838. Amalgamation of the two Water Companies.	
1843. *Sixth Police Act.*	1843. Relapsing Fever Epidemic—1398 deaths. Death-rate, 32.
1846. *Seventh Police and Extension Act.*	
,, NUISANCE REMOVAL (SCOTLAND) ACT.	
	1847. Typhus Epidemic — 4346 deaths. Death-rate, 56.
1848. Gravitation Water introduced to Gorbals by Private Company (February).	1848-9. Second Cholera Epidemic—3772 deaths in 1849, or 11 per 1000. Death-rate, 35.
	1851-2. Typhus Epidemic.
1854. SCOTCH REGISTRATION ACT.	1853-4. Third Cholera Epidemic—3885 deaths in 1854, or 12 per 1000. Death-rate, 42.

Prior to 1855, the register of burials kept by the wardens of church-yards was the only source of information as to the number of deaths or their causes. "Mortality Bills" made up from these sources were systematically

[1] Local Acts are printed in *Italics;* Imperial in SMALL CAPITALS.

published from 1821, and from 1832 a succession of able statisticians issued annual reports, which kept vividly before the community the facts so far as known regarding the prevalent causes of death. What these facts were may be very shortly stated. The city was devastated with epidemics of "Fever" and Small-pox. Though Typhus did not arrest attention by any epidemic prevalence until 1818, it was in the city from the very beginning of the century. Its subsequent history was that of an active volcano, periods of deceptive repose alternating with violent eruptions. For short intervals it smouldered in the wynds. When the steady influx of immigrants attracted by the prospect of work had reproduced a susceptible population, it burst out into an epidemic. Small-pox, though warded off from the infant population by the early introduction of Jenner's discovery, was scarcely ever entirely absent, apparently feeding chiefly on the Celtic immigrants, and becoming epidemic at intervals as they accumulated. There were three severe epidemics of Cholera in this period—the first in 1832, the second in 1848-9, the third in 1853-4. An outbreak of Relapsing Fever in 1843 attacked more than a quarter of the inhabitants of the poorer districts. Underneath these periodic eruptions flowed a continuous condition of ill-health, which represented the chronic as the former represented the periodic results of precisely the same physical circumstances in the environment of the population.

It is difficult to convey to the present generation any adequate conception of what such varied recurrent epidemics meant in the experience of their forefathers. An attempt may be made so far as figures will go. In 1837 the population of Glasgow was 253,000, the death-rate was 41 per 1000, the number of deaths from "Fever" was 2180, or 8·6 per 1000. It was estimated that at least 21,800 persons suffered from the disease that year. In 1847 the population of Glasgow was 320,470, the death-rate was 56·4 per 1000, the number of deaths from "Fever" was 4346,

or 10·4 per 1000, representing in cases some 45,000 persons. In 1893 (chosen as the *worst* epidemic year in recent times) the population of Glasgow was 677,880, the death-rate was 23 per 1000, the number of deaths from "Fever" was 137; the number of *cases of "Fever" compulsorily notified* was 800. The total number of *deaths from infectious diseases of every description* was 3096, or 4·6 per 1000. The total number of *cases of infectious disease of every description* registered in the books of the Sanitary Department was 17,108, so that putting altogether aside the increase of population, if every case of infectious disease (including even Measles, Whooping-cough, and Chicken-pox) was a case of Typhus, we should not have in absolute numbers now-a-days in Glasgow as many cases as there were of Typhus alone in epidemic years in the first half of this century. In fact, even on the average of long periods the cases of Typhus exceeded the whole of our compulsorily notifiable diseases. In the seven years (1836-42) the average number of Fever cases was estimated to be 8570, and in the five years of compulsory notification (1890-94) the average of *all* the cases notified was only 6715 per annum. If every case now treated in our Hospitals was one of Typhus they would only feebly represent the number of typhus patients pressing for admission to the Infirmary and Parochial Fever Wards of those days. Inside these gaunt figures there are the recurrent panics, the spasms of lavish expenditure, as barren of real profit as the costs of war, the burials to be defrayed by the public, the widows and orphans to support, the lives of medical men, of clergymen, and of nurses annually lost.

It is interesting and important to note what was said by the contemporaries of these events as to their causes and done for their prevention. The pamphlet literature is considerable and the medical part of it very out-spoken. From the advice given as to what ought to be done, we can at least learn what had not hitherto been done. We have also reports upon the sanitary condition of Glasgow, made

from time to time by Royal Commissioners and others, who weighed with a sense of official responsibility what they wrote. The following are quotations from a few of the more striking of these testimonies arranged in chronological order:—

1818.—Dr. Robert Graham, Regius Professor of Botany in the University.[1]

"If any man wonders at the prevalence of continued fever among the lower classes in Glasgow, or at its spreading from their habitations, let him take the walk which I did to-day with Mr. Angus, one of the district Surgeons. Let him pick his steps among every species of disgusting filth, through a long alley, from four to five feet wide, flanked by houses five floors high, with here and there an opening for a pool of water, from which there is no drain, and in which all the nuisances of the neighbourhood are deposited in endless succession, to float and putrify and waste away in noxious gases. Let him look as he goes along into the cellars which open into this lane, and he will probably find lodged, in alternate habitations, which are no way distinguished in their exterior, and very little by the furniture which is within them, pigs, cows, and human beings which can scarcely be recognised till brought to the light, or, till the eyes of the visitant get accustomed to the smoke and gloom of the cellar in which they live. I have been to-day in several dens of this kind, where I did not see persons lying on the floor near me, till Mr. Angus, whom a previous visit had taught where to find them, inquired after their health. I was in one closet, measuring twelve feet by less than five, on the floor of which he told me six people had lain, affected with fever, within these two days, and where I saw the seventh inhabitant now confined. We found in one lodging-house, fifteen feet long by nine feet from the front of the beds to the opposite wall, that fifteen people were sometimes accommodated; and when we expressed horror at the situation in which they were placed, the woman of the house, somewhat offended, and, I believe, a little alarmed lest we should cause some enquiry to be made by the Police, said, in support of the character of her establishment, that *each family* was provided with *a bed*, and that she very seldom had anybody lying on the floor. I shall only mention one other instance of misery. In a lodging-house consisting of two rooms, separated by boards, the first thirteen feet by eleven, the other fifteen by eight, twenty-three of the lowest class of Irish

[1] Practical Observations on Continued Fever, especially that form at present existing as an Epidemic, with some Remarks on the most efficient plans for its suppression. Glasgow, 1818.

were lately lodged. To-day, there are fourteen, of whom two are confined with fever, three are convalescent, and one only has hitherto escaped. There are only three beds in this house, (denominated with that facetiousness which enables an Irishman to joke with his own misery, Flea Barracks)[1]—one of them in a press half-way up the wall, the others wooden frames, on which are laid some shavings of wood, scantily covered with dirty rags. Most of the patients were lying on the floor. A man, two sons, and an adult daughter, were lying side by side on the floor of the first room, their bedding of the same materials with the others, and the boys being destitute of shirts. Could imagination feign a combination of circumstances more horribly conducive to disease and immorality?

* * * * *

"An important step towards ventilation would be effected, if we could even open up the lanes in which the lower classes live. In Glasgow, the hovels which they inhabit are collected into dense masses of very great size between some of the larger streets. I believe it would greatly add to the healthiness of the place, if some improvements which I have heard talked of were effected, and straight and wide streets carried in different directions through these depositaries of wretchedness. It would not, I think, be easy to devise a more judicious charity, than the building of houses for the poor on an approved plan, and in a good situation. . . . However difficult it might be found to effect a proper ventilation of the houses of the poor, the crowding of these may surely in many cases at least be prevented by the police. Perhaps it might be thought a strong measure to enter a man's house, and regulate the accommodation of his family, even though public good seemed to require it, but I should conceive that lodging-houses are strictly under the cognizance of the police, and that the Magistrates are quite entitled to license these, and to put them under regulation. . . . With regard to the lessening of some of the circumstances which favour the action of contagion, I am confident the police can and ought to do a great deal. They can compel the removal of the dunghills, or the filling up of the ground on which they stand, so that they may no longer remain a pool of stagnant filth; they can renew the pavement in the closes, giving them all an inclination towards the street, so that the water may not stagnate in them; or, if this cannot be done,

[1] "I then [1815 or 1816] left Lady Marshall's Close, and came to the foot of the Old Wynd, and took lodgings in a celebrated spot called the 'Flea Barracks.' This place was on a ground floor, *near a dung-heap.* It was kept by an Irish woman. . . . The Flea Barracks to my knowledge, have been the resort of all sorts of bad characters for the last thirty years." "Hawkie," in his Autobiography, written in Town's Hospital, 1840-50. Glasgow, David Robertson, 1888.

they may put drains in them, to carry the water to the common sewer; they can compel the cleaning of the closes by the inhabitants themselves, which can be no difficult task, as almost everywhere there is one, and sometimes two water-pipes in these places. I believe the flooding of the kennels in the closes once every day, and the removal of the multiplied nuisances with which they abound, would go further than is generally supposed in the prevention of contagion."

1837.—Dr. Cowan, Professor of Medical Jurisprudence in the University.[1]

"Many of the causes of the production and propagation of Fever must be ascribed to the habits of our population; to the total want of cleanliness among the lower orders of the community; to the absence of ventilation in the more densely peopled districts; and to the accumulation, for weeks or months together, of filth of every description in our public and private dunghills; to the over-crowded state of the lodging-houses resorted to by the lowest classes; and to many other circumstances unnecessary to mention.

"Before the Municipal Bill for Glasgow is presented to the Legislature, a well-digested system of medical police should be drawn up and incorporated with the other necessary enactments. Power should be vested in the police to enforce the daily removal of filth of every description. Public water-closets should be established, and every measure calculated to promote the general health rigidly enforced.

* * * * *

"A few thousand pounds, judiciously expended in opening up the districts most densely populated, and in other obvious ways, would greatly tend to alleviate the pressure of our heaviest municipal tax—the 'fever tax.'"

1838.—J. C. Symons, Assistant Commissioner on the Condition of Handloom Weavers.[2]

"These districts [the low districts of Glasgow] contain a motley population, consisting in almost all the lower branches of occupation, but chiefly of a community whose sole means of subsistence consists in plunder and prostitution. Under the escort of that vigilant Officer, Captain Miller, the superintendent of the Glasgow police, I have four times visited these districts, once in the morning and three times at night; I have seen human degradation

[1] Statistics of Fever and Small-pox in Glasgow. Read to Statistical Society of Glasgow, 1837.

[2] Reports from Assistant Handloom Weavers Commissioners, Parliamentary Paper, issued 27th March, 1839.

in some of its worst phases, both in England and abroad, but I can advisedly say, that I did not believe, until I visited the wynds of Glasgow, that so large an amount of filth, crime, misery, and disease existed on one spot in any civilised country. The wynds consist of long lanes, so narrow that a cart could with difficulty pass along them; out of these open the 'closes,' which are courts about fifteen or twenty feet square, round which the houses, mostly of three storeys high, are built; the centre of the court is the dunghill, which probably is the most lucrative part of the estate to the laird in most instances, and which it would consequently be esteemed an invasion of the rights of property to remove. . . . In the lower lodging-houses, ten, twelve, and sometimes twenty persons, of both sexes and all ages, sleep promiscuously on the floor in different degrees of nakedness. These places are generally, as regards dirt, damp, and decay, such as no person of common humanity would stable his horse in.

"Many of the worst houses are dilapidated and in a dangerous state, and are condemned by the Dean of Guild Court, a sentence of which the execution appears to be generally postponed, and which renders these abodes doubly desirable to the occupants, as the passing of sentence prevents the levy of rent.

* * * * *

"I visited the parts of Edinburgh likewise, where the lowest portion of the community reside, but nothing which can for a moment be compared with the wynds of Glasgow exists there. It is my firm belief that penury, dirt, misery, drunkenness, disease and crime culminate in Glasgow to a pitch unparalleled in Great Britain."

1839.—Henry Paul, a Magistrate of the City.[1]

"No one at all acquainted with the state of many of the Lanes and Closes of this City, and of the miserable lodging-houses with which these abound, can be astonished at the extent to which Fever often prevails among our population. Having had occasion, in the discharge of official duty as a Magistrate, to visit many of these dwellings, I can unhesitatingly declare that the scenes which have been presented, few could have imagined to exist, and, in my humble judgment, a better state of things will never be brought to take place, until many of the loathsome hovels of the poor be entirely removed, and until a more free and properly ventilated atmosphere be introduced into their dwellings. How this can be best and most effectually accomplished, I shall not now presume to determine, but it is assuredly a subject well entitled to the best consideration of those who feel an interest in the prosperity of our City, and in the general health and comfort of our citizens."

[1] The Glasgow Mortality Bill for the year ending 31st December, 1838.

1840.—Captain Miller, Chief Constable of the City.[1]

"*Health.*—In the very centre of the city there is an accumulated mass of squalid wretchedness, which is probably unequalled in any other town in the British dominions. In the interior part of the square, bounded on the east by Saltmarket, on the west by Stockwell Street, on the north by Trongate, and on the south by the river, and also in certain parts of the east-side of High Street, including the Venals, Havannah, and Burnside, there is concentrated everything that is wretched, dissolute, loathsome and pestilential. These places are filled by a population of many thousands of miserable creatures. The houses are unfit even for styes, and every apartment is filled with a promiscuous crowd of men, women, and children, all in the most revolting state of filth and squalor. In many of the houses there is scarcely any ventilation, and, from the extremely defective sewerage, filth of every kind constantly accumulates."

1840.—Dr. Neil Arnott—Official Report to Poor Law Commissioners.[2]

In Glasgow it was found that the great mass of the fever cases occurred in the low wynds and dirty narrow streets and courts in which, because lodging was there cheapest, the poorest and most destitute naturally had their abodes. From one such locality, between Argyle-street and the river, 754 of about 5000 cases of fever, which occurred in the previous year, were carried to the hospitals. In a perambulation on the morning of September 24th, with Mr. Chadwick, Dr. Alison, Dr. Cowan (since deceased, who had laboured so meritoriously to alleviate the misery of the poor in Glasgow), the police Magistrate, and others, we examined these wynds, and, to give an idea of the whole vicinity, I may state as follows:—

"We entered a dirty low passage like a house door, which led from the street through the first house to a square court immediately behind, which court, with the exception of a narrow path around it leading to another long passage through a second house, was occupied entirely as a dung receptacle of the most disgusting kind. Beyond this court the second passage led to a second square court, occupied in the same way by its dunghill; and from this court there was yet a third passage leading to a third court, and third dungheap. There was no privies or drains there, and the

[1] Proceedings British Association—Glasgow Meeting, 1840, paper "On the State of Crime within the Glasgow and City Police Jurisdiction," p. 170.

[2] Reports on the Sanitary Condition of the Labouring Population of Scotland, in consequence of an Enquiry directed to be made by the Poor Law Commissioners. Presented to Parliament July, 1842.

dungheaps received all filth which the swarm of wretched inhabitants could give; and we learned that a considerable part of the rent of the houses was paid by the produce of the dungheaps. Thus, worse off than wild animals, many of which withdraw to a distance and conceal their ordure, the dwellers in these courts had converted their shame into a kind of money by which their lodging was to be paid. The interiors of these houses and their inmates corresponded with the exteriors.

* * * * *

"Several intelligent inhabitants of Glasgow stated that they were persuaded, if any capitalists would buy the ground of these wynds, and pull down the houses to substitute better houses in wide streets, with good drainage, the increased rental would make the speculation, even to them, very profitable, while the saving to the community of the cost of supporting the wretched widows and orphans of men who die of the disease generated in the place would exceed the amount of any rent which the property could produce."

1842.—Mr. Chadwick, Secretary to the Poor Law Commissioners.[1]

"It might admit of dispute, but, on the whole, it appeared to us that both the structural arrangements and the condition of the population of Glasgow was the worst of any we had seen in any part of Great Britain."

1843.—The District Surgeons of the Parishes of Glasgow.[2]

[In preparation for his paper on the Sanitary State of Glasgow in relation to the Epidemic of Relapsing Fever in 1843, Dr. Perry asked the District Surgeons to write reports on the state of their districts. He printed those reports as an Appendix to his paper, and, referring to it, says he "*earnestly recommended to our civic authorities the careful perusal of these reports. From them they will learn the state of danger in which we live, if matters are allowed to continue as they are.*" They preserve what is in fact a description as detailed as a directory of the Closes and Wynds as they were seen in 1843 by those men in the course of their professional duties. A few extracts are given as a sample.]

[1] Report of Poor Law Commissioners on an Enquiry into the Sanitary Condition of the Labouring Population of Great Britain. Presented to Parliament, July, 1842.

[2] Facts and Observations on the Sanitory State of Glasgow during the last year, &c., by Robert Perry, M.D., with an Appendix containing Reports from the District Surgeons. Glasgow, 1844.

District II.—Dr. Kennedy.

"All the closes in the Bridgegate, from Merchant Lane to Market Lane, are kept in a most abominable manner. I may particularly mention 101 or Miller's Close, 95 or Mitchell's Close, 87 or Glue and Size Close, 81 or Marshall's Close, 71, 65 or Scanlan's Close; but if a prize were to be given for abominations of all kinds, Miller's Close deserves it. . . . The next worst part of my district is that part of west side of Saltmarket, extending from Bridgegate up to Princes Street. The closes are all thickly peopled and kept in a most disgraceful state."

District IV.—Dr. D. Smith.

[To the East of Saltmarket.]

"The tenements in which I have visited are occupied from the cellars to the attics, and almost altogether kept for lodging-houses, many of them being more fit for pig-styes than dwellings for human beings; and in not a few the donkey and the pigs rest at night in the same apartment with the family. The entrance to these abodes is generally through a close, not unfrequently some inches deep with water or mud, or the fluid part of every kind of filth, carelessly thrown down from unwillingness to go with it to the common receptacles; and in every close there is at least one of these places situated often immediately under the windows of the dwelling-houses, or together with byres, stables, &c., forming the ground floor, while the stench arising therefrom in summer pollutes the neighbourhood, and more especially renders the habitations above almost intolerable. The beds are variously constructed, some being merely a portion of the floor divided by a piece of wood kept in its place with stones or brick, . . . in other cases the beds are formed in tiers over each other, as in the steerage of an emigrant ship. . . . Need I add to this, that the inhabitants with whom I have to deal are of the very lowest ranks in society; a few of them are labourers, but the greater majority are hawkers and beggars, thieves and prostitutes. At night whole families sleep in one bed; and as there are several beds in each apartment, several families are made to occupy it. . . . In short, of the moral degradation, grossness, and misery of those people, no adequate description can be given; and few, very few indeed, besides the District Surgeons know the actual condition of the pauper population of Glasgow. The Highland Close, Jefferies' Close, and Todd's Close enter from off Goosedubbs, there fever has prevailed to a fearful degree, and all these places abound in filth; are overcrowded with inhabitants, the lowest of our pauper population."

District XI.—Dr. Brown.

[Between New Vennel and Duke Street, High Street and the Molindinar. Population, 5300. Attended 1700 cases in twelve months! Chiefly inhabited by thieves and prostitutes. Only a sentence here and there can be quoted.]

"64 Havannah Street is not surpassed by any close in the city for filth, misery, crime, and disease; it contains 59 houses, all inhabited by a most wretched class of individuals; several of these houses do not exceed 5 feet square, yet they are forced to contain a family of sometimes six persons. . . . 105 Havannah Street was an old Carpet Factory lately arranged into 36 cells about 7 feet square, . . . comfort, convenience, and ventilation kept out of sight; there is scarcely a bed in the whole land but what was supplied by me from the Town's Hospital. As might be supposed, fever raged dreadfully here; . . . the whole furniture is not worth a week's rent; the cellars behind are converted into houses of the worst description. . . . The whole of the Burnside, especially the ground floors, are not fit places for pigs; height of ceiling 6 feet, and at almost every flood in the Clyde they are inundated by the Molindinar Burn; every inhabitant of these dens has had fever; it literally swarms with prostitutes of the lowest class."

District XII.—Dr. Fisher.

[Between Candleriggs and High Street, north of Trongate.]

"This space forms part of a district of this great city, which, in the opinion of one capable of judging of the subject, contains a greater amount of human degredation, both moral and physical, than is to be found in any corresponding space of the Kingdom of Great Britain. I do not think him wrong, for I cannot conceive of human beings more sunk in vice, or labouring under a heavier load of misery than are the wretched inhabitants of the part to which I refer. . . . No. 75 High Street, a very dirty close, abounding in low Irish Lodging-houses. The floors of the houses in the ground flats are damp and dirty, in fact little better than cellars. The upper part of the close is very filthy. The lower flat of one of the houses here was lately appropriated to the breeding of swine, while several families occupied the flats above. The part of the close at the side of the house is used as a dunghill, which renders access to it by no means either pleasant or easy. I believe every inhabitant of this tenement has had fever. Upwards of 120 cases occurred in the close. . . . No. 83, a very filthy close. . . . No. 93, or Pipehouse close, is the filthiest in the district. . . . No. 13 Bell Street, a dirty close, with a dunghill at the head of it. . . . No. 23, a long dirty close. In one house at the top of it several severe

cases occurred. Access is obtained to this house, or rather apartment, by an outside stair, by the side of which is a dunghill, the stench from which is intolerable. I have seen the dung reach the landing place on the top of the stair. I attended for fever almost every individual residing in the front land."

District XV.—Dr. Hannah.

"The fever showed itself first among the very poorest of the inhabitants, and in the most filthy places, such as the close No. 275 High Street, 46 and 47 Rottenrow, and the adjoining places, where it has ever since prevailed to a great extent."

Gorbals.—Dr. Strang.

"In the back lands of closes 6 and 13 Clyde Terrace, not a single family or member of a family has escaped. The inhabitants are . . . very dissipated, and particularly dirty. The tenements in 13 are unfit for any purpose in the shape of habitation. . . . In a lodging-house in Parker's Close (102 Main Street) saw ten individuals lying with the fever at the same time in one apartment, and that den without a window. The Sweep's and Barker's closes are truly miserable places."

Anderston.—Dr. M'Ewan.

"800 cases of the prevailing epidemic have come under my notice in the short period of six months; and these for the most part in the dirtiest districts of this burgh—in ill-ventilated underground cellars, and in old houses."

1849.—Dr. Sutherland, General Board of Health.[1]

"It is in those frightful abodes of human wretchedness which lay along the High Street, Saltmarket, and Briggate, and constitute the bulk of that district known as the "Wynds and Closes of Glasgow," that all sanitary evils exist in perfection. They consist of ranges of narrow closes, only some four or five feet in width, and of great length. The houses are so lofty that the direct light of the sky never reaches a large proportion of the dwellings. The ordinary atmospheric ventilation is impossible. The cleansing, until lately, was most inefficient, and, from structural causes, will always, under existing arrangements, be difficult and expensive. There are large square midden-steads, some of them actually under the houses, and all of them in the immediate vicinity of the windows and doors of human dwellings. These receptacles hold

[1] Report on the Measures adopted for the Relief of Cholera in Glasgow during the Epidemic of 1848-49—Appendix A to a Report of General Board of Health on the Epidemic Cholera of 1848-49.

the entire filth and offal of large masses of people and households, until country farmers can be bargained with for their removal. There is no drainage in these neighbourhoods, except in a few cases; and from the want of any means of flushing, the sewers, where they do exist, are extended cesspools polluting the air. So little is house drainage in use, that on one occasion I saw the entire surface of a back yard covered for several inches with green putrid water, although there was a sewer in the close within a few feet into which it might have been drained away. The water-supply is also very defective; such a thing as a household supply is unknown, and I have been informed that, from the state of the law, the water companies find it impossible to recover rates, and that, had the cholera not appeared, it was in contemplation to have cut off the entire supply from this class of property.

"The interior of the houses is in perfect keeping with their exterior. The approaches are generally in a state of filthiness beyond belief. The common stairs and passages are often the receptacles of the most disgusting nuisances. The houses themselves are dark, and without the means of ventilation. The walls dilapidated and filthy, and in many cases ruinous. There are no domestic conveniences even in the loftiest tenements, where they are most needed, except a kind of wooden sink placed outside some stair window, and communicating by a square wooden pipe with the surface of the close or court beneath. Down this contrivance, where it does exist, is poured the entire filth of the household or flat to which it belongs, and the solid refuse not unfrequently takes the same direction till the tube becomes obstructed.

* * * * *

"Another matter connected with these districts, and their peculiar liability to epidemic disease, is the great and continually increasing overcrowding that prevails. I have been credibly informed, that for years a population of many thousands has been annually added to Glasgow by immigration without a single house being built to receive them. The great proportion come from Ireland. Every cabin in that wretched country that is razed to the ground sends one or more families to find house-room in the cities of England and Scotland, and of this element of disease Glasgow obtains its full share.

* * * * *

"The overcrowding and wretchedness of late years has brought typhus with it, a disease that not long ago was almost as rare in the large Cities of Scotland as ague now is; and wherever typhus has prevailed, there cholera now prevails, or has done so recently."

Many more witnesses might be called, but only to corroborate and repeat those testimonies. It is proved

beyond question that a considerable proportion of the population lived in districts in which the houses were so crowded upon the soil as to be beyond the reach of sun or air, and to leave no more space than was necessary for access of the residents to the recesses of those continuous masses of building, that those houses were crowded without consideration either of health or decency, and their inhabitants left uncared for and so shut out from all chance of cleanliness of life as to have reached the lowest depth of physical and moral degradation. The urgency of remedial measures for the clearing out and reconstruction of these localities was persistently pointed out, but not until towards the end of the period under review (1800-1854) was a beginning made and then only a beginning. Under the immediate stimulus of the Cholera of 1848 the Dean of Guild Court began to put in force its power to require houses or buildings which were "insecure, ruinous, or in any other way dangerous to the safety of the inhabitants" to be demolished or repaired. Many of the most disreputable tenements in the wynds of Glasgow proper, and in Calton. Gorbals, and Anderston, were thus dealt with, but it was only because they could hold themselves upright no longer! The special reports of the proceedings of this Court from 1848 to 1851, which appeared in the *Glasgow Herald*, served a most useful educational purpose.[1] Alongside of the petitions of the Procurator-Fiscal for those demolitions came up applications for permission to erect new buildings, which the Court had reluctantly to pass although plainly reproductions of the old. In fact, substantial structures could be erected even on the sites of these condemned buildings so that the encumberment of space was not lessened. The *Herald* pointed to the "Wynds" which were being laid out on the Blythswood and Milton feus and demanded a Building Act. In 1851, the Dean of Guild brought the necessity of such an Act before the Town

[1] They form the first chapter of Vol. 1 of *Glasgow Past and Present*, pp. 1-240, Glasgow, 1884.

Council. We are also told by Mr. Carrick that "soon after 1846 the Town Council resolved to set aside the sum of £30,000 for acquiring property in the districts known as the wynds and in the closes abutting on the High Street, the Saltmarket, and in the Gorbals. A large amount of property was thus acquired."[1] Another noteworthy result of those distressful forties was the "Model Lodging Association," got up by large-hearted citizens, which established three large houses, thus anticipating one of the most useful works of the Improvement Trust by which they were ultimately acquired. When we consider the next period, 1855-64, it will be made evident that all this was a mere scratching of the surface, and that not until 20 years later was anything radical and effectual done.

It is further evident that not merely was the permanent structure of the city bad, but the daily service required to keep the city wholesome in its life was practically neglected—the cleansing, the repairs, the distribution of fresh water, the removal of foul, all the primary duties of civic management were either wholly undone or very imperfectly done. Of sanitation in the modern sense there was none. In the Police Acts passed in 1800, 1807, 1821, 1830, and 1837 there are clauses as to scavenging streets and public places by the authorities, and private closes, &c., by proprietors, but it was not until 1843 that an Inspector of Cleansing was introduced and powers taken "to make regulations for watering, sweeping and cleansing closes, thoroughfares and areas, for the purpose of disinfection and otherwise promoting the health of the inhabitants therein," for the cleansing of common stairs by tenants; for regulating the emptying of middens and privies "according to their dimensions and the local circumstances as regards the health and comfort of the persons in the neighbourhood"; to license Common Lodging-houses, prevent overcrowding, and secure the reporting of fever by the keepers; for carrying out disinfection by the Magistrates through the

[1] *Glasgow Past and Present*, vol. 1, p. xxi.

Police. Altogether this Act marked a considerable advance, but it was chiefly on paper. It provided no special executive machinery, functions were so far defined but, except as regards cleansing, were left as a sort of bye-play to officials appointed primarily for police purposes. Dr. Scott Orr[1] tells us that the great epidemic of 1847 was in full swing before any attempt was made to disinfect either houses or clothing; and Dr. Sutherland[2] testifies to the shameful inefficiency of the general sanitary service in 1849. The filth was a perquisite of the householders and was removed at the convenience of farmers, a system which now exists only in the smallest of villages.

This brings us to the measures adopted for the prevention and control of infectious disease at this period. In the wide and provident sense there were none. Fevers as such were not dealt with preventively, only epidemics. Each epidemic was a tragedy. When it was played out all the properties were dispersed and the stage left unfurnished. We shall deal with the important matter of hospital isolation by itself subsequently. Suffice it to say meanwhile that from its opening in 1794 for 70 years the Royal Infirmary was the centre of every provision for isolation. At one time indeed the managers even disinfected the houses from which they removed fever patients. The usual course of events was the rapid extension of the epidemic until the Infirmary Fever House was overflowing, then public excitement, public meetings, the appointment of a "Fever Committee" or a "Board of Health," as in 1832 and 1837, the collection of funds, a rushing about for sites for temporary hospitals, attendance at home, the organization of a staff of fumigators, &c. Then the disease in due time began to decline; it shrank within the capacity of the Royal Infirmary; the hospitals were pulled down, the doctors, nurses,

[1] Historical and Statistical Sketch of the Progress of Epidemic Fever in in Glasgow during the year 1847. *Edinburgh Medical Journal*, 1848.

[2] Report on the measures adopted for the relief of Cholera in Glasgow during the epidemic of 1848-9, appendix A to a report of General Board of Health on the Epidemic Cholera of 1848-9.

and fumigators who had not been buried were paid off; a report of the receipts and disbursements was submitted and the Board or Committee ceased to be. The play was over; the old properties were not even stowed away, they were burned.

This evil method was not a feature of the locality. It was the method of the period. This was the fashion of the first instinctive effort at self-protection when the Cholera spectre stalked into the land. The Preamble to the Cholera Acts (English and Scotch) of 1832 is worth quoting, it so vividly exhibits the administrative mind of the time. It runs: "Whereas it has pleased Almighty God to visit the United Kingdom with the disease called Cholera, or spasmodic or Indian Cholera, and whereas . . . with the view to prevent as far as possible by the Divine Blessing, the spread of the disease, it may be necessary that rules and regulations should from time to time be established within cities, &c., affected with, or which may be threatened by the said disease, . . . be it enacted that it shall and may be lawful for the Lords and others of H.M. Most Honourable Privy Council . . . to establish, and again from time to time . . . to revoke, renew and alter such rules and regulations as to them may appear necessary or expedient for the prevention of said disease." When we recall the state of Glasgow as described by citizens of her own and of the cities of Great Britain generally so soon to be disclosed by Royal Commissions issued only when Privy Council Orders had dismally failed to "prevent," our wonderment is divided between the mediæval piety of the preamble and the superficial knowledge of the case betrayed by the remedy applied. Both in quality and quantity it miserably fails. Not merely are the rules and regulations spasmodic and temporary, but their purpose is limited to the "relief" of the sufferers and "the safe and speedy interment of those who die." Magistrates were authorised to levy a special assessment for those purposes. Hence, while for Cholera shelters and "sheds," medical attendance,

&c., &c., might be provided out of special rates, for "Fever" there was no resource but public subscription and subventions from the common good until the date of the Nuisance Removal Acts. The same method, but with an extended scope, was recognised in these Acts, which encouraged a meagre administration and expenditure during the absence of epidemics and clothed the Privy Council with power by special Order to require local authorities to provide hospitals, deal with overcrowding, purge themselves of nuisances, make domiciliary inspections, and otherwise improvise in the midst of an epidemic what ought to be the work of a sanitary department from year to year.

The most important event of the period under review in relation not merely to public health, but to all the functions of municipal government was the abolition of sectional administration in the community of Glasgow. This was accomplished by the Police and Extension Act of 1846, which brought the Burghs of Calton, Anderston, and Gorbals under one jurisdiction with Glasgow. Hitherto, administration had been parochial rather than municipal in spirit and scope. Divisional administration of what ought to be civic business always is. The sense of corporate life developed slowly in the new municipality; how slowly in respect of public health we shall see further on. Every successsive "Fever Committee" and "Board of Health" touched the consciences and actuated the brains of some of the citizen members and gave them glimpses of a larger policy, which remained after the occasion had passed by. The leading medical men, among whom Graham, Miller, Cowan, Watt, and Perry deserve honourable mention, drew from the bitter experience of their time administrative lessons which it took the municipality long years to learn, but which even now we can scarcely be said to have improved upon in practice. By refined methods physiologists have been able to measure the intervals which elapse between the stages of perception and volition in the brain and action at the circumference. This history gives us

many opportunities of measuring in like manner the inertia of the civic mind by noting the length of time which intervenes between the clear formulation of a policy and its adoption. In 1842, there was published a "Report on the legal provisions available in Glasgow for the removal of Nuisances," drawn up at the request of the Poor Law Commissioners by Mr. Chas. R. Baird, an eminent local lawyer. He had acted as secretary of the Glasgow Relief Fund in 1837. He had been a member of the Board of Health. He was satisfied, and he believed the majority of his fellow-citizens were satisfied, that, if not for all municipal purposes, for *sanitary* purposes at any rate, Glasgow and its suburbs ought to be under one jurisdiction. He outlines the constitution of a "Sanitary Commission or Board of Health," with executive medical and inspecting staff and power of assessment, to be responsible for the care of the public health throughout this area. Further, he details the purposes which such a Board ought to have legal powers to accomplish. Here was the idea of differentiating sanitary from other municipal functions, and even now one could scarcely desire a more satisfactory synopsis of the scope of the duty of such a special executive. It was twenty years before the idea was carried out in Glasgow, and the legal powers were only sought and obtained from time to time over a longer period.

The Scotch Registration Act took effect in 1855, so that 1855 to 1864 covers the first decade of unquestionable statistics. Glasgow entered upon this period under the impulse to practical sanitation of her third Cholera Epidemic, 1853-4. The first result was the passing of the Corporation Water Works Act in 1855, which authorised new works, and took over the undertakings of the two private companies which had hitherto purveyed water to the community. One of these derived its water from the Clyde. This source was abandoned in October, 1859, when water from Loch Katrine was substituted; one of

the most important events in the sanitary history of Glasgow.

1855-1864.

Mean Population, 387,515.

SANITATION.	HEALTH.		
		DEATHS.	
		Typhus.	Small-pox.
1855. *Corporation Water Works Act.*	1855, - -	460	203
1856. AMENDED NUISANCE REMOVAL (SCOTLAND) ACT.	1856, - -	439	127
1857. "Committee on Nuisances" (March).	1857, - -	549	399
	1858, - -	504	113
1859. Loch Katrine Water turned on (October).	1859, - -	381	201
,, *Parks and Galleries Act.*			
	1860, - -	408	347
	1861, - -	475	131
1862. *Eighth Police Act.*	1862, - -	533	27
,, "Sanitary Committee" (November).			
1863. First Medical Officer of Health (January).	1863, - -	671	349
,, Suppression of Overcrowding by ticketing Houses begun.			
1864. First Municipal Disinfection and Washing-house (September).	1864, - -	1138	300
,, SCOTCH VACCINATION ACT came into force (1st Jan.).			
,, First "Sanitary Office" opened (December).			

Ten Years, 1855-64.

Birth-rate, - - - -	41
Death-rate, - - - -	30
Highest Death-rate (1864), -	32·5
Lowest ,, (1861), -	27·5
Death-rate under 1 per 1000 born, - - - -	171
Death-rate, Zymotic Diseases,	7·8

In 1857 a "Committee on Nuisances" was appointed, and for the first time Public Health was differentiated as a special function of municipal government. This was done under the Nuisance Removal (Scotland) Act. In 1859 the Chairman (Mr. John Ure) submitted a scheme for the improvement of the sanitary condition of the city by creating a special department under a medical officer with an adequate staff of inspectors for the discovery of nuisances and the oversight of disease, the whole to be

under the Committee. The Town Council resolved to send Mr. Ure and another Councillor (Mr. Moir) with the Chief Constable and Master of Works (Messrs. Smart and Carrick) as a deputation through the chief towns of the United Kingdom to get information as to local organization and powers. They visited London, Leicester, Birmingham, Manchester, Liverpool, Edinburgh, Dundee, Aberdeen, Dublin, and Belfast. They reported in October. They found that while the sanitary condition of Glasgow might not be excelled in Scotland or Ireland, it was greatly surpassed in England, a result which, allowing for "the more cleanly habits of the English working-classes" and the different style of building, they thought was "undoubtedly also attributable to the extensive powers possessed by the local authorities, the thorough organisation of their sanitary departments, and the enforcement of their sanitary regulations." They found great defects in the local powers. They recommended that these should be extended and defined, and submitted their suggestions in detail. These were carefully considered by a special Committee; and ultimately Mr. Ure's scheme for the organization of a Sanitary Department was adopted. The notes made by the deputation of the powers desired for regulating new buildings, for dealing with nuisances, with overcrowding, with cellar-dwellings, with conveniences, water-supply, &c., &c., for cleansing, for erecting baths and wash-houses, &c., were put into the hands of the Committee in charge of the New Police Bill, and thus formed the draft of the clauses dealing with these and the like matters in the Glasgow Police Act of 1862. Apart from the temporizing method of dealing with infectious diseases, the great defect of this Act was looseness as to the executive officers, their appointment, and the allocation of their functions. The appointment of "one or more medical officers" was obligatory, but that of "one or more inspectors of nuisances" was permissive, while most elastic methods of manipulating functions by

distribution over various officials having primary duties of another kind were left at discretion. The duties of nuisance inspector and of common lodging-house inspector might be discharged by the Chief Constable or any of his superintendents or lieutenants, or by the Master of Works, who might also be Inspector of Cleansing and of Lighting. There being no provision for permanent hospitals, the removal of infectious disease from Common Lodging-houses is managed by a compulsitor on inspectors of poor. Notwithstanding these criticisms from the standpoint of thirty years of evolution, this Act in its day marked a great stride in advance of local sanitary legislation.

Immediately on the passing of the 1862 Act, a "Sanitary Committee" was nominated (Chairman, Mr. Ure). In January, 1863, the first Medical Officer of Health was appointed (Dr. W. T. Gairdner), with the five District Surgeons of Police as his assistants (Drs. MacGill, Dunlop, Renfrew, Young, and Johnston). In March a "special non-medical inspector" (Mr. George MacKay, now Chief Sanitary Inspector to the County of Perth) represented in his solitary person the "sanitary staff." He had a desk in the room in the Central Police Buildings used by Dr. MacGill in his capacity as Surgeon to the Police Force—a place measuring 15 feet by 10, which, if a one-room house, would now-a-days be ticketed for four inmates! This was the FIRST SANITARY OFFICE. All communications regarding infectious disease were requested to be addressed—"Inspector of Epidemic Disease, Central Police Office, 9 South Albion Street."

The Medical Officer and his pigmy staff found themselves immersed in a rapidly rising flood of Typhus. Since 1847 there had been no epidemic which, judged by the standard of those days, would be designated "great." Yet the disease was never for a day idle. In 1859 it touched the lowest point of prevalence; it carried off only 381 people. But its tribute was advanced steadily year by year until in 1864 it rose to 1138, and in 1865

to 1177. As usual nothing had been done to prepare for the evil day, still less to avert it. The fever-flood ebbed and flowed, its movements registered by the capacity of the Infirmary fever-house, and remarked upon with gratification when the permanent wards were sufficient; with anxiety when they were full. Dr. Gairdner was in the position of a Commander-in-Chief newly appointed; an active enemy swarming over the land, holding every strategetical point, well-found and well-equipped, while he possessed nothing but his commission. He had to recruit and drill and equip his army, to subsidize mercenaries, to bear a brave front, and make the most of his meagre resources. In January, 1864, three "non-medical officers, selected from the Police Force for special sanitary duty," were added to the staff, and, shortly after, two shops (59-61 College Street) were fitted up as a "Sanitary Office" at a rent of £25. In September, the first Municipal Disinfecting and Washing-house was established (66 High Street). The ground rent was £5, and the cost of erection and fittings, £244! A staff for fumigating and lime-washing infected houses was organized and placed, with the washing-house, under the Inspector of Cleansing. As the year advanced into winter the usual difficulty of hospital accommodation arose. Conferences were held between the Managers of the Royal Infirmary, the Parochial Boards, and the Police Board with their Medical Officer. The Board resolved to provide temporary accommodation under the 1862 Act. Many offers were made for adaptable existing buildings, and at last a willing proprietor of a disused mill in Anderston was discovered. But the moment the proposal became public it excited the neighbourhood into an opposition which was frantic in its threats and impossible to withstand. There was nothing for it but to build, and a site was purchased in the neighbourhood of St. Rollox where, amid deep snow, a beginning was made, and a pavilion hospital of wood on brick foundations was

erected, furnished, and opened with 136 beds on 25th April, 1865—*the first Municipal Fever Hospital.*

1865-1874.

Mean Population, 468,263.

SANITATION.	HEALTH.			
		Deaths.		
		Typhus.	Small-pox.	
1865. First Municipal Fever Hospital.	1865, -	1177	26	
,, *Market and Slaughter-houses Act.*				
1866. *Ninth Police Act.*	1866, -	596	104	Fourth and last Cholera Epidemic—only 68 deaths.
,, *City Improvements Act.*				
,, Cattle Sheds in Burghs (Scotland) Act.				
1867. Scotch Public Health Act.	1867, -	497	32	
1868. Cleansing assumed by City as a Special Department under a Committee.	1868, -	367	3	
	1869, -	970	2	
1870. "Committee on Health."	1870, -	544	25	Epidemic of Relapsing Fever.
,, First Sanitary Inspector.				
,, Sanitary Department Organized.				
,, Estate of Belvidere acquired for Hospital purposes (November).				
,, 14 Intra-mural Burial-grounds closed.				
1870-77. Improvement Trust Demolitions and Reconstructions.				
1871. New Washing and Disinfecting House at Belvidere.	1871, -	284	184	
,, *Improvement Act Amendment Act.*				
1872. First Reception House opened (June).	1872, -	182	149	
,, Scotch Education Act.				
1873. Permanent Vaccination Station opened (January).	1873, -	68	228	Milk Epidemic of Enteric.
,, *Streets Improvement Act.*				
1874. System of Co-operation with School Board to prevent dissemination of infectious disease through schools (September).	1874, -	113	214	

Four Years, 1871-74.	*Ten Years*, 1865-74.	
7 Articles washed, &c., per case of infectious disease registered.	Birth-rate, - - -	40·5
10 "Nuisances" removed per annum per 100 houses inhabited.	Death-rate, - - -	30·5
	Highest Death-rate (1869),	33·7
	Lowest Death-rate (1867),	28·2
	Death-rate under 1 year per 1000 born, - - -	167
	Death-rate, Zymotic diseases,	7·4

Glasgow had now the rudiments of a Sanitary Department; nothing more. What was wanted, and what unhappily was not possessed at first, was a proper conception of the nature of the functions of such a department. As already stated, a totally erroneous and mischievous suggestion was kept before local authorities by the Nuisance Removal Acts. The chronic nuisance was allowed to fester; the solitary case of infectious disease to propagate its kind unmolested until the supreme moment of epidemic prevalence had arrived. Forthwith issued the "Order in Council," and the local authority was clothed with extraordinary powers and quickened to spasmodic energy. House-to-house visitation was begun, overcrowding was put down, the scavenger sallied forth with his broom, the limewasher with his brush, temporary hospitals were run up, and medicines were dispensed. Not unnaturally, Glasgow in the 1862 Act adopted this principle in a modified form, the authorities assuming to themselves the right to proclaim "districts, streets, or courts," upon the report of their own medical officer, "that epidemic, endemic, or contagious disease prevails or exists and threatens to prevail." Hence everything the new department did, its own constitution and executive, its functions, its hospital and washing-house, bore the mark of temporary emergency. All these extraordinary powers were exercised through the Magistrates' Committee, not through the Sanitary Committee. The work of a sanitary department must be uniform and continuous, not spasmodic and cataclysmal. Fortunately the 1862 Act was operative for only five years, the experiences of which were sufficient to teach the true method. In the 1866 Act the authorities bound themselves to erect and maintain hospitals and washing-houses, and to appoint a chief sanitary inspector and subordinate sanitary staff. For the power to compel inspectors of poor to remove fever cases from Common Lodging-houses, they substituted compulsory removal to their own hospital. Between the local Act and the general Public Health (Scotland) Act,

passed next year, Glasgow found itself in a position to develop a permanent sanitary department and commence the daily routine of the sanitary function, undisturbed by a perpetually impending dissolution. The most difficult task of the new department was the recovery of its work from the Police, the Master of Works, and the Inspector of Cleansing.

In 1870 the first Sanitary Inspector was appointed (Mr. Macleod). The staff at 69 College Street had, since 1864, been increased to nine (1 Indoor, 2 Nuisance, and 6 Epidemic and Common Lodging-house Inspectors), but this was recognised to be inadequate, especially for the discovery and removal of nuisances. The whole system was expanded and remodelled, taking the five Police Districts as the units of administration. The subordinate staff was thus at once raised to 42, exclusive of clerks. There were five Female Sanitary Inspectors among the number, which was then a novelty. New premises were taken (1 Montrose Street[1]). The only subsequent changes of importance in the executive, apart from the steady increase in the strength of the rank and file, were the concentration of the medical function in one Medical Officer of Health, devoting his whole time to the work (November, 1872), and the appointment of a junior Medical Officer in 1892. An important administrative improvement was effected by the combination of the "Sanitary Committee" and the "Cleansing Committee" in the "Committee on Health," with two standing Sub-Committees, "Hospitals" and "Cleansing." Under this last the whole

[1] The development of the Sanitary Department is well shown by the advance in the rent of the premises with each successive addition to the accommodation :—

1864, 59-61 College Street, £25.
1870, 1 Montrose Street, £180.
1874, 1 Montrose Street and 120 Ingram Street, £250.
1886, 1 Montrose Street and 120-122 Ingram Street, £290.
1890, 1 Montrose Street and 120-122 Ingram Street (whole of two flats) £340, with two sub-offices—at Crosshill, £21, and Hillhead, £25.
Now, 1895, premises are in course of erection which will cost £17,000, exclusive of site.

cleansing of the City, which had in 1868 been organised under a Cleansing Department, instead of being carried out by contractors, was placed and so brought into close sympathy with the purposes of health, in place of being carried on as a gigantic manure business, to be judged solely by its ledger balance. This was, therefore, a memorable year in the evolution of system in the performance of the health functions of municipal government in Glasgow. It was also noteworthy for the acquisition, under pressure of the necessities of an epidemic of Relapsing Fever of the Belvidere estate, which has since become known over the world as the site of the largest Fever Hospital out of London, and, probably, taking natural beauty along with design and equipment, the finest in the three kingdoms. In 1871 the primitive washing-house in High Street was abandoned for a more commodious and better equipped establishment at Belvidere.

City Improvements Act, 1866.—This period includes another epoch-making event. In the same year, 1866, in which the Police Act of 1862 was revised and re-enacted the City Improvements Act was passed. We have quoted at length contemporary descriptions of the Wynds and Closes of Glasgow from 1818 down to 1849. We have stated that after the Cholera epidemic of 1848 they received some attention from the Dean of Guild Court and Town Council. By demolitions here and there, and by greater attention to paving, scavenging, and the position and structure of conveniences, no doubt some improvement was effected. The meeting of the Social Science Association in Glasgow in 1860 enables us to gauge how much. Papers were read in the section Public Health "On the sanitary condition of the lower localities of the City of Glasgow, &c.," by Dr. MacGill, Police Surgeon, and "On the Measures required for improving the low parts of the City, &c., &c.," by Mr. James Watson (afterwards Lord Provost and Sir James Watson), the descriptive parts of which really reproduce almost the same phraseology as to the condition of the Wynds, Vennels,

and Closes, as had for half a century been applied to them with monotonous reiteration. We shall quote three detached sentences from Mr. Watson's paper, premising that the details with which he supports these generalities afford a redundant justification.

"Our City is distinguished for its wealth and commercial enterprise, its public buildings, its extensive manufactories, its numerous charitable, religious, and philanthropic institutions, and is ever foremost in all great and patriotic movements; but it is not to be concealed that there are certain portions of it in a most frightful condition, and which, like so many plague spots, demand investigation and call for legislation and reform. . . . . We question if in any city of Europe the vicious are allowed to congregate together in such clusters as in the City of Glasgow, and in no city that we are aware of are such facilities given, by means of the buildings and localities, both for hatching and perpetuating [perpetrating?] vice and crime. . . . It appears to us that the radical and only effectual cure for such evils is to sweep away these old buildings; to form commodious thoroughfares and to erect buildings with proper conveniences and comforts in room of the old."

We have still later testimony in the Reports of the first Medical Officer of Health. Notwithstanding the exigencies of Dr. Gairdner's position, within a few months of his appointment he found time to make "a personal visitation of most of the epidemic localities within the boundaries of the Glasgow Police Act" and to describe in detail, without rhetoric but with unreserved fidelity to fact, what he observed, which seemed to him to explain the prevalence of epidemic fever in Glasgow. The main body of these observations was published in his third Quarterly Report for 1863, before he had been a year in office. Anyone who is familiar with the literature from which we have quoted so extensively will at once recognise in this report the same old facts. It contains nothing new. The reports of the District Surgeons to Dr. Perry as to the state of their districts in relation to the epidemic of 1843 practically deal with the very same places as Dr. Gairdner's reports in 1863. The same wynds, closes, even tenements, appear, only the earlier reports refer to them more frequently by

the picturesque local names than by the prosaic numbers of the later. The conditions noted and described are not essentially different. Still this does not bate a jot of the merit or historic importance of Dr. Gairdner's work, which no doubt gave the final impulse which launched that Improvement Act which was in the thoughts of Mr. Watson when he read his paper in 1860. The suggestion of such a scheme was as old as the perception of the conditions it was intended to remedy. It is one which we find in local literature from the very first time when the "Fever," like the Ancient Mariner, "held with his skinny hand" the comfortable citizens of Glasgow and told them the tale of the wynds. In 1818 Dr. Graham wrote—"I believe it would greatly add to the healthiness of the place if some *improvements which I have heard talked of* were effected, and straight and wide streets carried in different directions through these depositaries of wretchedness." Yet it was not until 1866, well nigh fifty years later, that the community through its representatives confessed its sin in the preamble to the City Improvement Act:—"Various portions of the City of Glasgow are so built, and the buildings so densely inhabited, as to be highly injurious to the moral and physical welfare of the inhabitants." Private philanthropy foreran this public action. When the purchases, begun under the resolution of the plague-stricken forties, were exhausted, a number of citizens, of whom Mr. Watson was one, entered into combination for the private purchase of unwholesome property, which they naturally effected on more favourable terms than any public body could obtain. They subsequently handed over all their acquisitions at original cost to the Improvement Trust. The modern form of Divine Right—the infallibility of the majority—was never more disparaged than by the manifestation of popular feeling which burst out on the imposition for the first time of that most righteous tax—the City Improvement Tax—and wreaked its vengeance on Lord Provost Blackie, who carried through the scheme.

There had been no opposition in the Town Council, none in Parliament. All the opprobrium of those testimonies of half-a-century must be wiped off. The "Fever-tax" was to be displaced by the "Improvement tax." Mr. Blackie represented a ward in the centre of the city which actually embraced many of those plague spots. He wished to assist in the initiation of the gigantic and then unprecedented scheme. His re-election was challenged distinctly and expressly on the ground of the Improvement Tax, and he was defeated! So shallow at times are the thoughts of the multitude.

1875-1884.

Mean Population, 511,302.

SANITATION.		HEALTH.	
		1875.	Milk Epidemic of Enteric Fever — Washington Street, Pollokshaws Road, and Kingston.
1876.	Hospital Treatment of Infectious Diseases wholly in the hands of Municipality.		
1871-79.	7 District Model Lodging-Houses erected.		
1877.	Small-pox Hospital, Belvidere, opened.	1877-78.	Milk Epidemic of Enteric Fever—West-End.
,,	*Streets Improvement Act.*		
1878.	*Public Parks Act.*		
1878-84.	5 District Public Baths and Wash-houses erected.		
1879.	DAIRIES AND MILKSHOPS ORDER.		
,,	Fulwood Moss leased.		
1880.	*Improvement Act Extension Act.*	1880.	Milk Epidemic of Enteric Fever — North and Central.
1881.	First Refuse Despatch Work opened.		
,,	Arrangement made with Registrars for Returns of Vaccination Defaulters.		
,,	Resolution to admit all Citizens free to Hospitals (April).		
1882.	Systematic Drain testing begun.		
1883.	New Municipal Washing and Disinfecting Establishment opened at Belvidere.		
1884.	Second Refuse Despatch Work opened.	1884.	Milk Epidemic of Enteric Fever—Hospitals.

Ten Years, 1875-84.		*Ten Years*, 1875-84.	
32	Articles Washed, &c., per case of Infectious Disease registered.	Birth-rate, - - - -	39·4
15	Nuisances removed per annum per 100 houses inhabited.	Death-rate, - - - -	26·9
		Highest Death-rate (1875), -	30·8
		Lowest do. (1879), -	24·6
		Death-rate under one year per 1000 born, - - -	150
Two Years, 1883-84.		Death-rate, Zymotic Diseases,	5·05
683	Drain Tests per annum.		

This period reaped the first-fruits of the steady work of the Sanitary Department and the operation of the City Improvement Act. The campaign against infectious

diseases was pushed home. The ordinary "Fevers" having been subdued, attention was turned to the now more destructive infectious diseases of children. A system of co-operation with the School Board to prevent their dissemination through schools was established. In olden times the highest demand of reformers was that there should be disinfection of house and clothing, &c., after removal to hospital. Under the new regime the practice as regards clothing was extended to washings during the currency of cases of fever treated at home. The systematic attack on the (so-called) minor infectious diseases meant, therefore, not merely hospital treatment where possible, but a vast increase in the labour of disinfection. Every case of infectious disease entailed service. In such diseases as Scarlet Fever or Enteric Fever treated at home, there was service distributed over a long illness as well as on recovery. Dirt in the house was treated as a bad thing, which it was of public advantage to get rid of by such a revolution as the presence of an infectious disease even of the minor sort gave one a legal right to effect. In this way thousands of houses were at least once in a year made thoroughly clean. The number of articles of bed and body clothing washed per case registered, which in 1865 was only between four and five, rose in the first four years of the extended department (1871-74) to 7, and in this decade, with its widened scope and increased facilities, to 32. Something had also been learned as to the conditions most conducive to success in the application of preventive measures. Experience had taught that from first to last, wherever it existed, infectious disease must be dealt with by one authority, and that any condition of payment interfered with the adoption of preventive precautions. The whole hospital treatment of infectious disease was undertaken by the authorities, and it was resolved to admit every person living within the area of the rates free of charge, and also to make all services of washing and disinfection free to everybody. A much enlarged and better equipped washing

and disinfecting establishment was opened at Belvidere. The most important step in the nuisance department was the commencement of the systematic application of the smoke-test to drains, which has now developed greatly both in the efficiency of the apparatus and the frequency of its use. The number of "nuisances" removed per 100 inhabited houses rose from 10 in the first four years of the new department (1871-74) to 15 in this decade. The whole method of refuse collection and removal had been gradually reformed and systematised. In place of the huge "manure depots" which used to disfigure the outskirts of the city, "Refuse Despatch Works" were erected where the refuse was disposed of daily as collected, by despatch to the country either to customers or refuse farms leased or purchased by the cleansing department,[1] or by cremation. The aggregate result was a steady diminution in the quantity of offensive matter to be found within the city at any one time, more especially in the vicinity of the dwellings of the people. Cleanliness of person and of clothing was greatly facilitated and promoted by the erection (1878-84) of district Baths and Wash-houses.

The area originally scheduled under the Improvement Act extended to 88 acres, inhabited by over 51,000 persons, and situated chiefly in the Central District, partly in Gorbals and Calton. The borrowing power was £1,250,000. The Act was amended in 1871 and extended in 1880, when the borrowing powers were raised to £1,500,000. Streets Improvement Acts, with borrowing powers to £370,000, were obtained in 1873 and in 1877, which in effect were supplementary to the Act of 1866, leading not merely to improved communication in various places, but to the acquisition of a considerable amount of inferior property in Anderston, which has since been transferred to the Improvement Trust. This Trust made little outward show

[1] In 1879, 98 acres of Fulwood Moss were taken on a 31 years' Improvement Lease. In 1887, 25 acres were added. In 1891, the estate of Ryding, 565 acres, was purchased. The refuse of the city makes the desert to rejoice and blossom as the rose.

as a reforming agent until 1870, but between that year and 1877 it carried out extensive clearances and partial reconstructions in the scheduled area, besides purchasing two estates on the outskirts and laying them out with liberal air space for working class dwellings. Between 1871 and 1879 the same Trust erected seven Model Lodging-houses in as many districts, thereby killing off the greater number of the inferior private lodging-houses and attracting lodgers from small private houses. When to these operations by the authorities we add the breaking up of slums incidental to extensive railway undertakings, we may characterize this period as one of revolution in the proverbial Wynds and Closes of the City, and of re-housing of a large proportion of their inhabitants.

1885-1894.

Mean Population, 588,613.

SANITATION.

1885. *Glasgow Corporation Water Works Act.* (Extension of Loch Katrine Works.)
1887. Belvidere Fever Hospital completed.

1889. Improvement Trust resumes reconstruction.
,, Resolution of Committee on Health condemning the Privy System.
,, Tuberculous Meat Case.
1890. *Glasgow Police (Amendment) Act.*
,, The Housing of the Working Classes Act.
,, Infectious Disease (Notification) Act, adopted 1st January.
,, Third Refuse Despatch Work opened.
1891. *City of Glasgow Act* (1st November) Extension.
,, Ryding Estate purchased.
1892. Second Reception House opened.
,, Site acquired for Fever Hospital, Ruchill.
,, *Building Regulations Act.*
1894. First Sewage Purification Work opened (May).
,, New Bye-laws—Cow-houses and Byres.
,, Washing and Disinfecting Establishment for North and West, opened at Ruchill (October).

Ten Years, 1885-94.

43 Articles washed, &c., per case of Infectious Disease registered.
18 "Nuisances" removed per annum per 100 houses inhabited.
2,540 Drain tests per annum applied. (5,390 in 1894.)

HEALTH.

1888. Milk Epidemic of Scarlet Fever—Garnethill.

1892. Milk Epidemic of Scarlet Fever—Paisley Road.

1893-94. Milk Epidemic of Scarlet Fever—Kelvinside.

Ten Years, 1885-94.

Birth-rate,	35
Death-rate,	23·2
Highest Death-rate (1885),	25·3
Lowest ,, (1894),	19·9
Death-rate under 1 year per 1000 born,	144
Death-rate, Zymotic Diseases,	3·8

Probably the most important event in the sanitary history of Glasgow in this period was the resumption by the Improvement Trust in 1889 of an active policy of

demolition and reconstruction. To speak frankly, between 1877 and 1889 the Trust had stood still, and was in fact the largest owner of unwholesome property in the city. True, much had been done to improve this property, but the fact remained that it had been purchased for the very purpose of demolition, and nothing short of demolition would meet the necessities of the case. The explanation, and so far the excuse, for this attitude of the Trust was that, like other holders of property in the commercial crisis of 1878, it suddenly found itself without a profitable market for its land, and, like all holders of property who could afford to do so, it held for a rise. It is an open secret in municipal circles that the Committee on Health found its progress blocked by this position of the Trust. It was impossible to deal with other landlords and leave the Trust alone. In fact, no other landlords held such property, certainly in quantity, probably even in quality. A private survey of the Improvement Trust property was made by the Medical Officer, and a report thereon with plans drawn up and submitted to the Chairman of the Committee on Health (Mr. Crawford). A special committee was appointed to inspect the property complained of. The reports of these inspections were forwarded from time to time to the Trust, and ultimately it was pressed into that course of demolition and reconstruction on the ground thus cleared and laid out anew, which has since been steadily followed. It may be said that the proverbial Wynds and Closes have now ceased to be. The special feature of these operations is that the Trust, having failed to get its land feued in the ordinary way, is itself building, with the result that ultimately Glasgow will exhibit another development of what has been called "Municipal Socialism," but like her other enterprises of the same nature, not aimed at or advocated under a general theory, but reached on the lines of business expediency applied to each question as it arose in the course of municipal life.

It was in consequence of the observations made by the

special committee referred to above, that the Committee on Health (March, 1889) formally recorded their condemnation of the privy system in these terms:—"In our opinion the privy is in no case a sufficient provision for flatted tenements. It is never used, and cannot in the nature of the case be used, by females, and seldom by children. The result is that every sink is practically a water-closet, and the stairs and courts, and roofs of outhouses, are littered with deposits of filth cast from the windows. Some form of wash-out closet, in the proportion of one to every two or, at most, three families, ought to be provided, as far as possible in a back jamb." The importance of this resolution cannot be exaggerated. It struck at the root of all that filth in the Wynds and Closes, which was so prominent in the criticisms of visitors, but could scarcely be described. It singled out the one element in the circumstances of the inhabitants which thirled them to indecency and made immorality natural. The practical outcome of this resolution was the introduction of a clause in the Amendment Act of 1890, the application of which has begun a revolution in the tenement houses of Glasgow which is yet only in mid career. The Committee at the same time expressed the opinion that supervision by resident caretakers is necessary in tenements, and directed the attention of the Trust to the prevalence of farming out of small houses in their property. These observations also have borne fruit in voluntary action, though they have not yet become the subject of legislation.

The completion of the permanent structure of Belvidere Fever Hospital, the acquisition of the estate of Ruchill where, taking advantage of the experience gained at Belvidere, another hospital is being erected, and another Washing and Disinfecting establishment is already in use for the north-west quarter of the city, show that the resources for dealing with infectious disease are keeping pace with the growth of the city. The adoption of the Infectious Disease (Notification) Act on 1st January, 1890, brings automatically

into the hands of the Medical Officer information for which his staff had laboriously to seek. The Police (Amendment) Act of 1890 adds to the stringency of the powers for dealing with infectious disease, and in respect of drains, conveniences, overcrowding, lodging-houses, disease in dairy cattle, and uninhabitable houses, &c., &c., gives Glasgow, on the whole, the benefit of the advances in sanitary law following up the advance of sanitary knowledge, from which Scotland in general is shut out by the neglect of her interests in Parliament. The systematic removal of refuse, and the daily disposal of the daily collection have been further developed, and the great and necessary task of purifying the Clyde begun by the opening of the Dalmarnock Sewage Purification Work in 1894.

In this period systematic efforts were for the first time made to provide Children's Playgrounds. The city has always been supplied with suburban parks. The historic Glasgow Green was purchased at various times in the 17th and 18th centuries. It remained the sole park until 1854, when the West-end Park was obtained, and several new parks and large additions to old ones have since been acquired from time to time. Still no provision had been made near to tenement houses, for the use of children, of smaller spaces such as may be found near all our large self-contained houses in the shape of *pro indiviso* gardens or pleasure-grounds. George Square, St. Enoch Square, St. Andrew's Square are examples of spaces left near the houses of the wealthy of former generations which remain for the use of the many. The City Improvement Trust left spaces in feuing Overnewton and Oatlands for tenements, and in the course of laying out afresh areas which had been cleared reserved useful vacant plots of which Cathedral Square and Bain Square are examples. The negotiations preliminary to the extension of the city in 1891 led to several of these more modest play-places being bargained for as a condition of consent. Still there was no effort here to redress the wrongs of the past. These

negotiations showed that the people of the present were alive to their interests, and, although still in close touch with the green fields, were determined to anticipate the day when the growth of the city should cover them. Power was obtained in 1878 to lay out and throw open the graveyards which had been closed. Six of these now furnish attractive spaces in the midst of crowded localities in the oldest parts of the city, and make one thankful that the necessity of "the possession of a burying place" preserved from the builder of former generations some space of which the living now enjoy the reversion. Since 1892 the Committee on Health has made it a part of its ordinary business to secure, as opportunity offers, play-places for the children of the poorer and more crowded localities. There is a special Sub-Committee for the purpose. The noblest of these acquisitions hitherto is "Phœnix Square," which, in place of being one of the grimiest, most repulsive spots in the city, now smiles in the sunshine and echoes with the laughter of happy children. From Mr. MacLellan's interesting book on "Glasgow Public Parks" we find that in 1893 the parks and spaces extended to 700 acres, of which about 30 were distributed in smaller plots near the houses of the people.

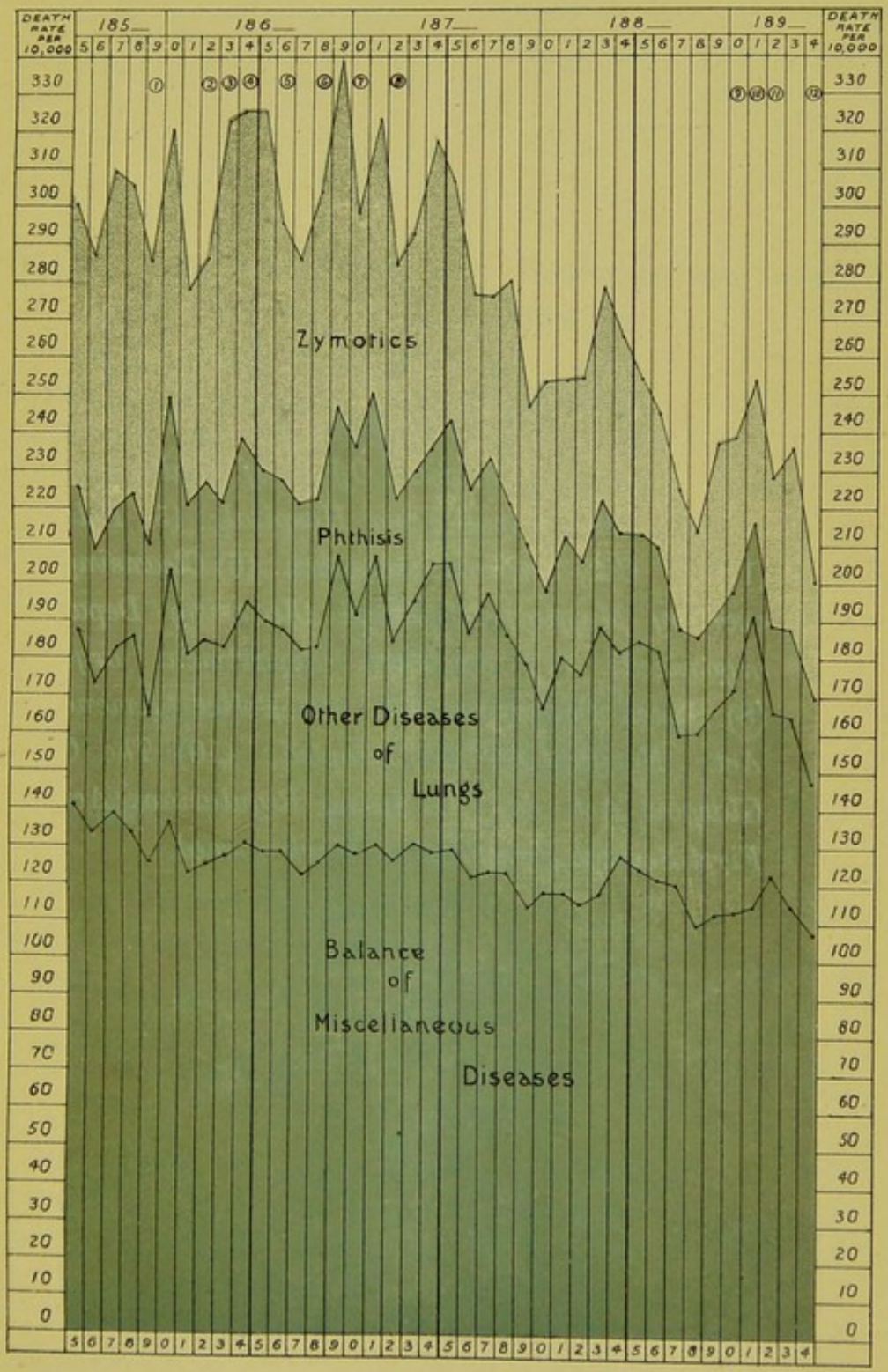
We have seen that, naturally and logically, along with the project of improving the Wynds and Closes, came into the minds alike of individual reformers and of the authorities themselves the conviction that new buildings must be controlled and supervised in the interests of public health. This in Glasgow meant that power must be put into the hands of the Dean of Guild Court. This was begun in 1843 and 1846, and considerably extended in 1862 and 1866. Following the historic and natural course, no sooner was the representative mind compelled by the special inspection of Improvement Trust property, and the revived interest in the physical environment of the dwelling-house, to consider closely the conditions which made existing buildings unhealthy, than the necessity for a thorough revision of the powers of the Dean of Guild Court was borne in and

recognised. Hitherto, too much in detail had been left to the discretion of the Court and the Master of Works for the time being, even in matters regarding which they had general powers, while there were other matters regarding which they had no power or only a restricted power. The result was Glasgow's first Building Act passed in 1892. Another generation will reap the benefit of it. The Municipal Extension Act of 1891 made the Building Act very opportune, because it is in the suburbs that the future of Glasgow, so far as house building is concerned, is being made or marred. It is to be regretted that this measure did not accomplish the same end as the Extension Act of 1846—bring together into the fulness of one corporate life *all* the dissociated administrative fragments of this great community. Nevertheless there is enough in the promise of progressive returns from that which has long ago been accomplished, and of a fresh harvest from that which has only just been inaugurated, as well as from the entirely new enterprises which lie in the future of a city which has never failed of intelligence and courage in administration to warrant the expectation that the vital statistics of the next decade will prove that Glasgow has kept up the running in the race of progress.

Diagram No. I.—Historical References.

(1) *Loch Katrine Water turned on.* (2) *Police Act* (1862). (3) *First Medical Officer of Health appointed.* (4) *First Municipal Fever Hospital.* (5) *Police Act* (1866). *City Improvements Act.* (6) *Cleansing taken over by Municipality, and Cleansing Department organized.* (7) *Sanitary Department organized.* (8) *Scotch Education Act.* (9) *Police (Amendment) Act. Notification Act adopted.* (10) *The City of Glasgow Act.* (11) *Building Regulations Act.* (12) *First Sewage Purification Work opened.*

I. GLASGOW.—Death-rates per Ten Thousand for 40 years (1855-94), showing proportion due to Zymotics, Phthisis, and Acute Diseases of the Lungs.



PART II.

General Results—More about Hospitals and other Methods—Special Results.

In an appended diagram, the rate of mortality during the last forty years is shown, and the proportion of the total rate contributed by—(1) Zymotic Diseases; (2) Phthisis; (3) Other Diseases of the Lungs; (4) The Balance of Miscellaneous unclassified Diseases. The following Table reduces this annual to a decennial statement, the figures being death-rates *per million*.

	Zymotics.	Phthisis.	Other Diseases of Lungs.*	Other Causes.	All Causes.
1855-64	7,841	3,918	5,170	13,121	30,050
1865-74	7,377	3,940	6,522	12,692	30,530
1875-84	5,056	3,396	6,322	12,113	26,886
1884-94	3,822	2,458	5,329	11,566	23,175

* Exclusive of Croup.

If we compare the first with the last decades, we find the following results—

A Decrease of 4019 or 51 per cent. in the Death-rate from Zymotics.
Do. 1460 or 37 do. do. do. Phthisis.
An Increase of 159 or 3 do. do. do. Other Lung Diseases.
A Decrease of 1555 or 12 do. do. do. Miscellaneous Diseases.
Do. 6,875 or 23 per cent. in the General Death-rate.

In short, if we divide the whole balance of gain into two, we find that it amounts to 4019 lives per million saved from the tribute formerly levied by Zymotic Diseases, and 2856 from the tribute of all other diseases, or 58 per cent. of the total saving from the former, and 42 per cent. from the latter.

This result is doubly interesting. It is consistent alike with the history and with the science of public health. The history of sanitation in Glasgow is recorded in the preceding pages. It is merely a particularly striking illustration of the history of sanitation at all times and in all places. Sanitation is primarily the outcome of selfishness, a simple effort on the part of the community or the thinking governing part of it at self-protection. Ultimately it becomes altruistic, or at anyrate when the plagues are gone it has passed into a habit, although still Cholera is more effectual as a stimulant to the soporose than a discourse on altruism, or even Christianity. Hence it is that sanitary administration, like an infant Hercules, struggles in its cradle with the serpent brood of infectious diseases, and their destruction is naturally the first evidence of its prowess. But this instinctive effort intelligently directed leads to precisely the same works and executive procedures as the most abstract study of the scientific principles of public health undertaken by the most altruistic of philanthropists would reason out. Exactly the same physical conditions which nourish and sustain epidemics promote chronic ill-health. If we could find a community with a permanently high death-rate and no epidemics, we should find uncleanness of air, water, soil, if not co-existent, at anyrate in various combinations, expressing themselves in the detail of slums, want of drainage, want of conveniences, impure or imperfectly distributed water, overcrowding, personal and household dirt, &c., &c. The clue to sanitary work is to follow infectious disease into the houses of its victims, whether they live in the Wynd or the Crescent. It brings you not merely to the place where disinfection is wanted and isolation may be expedient, but to the place where the technical "nuisance" may be looked

for. In the Crescent, infectious disease sharpens the senses and quickens the critical faculty of the householder; in the Wynd, it enables the sanitary inspector to elicit complaints of nuisance hitherto endured without murmur, and gives him the chance of discovering others undreamt of. In neither case does it matter whether the nuisance has anything or nothing to do with the particular disease. Etiology may be left to others to discuss. Sewer gas does no good, whether it causes diphtheria or not. The business of the medical officer is to get rid of it first, and afterwards to find out if he can what particular part it plays in the depreciation of health.

A Century of Hospital History.

Hospitals not only bear an important part in the prevention of infectious disease, but indirectly also in the education of local authorities. They give concrete expression to the costliness of slums and nuisances. I propose, therefore, to expand into more detail this department of the sanitary history of Glasgow.

The Royal Infirmary, opened in December, 1794, became at once the centre of all hospital treatment of Fever in Glasgow. It contained 150 beds, and even in the first five years of its existence 14 per cent. of the patients treated suffered from "Fever." In 1816 the beds were increased to 230, and the addition is reported in that year to have been "found of incalculable use as a receptacle for persons with low Fever, the multitudes of whom, flocking from the closses, and ill-aired alleys and lanes of the city, have of late exceeded all precedent." In 1818 no less than 60 per cent. of all the patients admitted had "Fever." A temporary Hospital with 200 beds was erected by public subscription at Spring Gardens, and kept open from March, 1818, to July, 1819, during which time 1929 patients were treated. This hospital was again opened for five months in 1827 at the expense of

the Royal Infirmary. The directors resolved to proceed with the erection of a separate permanent "Fever House," because "in this large city Typhus Fever must be at all times liable to occur, and in the narrow and crowded Vennals and Wynds it must be frequently apt to break out with virulence, so as to endanger the whole town." Next year they were compelled to erect within the Infirmary grounds "a temporary wooden booth," which contained about 80 beds. In 1829 the Fever-house was half finished and 100 beds provided. In 1832 it was completed with 220 beds. In 1831 a "Board of Health" had been formed by the Magistrates, and a cotton mill in King Street, Mile-end, secured, and put under the managers as a Fever Hospital, with 135 beds. Next year they report that, after being supported for three months by the Board of Health, its funds were exhausted, and the managers had kept it open at their own cost. In 1837 the permanent Fever-house was overflowing, and the managers opened a temporary hospital, with 60 beds, in Albion Street, which was in use from March of that year until April of the following. They also bought a site to the E. of St. Andrew's Square, near the Green, but did not require to use it. In 1846 the Fever was rising. The Fever-house was full. In January, 1847, they arranged to get the use of the Lock-Hospital in Rottenrow, just finished. In a month the 70 beds were full, and patients were again being turned away. The managers resolved to build on the site acquired in 1837, but the neighbouring proprietors threatened the strongest opposition. They sold the ground and purchased a large new building in Dalmarnock Road. At once a proprietor applied for an interdict which they resolved to oppose, but meanwhile the Fever could not be interdicted, and, at their wits' end, the managers proceeded once more to erect temporary wooden sheds for 140 patients in their own grounds. These were opened on 24th June. In two days 80 cases were admitted, and in a few days more the sheds were full. By the Poor Law Act of 1854

important auxiliaries in dealing with popular sickness had been created. Hitherto the Parochial Boards of Glasgow had merely sent their patients to the Infirmary at £1 per head, but the City Parish, finding the resources of the Infirmary exhausted, resolved to secure the old Town's Hospital in Clyde Street which had been for some time out of use. It was opened on 7th July, when between 70 and 80 patients were admitted in one day, and so day by day until the 634 beds from time to time provided were full. On 5th August wooden sheds erected by the Barony Parochial Board in Anderston were opened, and their 250 beds likewise speedily filled. In this year the total beds provided in Glasgow was 1254, and the number of patients treated was 11,425, the maximum on record in both cases. Of the District Surgeons and hospital medical staff, 18 took Fever and 8 died; of the inspectors, matrons, nurses, and servants, 99 took Fever and 22 died. In 1848 the parishes closed their hospitals and resumed sending their cases to the Infirmary, but now at 15s. each!! The managers sold their ground and building in Bridgeton, their right to use which they had defended before the Sheriff-Substitute, the Sheriff-Principal, and the Court of Session, but only established when success was of no value except as a precedent. In the winter of 1851, the wooden sheds of 1847 were reopened, and again in 1852, notwithstanding which cases were refused and the parishes had to resume hospital treatment. Then Fever declined and continued at a moderate level until 1862. In 1863 the managers report that of 1852 cases of fever and small-pox treated half had been sent in by the Glasgow Parochial Boards; that they had been unable to accommodate all applicants, and that they raised their charge per case to £2. The newly-appointed Medical Officer of Health found this difficulty awaiting him and met it by stimulating the Parochial Boards to provide accommodation for paupers, while the Police Board, through the "Magistrates' Committee," gave to others "lines" on the Infirmary. This resource soon failed. Numerous conferences were held

between the Parishes, the Managers of the Infirmary, and the Authorities, in which the managers referred the latter to their powers under the 1862 Act, and the Police Board at last "arranged to provide temporary accommodation for such cases as do not fall within the province of the Parochial Boards to deal with, and which it is impossible for the Infirmary to take in."[1] An effort was made to get some existing building, which ended in the fiasco of the old mill, Nassau Court, Anderston, already recorded. Then "Parliamentary Road Hospital" was projected and opened in April, 1865—*The first Municipal Fever Hospital.* Still it was, in accordance with the Act of 1862, a mere temporary provision made to meet an epidemic emergency. The legal difficulties with which its existence was threatened were overcome by the renewal of the emergency powers every six months until, with the passing of the 1866 Act, its tenure of life was made secure, and the maintenance of fever hospitals by Glasgow became a necessity.

At the date when the new hospital brought its 136 beds to the help of the fever-stricken community, each of the Parishes had fever-wards in its Poorhouse, viz.—City, 100 beds; Barony 120; and Govan 54, so that the total bed accommodation, including the Infirmary, was 610. From this time onwards a gradual absorption by the local authority of the treatment of infectious diseases in hospital took place. The Parishes in succession closed their fever-wards, the Infirmary cut down its accommodation, still giving a friendly arm to the local authority until the waves of epidemic had sunk quiet. In 1865, 1866 and 1869, the Police Board subsidized "the Royal." In 1870, "Parliamentary Road" was increased to 250 beds, and the same number was provided at Belvidere, but in hot haste under epidemic pressure and therefore much more temporary in material and workmanship than "Parliamentary Road," which is as useful to-day as it was 30 years ago. Hence, during the 17 years, 1870-1887, there was a constant process

[1] Royal Infirmary Report for 1864.

of substitution and extension going on at Belvidere, resulting in a permanent Fever Hospital of 390 beds. In 1878 a permanent Small-pox Hospital had been completed at Belvidere, and "Parliamentary Road" which had been reserved for Small-pox for some years was reduced to 120 beds, closed and held as an overflow for Scarlet Fever. The demands of that disease became so great in 1893 that 80 beds were added to it and it was resolved to erect a hospital in the North-west of the city with 440 beds, on the completion of which the site of Parliamentary Road will be abandoned, leaving a net gain of 240 beds and increasing the total accommodation of the city to 980 beds.[1]

Development of Municipal Policy as to Infectious Diseases.

It appears from this narrative that the local authority took to the hospital treatment of infectious disease in pursuance of no great policy, but as a mere temporary expedient. It was not proposed to treat all cases, but the surplus of the Parochial Boards and the Royal Infirmary and not to provide always for treatment but only so long as there was a surplus. It therefore recognized within the category of infected persons distinctions which conditioned their relation to the local authority—the pauper case, the case which had a "line of admission" to the Infirmary, and the balance who were not paupers and who either could get no line or who could get no value for their line, the Infirmary being full. If an epidemic inspector came across what seemed to him to be a pauper case, the inspector of poor was asked to remove it. He always inquired into the facts. He might dispute the pauperism. If not, still the course was not clear. The patient might be legally a pauper, but only under stress of the fever, and he might refuse to be pauperized. The patient might be actually on the poor-roll and still might refuse to go to hospital because of prejudice against "the house." If the patient had a line

[1] See Table I. in Appendix giving dates and stages in this process of absorption and development.

for the Infirmary some time had been spent in getting it, so that removal to the Poor-house or to the Infirmary was always a slower process than removal to the civic hospital. If the patient, not being a pauper and not having a "line" for the Infirmary, seemed able to afford it or was a dependent of some one who could, a charge was made for treatment by the local authority. When the parishes gave up their fever-wards, the inspectors of poor sent their orders for the removal of paupers to the Sanitary Department and paid for their treatment. To obviate delay in dealing with cases apparently paupers which came first to the cognizance of the Sanitary Department, an agreement was made that they should be at once removed and coincidently a claim sent to the parish. When the managers of the Infirmary discovered that Small-pox spread among the patients in the general hospital and applied to the Local Authority to honour all their Small-pox lines, the Local Authority consented only on condition that for patients living within the municipal boundary one pound should be paid, for those living outside, two (1871.) Then the Local Authority discovered that Small-pox prevailed in the neighbourhood of their Small-pox Hospital to a suspicious extent and they declined to receive through the Infirmary persons who were not citizens and who might infect those who were. The managers thereupon (1872) refused to deal in any way with lines given to Small-pox cases and referred everyone to the Sanitary Department. In 1876 they adopted the same course with "Fever" recognising at last that it was impolitic to spend charitable funds upon persons suffering from diseases, the treatment of which was provided for by assessment. Still the Local Authority continued to complicate their otherwise simple function by maintaining a distinction between infection in paupers and infection in other people. The sanitary inspector kept ledger entries against the parishes for treating real or imaginary paupers, and rendered periodic accounts of which a constantly increasing proportion consisted of the item "To amount of

account rendered." Concurrently there flowed on correspondence, conferences, veiled threats of law, proposals of composition, payments for persons already on the pauper roll, as to others repudiation; until at last the absurdity of the whole situation became apparent and the Local Authority on 23rd April, 1881, cut the Gordian knot by resolving "*that all classes of the citizens suffering from infectious disease should be treated in hospital without any charge being made therefor.*" The fact was that in Glasgow no citizen suffering from infectious disease had been treated in a parochial hospital since 1872, or in a general hospital since 1876. What was now done was to municipalize the hospital treatment of infectious disease and so to dissociate it from all social depreciation whether of pauperization or of charity. This really carried with it the whole sanitary service of the city incidental to the control of infectious disease. In the Glasgow Police (Amendment) Act of 1890 (Section 6) the Glasgow Authorities bound themselves to this policy, which was developed from no social theory but from the observation that any condition attached to the isolation in hospital of a citizen, over and above that of being infectious, hindered isolation and therefore impeded prevention, and so with every public service associated with prevention.

The refusal of the Glasgow Authorities to admit cases of infectious disease from outside the city through Infirmary lines into the municipal hospital, and the recognition by the managers as dispensers of charity of their true relations to infectious disease had indirectly such important effects upon the policy of local authorities in the neighbourhood of Glasgow that a few lines must be devoted to this point. The Infirmary of Glasgow has been depicted as the centre of the hospital treatment of infectious disease only so far as the city was concerned, but it really was so also to the suburban and neighbouring districts. The shutting of the Infirmary against Fever at once brought applications to Glasgow from two quarters (1) from persons living in these districts,(2) from the authorities of these districts. Gradually

the true policy of the situation became clear. Private applicants were referred to the local authority within whose jurisdiction they lived. Local Authorities were assisted at a fixed rate so long as the requirements of the city permitted and on their undertaking to set about providing hospitals for themselves as soon as possible. In this way it may be said a salutary process of education was carried on around Glasgow both of constituents as to their rights, and of local authorities as to their duties, the fruits of which were soon manifest in their equipment. Many a rural ratepayer heard for the first time in the Sanitary Office of Glasgow of the duties imposed and the rights conferred by the Public Health (Scotland) Act on their representatives and themselves respectively.

Statistics of the Glasgow Fever Hospitals, 1865-94.

In the Appendix will be found Tables setting forth in each Hospital year and for each Hospital separately the number of patients who were admitted and who died from each disease.

The gross number of patients treated in those 30 years was—

	Treated.	Died.
Parliamentary Road, - - -	16,796	1,807
Belvidere (Fever) - - - -	56,320	6,195
Do. (Small-pox), - - -	1,179	71
Grand total, -	74,295	8,073

The principal diseases from which these patients suffered were—

	Treated.	Died.
Scarlet Fever, - - - - -	22,982	2,080
Typhus, - - - - - -	11,255	1,417
Enteric Fever, - - - - -	8,846	1,268
Measles, - - - - - -	8,356	717
Relapsing Fever, - - - -	4,901	102
Small-pox, - - - - -	4,232	620
Whooping-cough, - - - -	3,210	618
Erysipelas, - - - - -	1,447	120
Diphtheria, - - - - -	617	261
Cholera, - - - - - .	21	13

Following these are Tables containing a variety of

information regarding the vital statistics of the City for each of the 40 years during which there has been a national system of Registration. Of these Tables VIII. to XIV. give the number of deaths registered from Typhus, Small-pox, Enteric Fever, Scarlet Fever, Measles, Whooping-cough, Diphtheria and Croup, the number of these which took place in hospital since municipal hospital treatment was begun, the death-rate per million from each of these diseases and the percentage of the deaths which took place in hospital. The contents of these Tables are graphically represented in a series of diagrams from which at a glance the comparative mortality of each of the diseases mentioned above, and also of Diarrhœal Diseases, Phthisis, &c., may be seen for the last 40 years, as well as the proportion dying in hospital in the case of the chief infectious diseases.

Criterion of Success in Use of Hospitals.

In 1883 in a Memorandum on the Hospital Accommodation for Infectious Diseases in Glasgow, which was an attempt to forecast the requirements of Glasgow in hospitals and beds, I said—"Prevention is the aim and the *raison* "*d'être* of hospitals and sanitary organization; 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." Supposing all cases of any infectious disease to be known, then the curve of perfection as regards hospital treatment would be this, in which the proportion removed to hospital is shaded.

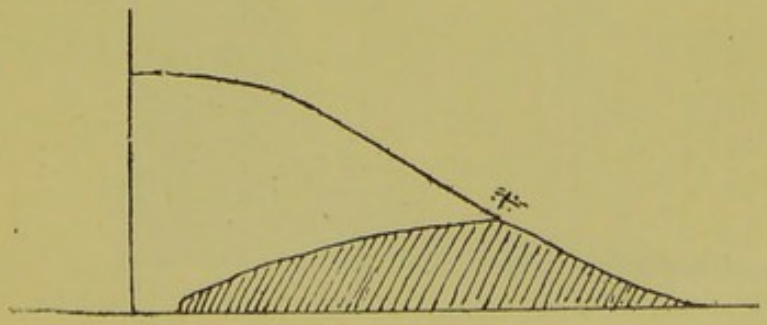
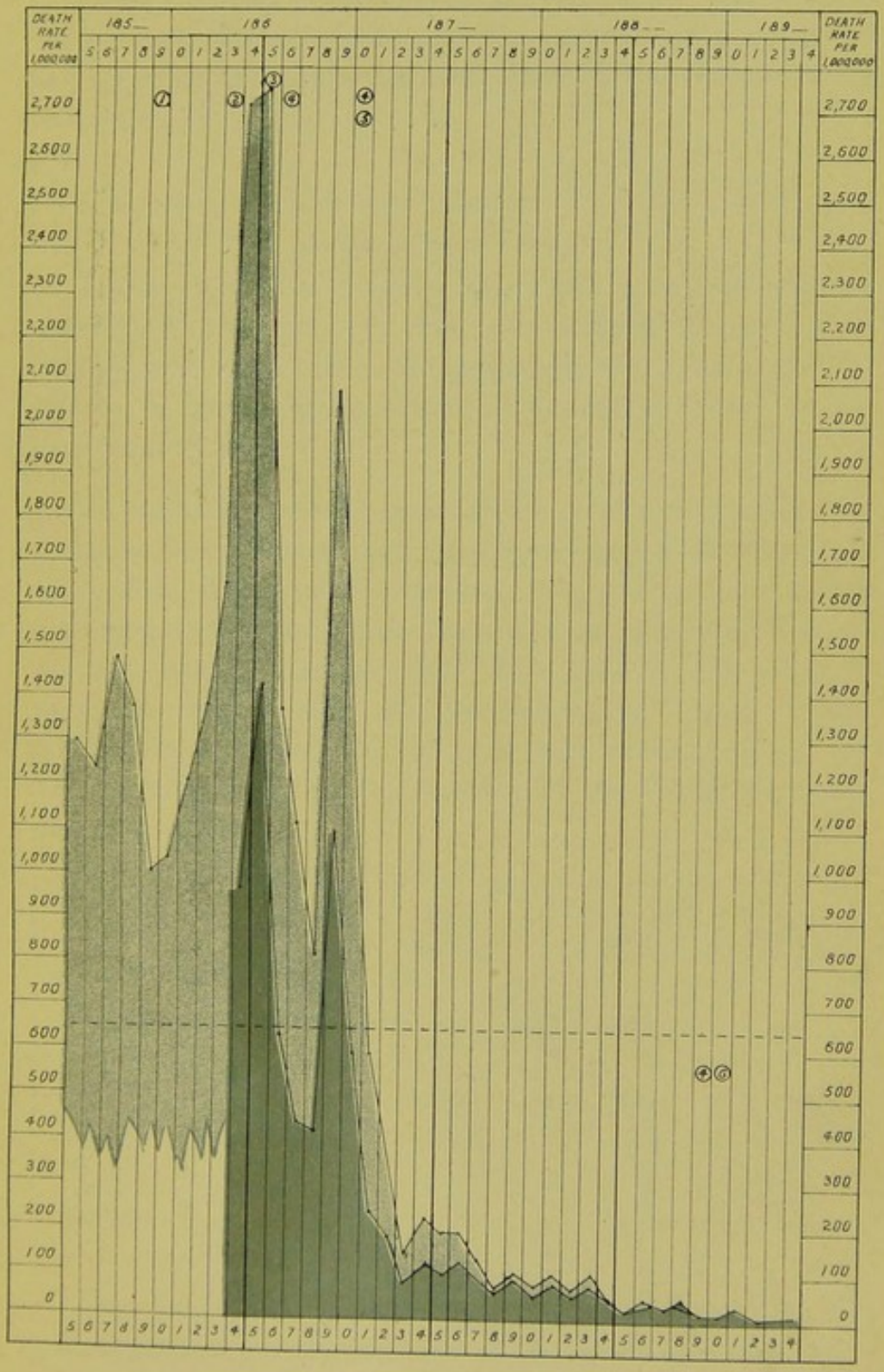


DIAGRAM NO. II.—HISTORICAL REFERENCES.

(1) *Loch Katrine Water turned on.* (2) *First Medical Officer of Health appointed. Suppression of Overcrowding by ticketing, &c., begun.* (3) *First Municipal Fever Hospital opened.* (4) *City Improvements Act passed. Clearances,* 1870-77. *Re-construction,* 1889. (5) *Sanitary Department organized.* (6) *Notification Act adopted.*

II. GLASGOW.—Death-rate per Million from TYPHUS for 40 years (1855-94), showing since 1864 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus - - - - - - - -

At the point marked the curve of isolation coincides with the curve of existing disease. They become one; the maximum of bed accommodation is reached. Thenceforth the amount of the disease and the accommodation needed fall together and perfection is reached by the contemporary extinction of both.

Special Methods and Results in dealing with Infectious Diseases.

I propose now to consider the chief infectious diseases individually, to bring out any peculiarity in the method of dealing with each and to distinguish in the general bulk of success in prevention the special degree attaching to the treatment of each.

TYPHUS.—Hospital accommodation was originally provided by the Glasgow municipality solely for the treatment of Typhus. In fact all the sanitary energy which now-a-days we expend upon the whole fraternity of infectious diseases was 30 years ago concentrated in a death-or-life struggle with this one disease. A "*Fever*-Hospital" or a "*Fever*-shed" meant a place for Typhus and nothing else. The following Table shows the progress of the struggle in quinquennial stages.

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	2333	...	1265	...
1860-64	3225	...	1576	...
1865-69	3607	1795	1623	50
1870-74	1191	583	492	49
1875-79	352	242	140	69
1880-84	194	149	75	77
1885-89	97	77	36	80
1890-94	70	66	23	94

We have only casual opportunities of knowing the proportion of cases treated in Hospital in the earlier pre-

registration times. Dr. Richard Miller,[1] in stating the number of cases which occurred in the 5 years 1827-32 adds that "only about a fourth were sent to any hospital," which is the same proportion as that given by Dr. Cowan for the 5 years 1835-39. We have not attempted to ascertain the proportion of deaths in hospital in the first decade of registration because the duplicate set of Registrar's books in the Sanitary Department only begins in 1865. Still in the figures as given we have a perfect realization of the "curve of perfection" in isolation treatment (see diagram). We begin with 3,607 deaths from Typhus in 5 years, of which 50 per cent. took place in hospital, we end with 70 in 5 years of which 94 per cent. took place in hospital. In other words, whereas in 1865, 610 beds were kept full of Typhus and yet more than one half of the total cases were allowed to run their pernicious course at home, for many years now two Wards of 15 beds each or 30 beds in all have sufficed to receive all the cases known to exist in Glasgow. In fact they are often empty for weeks and they are never full. This is an example of the attainment of theoretical perfection in isolation—"the largest proportion isolated of the smallest quantity of disease existing."

This result is not wholly due to the persistent enforcement of isolation. Typhus is peculiar in that its infectivity may, by change of environment, be weakened almost to extinction. Cleanliness and fresh air make it comparatively harmless. Small-pox and Scarlet Fever are not so influenced. Susceptible persons must keep away from them. The deadliest blow struck at Typhus in Glasgow was the suppression of overcrowding. The 1862 Act regulated the occupation not only of Common Lodging-houses but of small private houses. It fixed a minimum size of house which might be inhabited, which led to the closure of hundreds of undersized houses, and it fixed a standard of 300 cubic feet per adult in all houses of a less capacity than

[1] Clinical Lectures on the Contagious Typhus Epidemic in Glasgow and the vicinity during the years 1831 and 1832.

2000 cubic feet.[1] These powers took effect in May 1863, and Dr. Gairdner at once applied them, beginning with "Binnie's Court" 281 Argyle Street, which was ablaze with Typhus. In this way he followed the Fever about until he had brought all its haunts under night-inspection. Structural alterations to ventilate the lobbies and staircases which penetrated those buildings like tunnels were effected. Very soon he was able to point to notorious tenements remaining free of Fever while elsewhere it prevailed; and in 1866 when Typhus seemed to be reviving Dr. Gairdner proved by district statistics that its local incidence was in direct proportion to the local overcrowding as shown by the results of the night-inspections. Another thing which is inimical to Typhus is personal and domestic cleanliness. In a Typhus district there will always be more cutaneous excretions on the surface of the skin of the inhabitants and stored in their body and bed clothing than in a district where Typhus is unknown. A Reception House for the well is almost as essential as a hospital for the sick in an infected house. Every inmate of such a house is a magazine of infection, and removal to a temporary refuge is even more necessary for thorough disinfection of clothing than for observation. A Reception House was acquired in 1872, another in 1892. In the case of Typhus the period of detention is 17 days. The practice of free washing of clothes wherever dirt is found in presence of any infectious disease and the steady enforcement of household cleanliness at all times, as well as the facilities afforded by an ample water-supply and baths and wash-houses have raised the standard of domestic cleanliness in the poorest parts of Glasgow to an extent which only those who remember their former state can appreciate.

Small-pox.—Small-pox differs from every other infectious disease in relation to hospital treatment. The

[1] By the 1890 Act, the standard was raised to 400 cubic feet and made applicable to all houses, although "ticketing" and night inspection are still restricted to small houses.

Hospital must itself be isolated, and even when this seems to have been effected a Small-pox Hospital may in a manner not yet satisfactorily explained become a centre of epidemic influence. There is no doubt that ignorance of these peculiarities had at one time a deal to do with the propagation of this disease in Glasgow. Indeed, the arrangements at the Royal Infirmary indicated not merely ignorance of this comparatively recondite property of aggregations of Small-pox even when isolated in an entirely separate establishment, but carelessness of the ordinary precautions which every private practitioner would now-a-days think essential to the isolation of a single case. The Small-pox Wards were in the Fever-house, opening off the common stair, in direct structural and unrestricted personal communication with the general hospital, not isolated as to medical attendance, nursing, or management, using the common washing-house, laundry, mortuary, &c., served from the common provision stores, kitchen and dispensary. In such circumstances it need scarcely be said that to send a case of Small-pox to the Royal Infirmary was to plant the disease on wider lines of communication, so that instead of merely spreading in a particular close or wynd, it would spread in a general hospital and be taken out over the city. Hence the exclusion of Small-pox from the Infirmary in 1871 may be regarded as an important step in its prevention; but the treatment of it in Parliamentary Road Hospital was only a partial success although a distinct improvement. Suspicion was soon roused in the mind of the District Medical Officer. In the Spring of 1872 Dr. Gairdner and the Physician-Superintendent after careful enquiry could only report a verdict of "not proven." In the Spring of 1873 Dr. Gairdner's successor reported—"while I am not prepared to say *how* the hospital acts, I am afraid it must be admitted that it does act in propagating the disease in the Northern District." Steps were at once taken to provide a hospital at Belvidere, and it cannot be said that Glasgow ever had the full benefit of isolation in

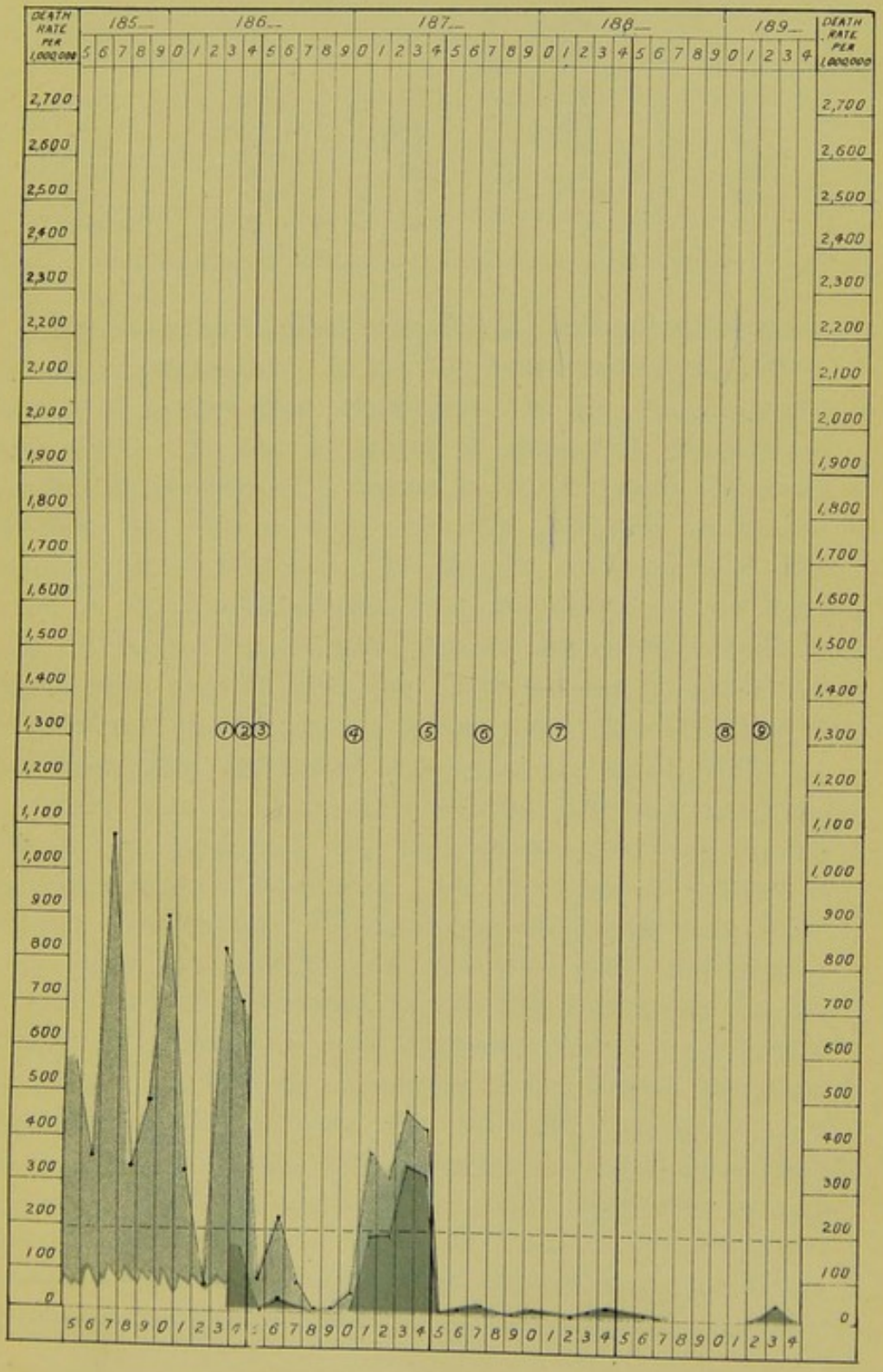
the prevention of Small-pox until 1877 when this hospital was opened. It will now be understood how with reference to the prevention of Small-pox the date of the shutting of a hospital may be as noteworthy as the date of the opening of a hospital with reference to the prevention of Typhus!

The part of Reception Houses in the preventive treatment of Small-pox is quite as important as in the case of Typhus, though somewhat different. Personal uncleanness has no essential relation to Small-pox. Still it is necessary where wardrobes are unknown to get the clothing actually on the bodies of the healthy washed. But the greatest service rendered by a house of temporary refuge arises from the opportunity it gives for the discovery of modified eruptions. Suppose a case of well-marked Small-pox is found in a workman's family—a young person of 20 or 25. There may be from eight to a dozen brothers and sisters graduated in age and all vaccinated more or less successfully. As to existing disease it is impossible to make sure that there is not among them a case or two of Small-pox, modified to the vanishing point of one to a dozen papules, or their remains, unless these persons are stripped and examined by an instructed *official* eye. As to prospective disease, for the same reason, such modified cases springing up under daily official surveillance are sure to be detected, whereas, under ordinary circumstances, they would be concealed even if suspected. Young people naturally kick against confinement in a hospital when in perfect vigour, not to speak of loss of work. For these reasons a Reception House is an indispensable aid in the campaign against Small-pox. Even such limited outbreaks as we are accustomed to in Glasgow tax the accommodation of our two houses, which is ample for all other needs. In Reception Houses as in Hospitals, the motto of Small-pox is *Noli me tangere.* Refugees from Small-pox cannot be put under the same roof as those from any other disease Typhus is not so touchy.

DIAGRAM NO. III.—HISTORICAL REFERENCES.

(1) *First Medical Officer of Health appointed.* (2) *Vaccination Act came into force.* (3) *First Municipal Fever Hospital.* (4) *Sanitary Department organized.* (5) *Revaccination by Epidemic Inspectors begun.* (6) *Permanent Small-pox Hospital opened.* (7) *Special Enquiry after Vaccination Defaulters begun.* (8) *Notification Act adopted.* (9) *Practitioners authorized to revaccinate at public expense persons unable to pay a fee.*

III. GLASGOW.—Death-rate per Million from SMALL-POX for 40 years (1855-94), showing since 1864 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus - - - - - - - -

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	1043	...	565	...
1860-64	1154	...	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

These results are sufficiently striking without reference to a standard population. In the 10 pre-sanitation years there were 2197 deaths from Small-pox; in the 30 sanitation years 1060. In the 10 years of imperfect isolation in hospital there were 971 deaths, in the 20 years of perfect isolation 89. There were normally 250 beds in Parliamentary Road Hospital. In March, 1874, we had 258 patients. In the Small-pox Hospital, Belvidere, we have only 150 beds. For the last 18 years the wards there have chiefly been used as a Scarlet Fever annexe to the Fever Hospital, and there have never been more than 106 cases of Small-pox under treatment at one time (in April, 1893).

Apart from their possibly sinister influence hospitals can at best play only the part of an auxiliary in the campaign against Small-pox. The first line of defence is primary vaccination. Nowhere has advantage been more fully taken of Jenner's great discovery than in Glasgow. So early as 1801 gratuitous vaccination was begun by the Faculty of Physicians and Surgeons, and is to this day continued. In 1857 the Managers of the Royal Infirmary instituted gratuitous vaccination at their dispensary. On 1st January, 1864, the Compulsory Vaccination (Scotland) Act came into force. In 1873 the Local Authority opened their vaccination station. Between these and other stations there is a very large proportion of the primary vaccination of Glasgow carried out officially and therefore in a superior

manner. In Scotland the Parochial Boards were until 1894 the authorities who enforced the Vaccination Act. The Parish Councils then inherited the function, but it is very obvious that it ought to be transferred to the authorities under the Public Health Act. In 1876 arrangements were made with the City Parish to have lists of defaulters passed on to the Medical Officer after the Parochial officials had dealt with them. It was found that the epidemic inspectors were able to discover 26 per cent. and procure the vaccination of 6 per cent. of these defaulters, the remaining 20 per cent. being actually vaccinated, although not certified. In 1881 all the City Registrars were asked to return from week to week the names and addresses of all children who were still unvaccinated a fortnight after the issue of the notice served by the Registrar on the guardians in accordance with the 17th Section of the Act. These were distributed among the Sanitary Staff, with the result that whereas previous to 1876 the proportion of children born in Glasgow who were not accounted for either by vaccination, death, or postponement, varied between 3 and 4 per cent., in the first year of limited enquiry by the Sanitary Department it fell to 2·8 per cent., and in the first year of complete enquiry to 2 per cent.

Having secured as far as possible a primarily vaccinated population, the next line of defence against Small-pox is still vaccination,—vaccination reapplied as a system to every person of 10 years or upwards, and as a special process to all persons within the infected area which surrounds every case of Small-pox. Systematic revaccination can only in this country be promoted by promulgating the opinion of the local authority that the practice is commendable, by announcing that practitioners are authorised to perform the operation gratuitously (*i.e.*, at the cost of the local authority) in cases where persons cannot afford a fee, and by giving this advice and these facilities special publicity when Small-pox is present. All this is done in Glasgow. Special means are also adopted to get at

sections of the community who are likely to encounter and import Small-pox. Of these the criminal population, so largely interfused with the tramp element, causes most solicitude. An arrangement is made under the sanction of the Prison Board, with Prison Surgeons to offer revaccination on behalf of the local authority to every person committed for more than ten days; and to vaccinate every unvaccinated prisoner. Through Reformatories, Church-missions, employers, &c., &c., and through the propaganda of the staff, a constant pressure is maintained towards the same end.

The best method of carrying out re-vaccination as a special preventive process in the face of existing Small-pox was only worked out after careful consideration of the results of several methods. In 1863 the District Medical Officers went to the infected localities in their districts. After the reconstruction of the Department in 1870, district vaccinating stations were opened for primary vaccination and re-vaccination, each in charge of a medical man. Experience proved (1) that of those who gave their names to the epidemic inspector as willing to be revaccinated a large proportion, before the visit of the District Surgeon or other medical man to whom the list was sent, had thought better of it and refused to be touched, (2) that those who said they would go along to the station never went, (3) that the epidemic inspector frequently found visitors in the infected house who either gave wrong addresses or otherwise managed to escape revaccination, (4) that the number of children brought to the *district* stations was insufficient to keep up a lymph supply. Looked at with an open mind it was clear that the man to carry out revaccination was the epidemic inspector, who was first on the spot, who was known to the people, who probably was there before the removal of the case and gave his advice in presence of the "awful example." Vaccination is a purely mechanical operation, a bit of handicraft. The selection of the lymph is a matter of medical responsibility. If the lymph is selected

and put into the hands of a man who has acquired this handicraft, no other conditions are necessary to justify the operation. In December, 1873, this system was adopted. The Medical Superintendent of Vaccination who attends at the vaccinating station attached to the Central Chambers, collected the lymph and taught each inspector the handicraft. Every inspector carries a supply of lymph (now calf-lymph), he revaccinates wherever necessary at the first visit, returning at meal-hours or in the evening to pick up all the stragglers. He is forbidden to vaccinate infants primarily but he sends their names to the medical superintendent or has the child brought to the station. If the parties prefer their own doctor he calls upon him, informs him of the circumstances, supplies him with lymph if he requires it, calls next day to see if the operation has been done, and does not lose sight of the business until it is ended satisfactorily. All this is done under the close supervision of the Medical Officer to whom everything is reported in detail. Where general revaccination in a close or court, or lodging-house, or anywhere on a large scale is required, the inspectors are sent out at night in pairs or in squads. When Small-pox is increasing and the work growing a young medical man is appointed to take subordinate charge. The success of this system is shown by the fact that whereas in the last three years (1871-3) of the old system the number of persons revaccinated at their residence per case of Small-pox was barely 2, in the last three years (1892-4) under the new the number was 15.

The fear of losing work from sore arms is a natural and serious obstacle to revaccination in the case of working people. If any *bona fide* case of hardship occurs, the arm is dressed and a small daily allowance is paid during disability. The most serious local inflammation arises from drink, rough usage and dirt. Cases in this category are sent to one of our reception-houses where they get free lodgings and food and are kept in bed and sober. In dealing with the Model Lodging-houses belonging to the

Improvement Trust a bribe of a week's free lodgings sufficed to induce the inmates to accept revaccination after all argument had failed. The same principle was applied to the still larger private "Models," by a pecuniary arrangement with the proprietors. In short it may be said that the local authority of Glasgow has always extended to their medical adviser perfect freedom of action to do anything and everything to promote the prophylactic use of vaccine lymph.

Lastly, a word may be said as to the special demands of Small-pox upon the intelligence, tact, and discretion of the epidemic inspector. To be efficient against Small-pox he must combine the keen scent of the pointer, the wisdom of the serpent, and the common-sense of human-kind. A great part of the difficulty of suppressing Small-pox arises from the extremely modified cases which form the germinating margin of every epidemic. It is in the scenting out and marking down of these for his medical officer that the inspector may show his keenness of observation, while his tact in adapting himself to the character and ways of the people will appear in the success of his offers of revaccination.

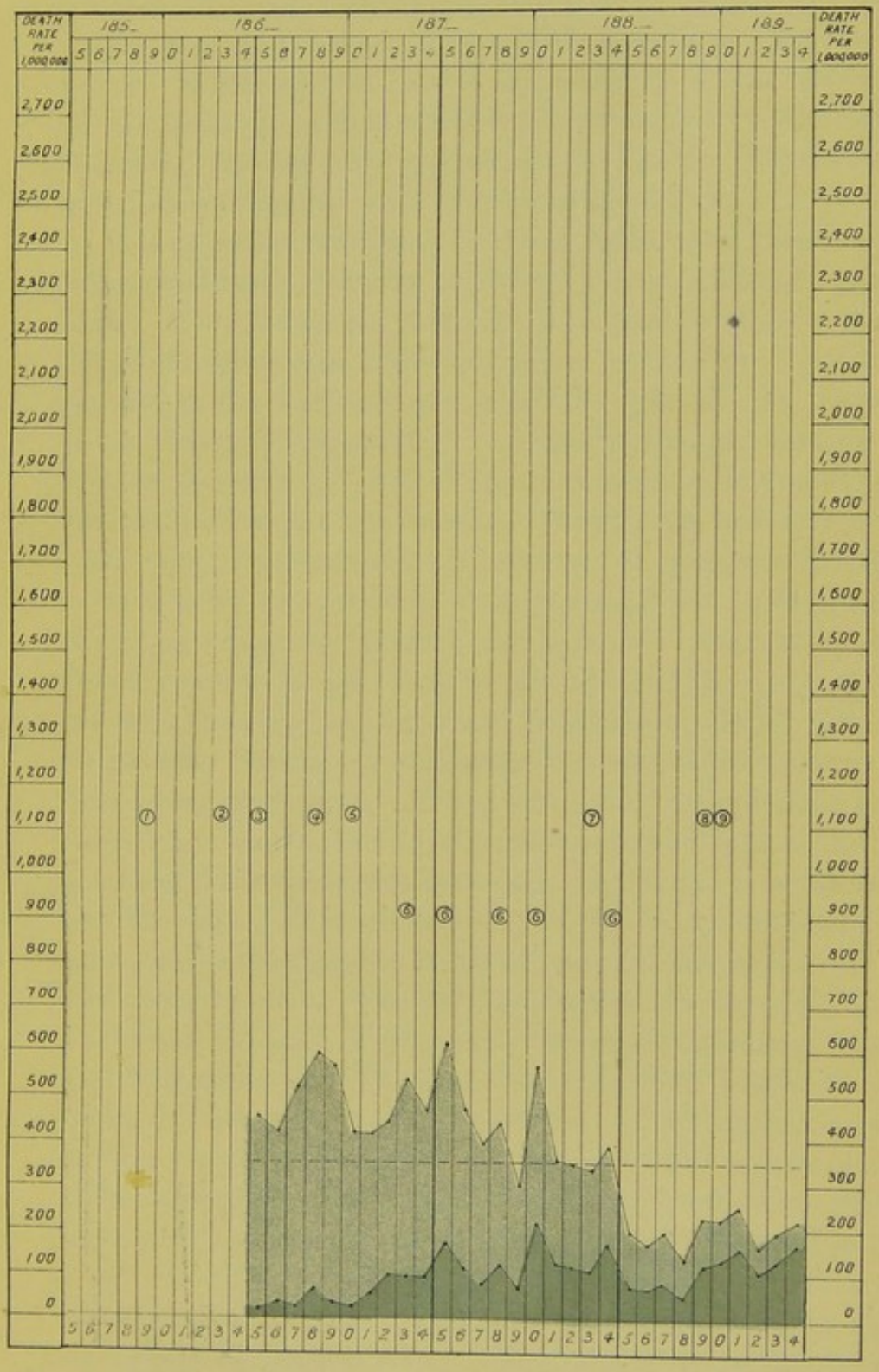
Enteric Fever.

Period.	Total Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Deaths in Hospital to total Deaths.
1855-59	...	...	...	...
1860-64	...	...	...	...
1865-69	1140	79	510	7
1870-74	1111	179	453	16
1875-79	1097	264	436	25
1880-84	1032	379	399	37
1885-89	497	210	182	42
1890-94	641	421	205	66

Diagram No. IV.—Historical References.

(1) *Loch Katrine Water turned on.* (2) *First Medical Officer of Health appointed.* (3) *First Municipal Fever Hospital.* (4) *Cleansing Department organized.* (5) *Sanitary Department organized.* (6) *Milk Epidemic.* (7) *Systematic Drain-testing and special Summer cleansing begun.* (8) *Privy system condemned.* (9) *Notification Act adopted.*

IV. GLASGOW.—Death-rate per Million from ENTERIC FEVER for 30 years (1865-94), showing the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus – – – – – – – –

We can refer to no statistics regarding Enteric Fever for the first 10 years of Registration. The Registrar-General did not classify it apart until 1865. To the deaths thus classified we have added those from "Remittent Fever" which are no doubt, especially in young persons, all attributable to Enteric Fever. Indeed since 1877 the Registrar-General has embraced "Infantile Remittent" (previously classified apart) under Enteric Fever.

It is apparent that there has been a great and progressive diminution in the fatality of Enteric Fever in Glasgow since 1865. If we divide the statistics into periods of five years the diminution has been unbroken except by a minute increase in the last over the preceding period. In periods of ten years the decrease in the death-rate per million is thus graded 481, 417, 193. The improvement is practically concentrated in the last decade. What is the cause of it?

No doubt the progressive influence of hospital isolation as shown by the growing proportion of the total deaths which took place in hospital (rising from 7 per cent. in the first 5 years to 66 per cent. in the last, and in 1894 to 77 per cent.) has had an important preventive effect. But if we consider the history of Enteric Fever in detail we observe that every occurrence of anything like an epidemic prevalence has been caused by the distribution of infected milk; and that these epidemics have been recorded in every decade but the last. This matter may best be understood by reference to the diagram in which the annual death-rate is laid down to scale. The milk epidemics are these (1) 1873 Parkhead, (2) 1875 Washington Street, Pollokshaws Road, and Kingston, (3) 1878 West End, (4) 1880 Northern and Central Districts, (5) 1884 Hospitals. If we note the peaks in the curve it will be seen that they fall on the years 1873-75-78-80-84, and these include every year which represents such a peak, viz.—a projection upwards confined to one year. In 1867-8-9 and in 1889-90-91 there are mounds or round-headed elevations spread over three years which were not traced to milk-infection. The history of Enteric Fever

in Glasgow therefore leads to those notable conclusions, (1) that her epidemics have all been milk-borne; and since in the first alone was the infection acquired locally (from the milking of the cows in a city byre by a mother nursing children who had Enteric Fever) and in all the others demonstrably from defective water-supply, bad drainage and other defects at the source of supply in the country, (2) that the status of Enteric Fever in Glasgow mainly depends upon rural sanitary administration. It is the case that during the last 10 years of comparative immunity there have been no milk epidemics of enteric fever.

There were three methods of working for the protection of the City upon the indications of these experiences—by legislation, by education, through the commercial relations of buyer and seller. The publication of the facts of these epidemics impressed the public mind very acutely and the local agitation not only initiated local reform in the dairy-trade, but coupled with the action of the authorities had no small share in producing the Dairies and Milkshops Order (1879). Clauses drafted in Glasgow in 1878 for an amended Police Act with the intention of facilitating the investigation of these milk epidemics and even authorising inspection of the suspected farms and the exclusion of their product, were adopted in the ill-fated Burgh Police Bill and thence in substance in various English local Acts and ultimately in the Infectious Diseases Prevention Act (1890) applicable to England only. This history led to the remarkable result that Glasgow herself only got the benefit of these clauses in 1890 in the Glasgow Police (Amendment) Act. However, much was done by education and the use of the commercial lever. In 1888 a pamphlet was drawn up entitled "The Sanitary Requirements of a Dairy Farm" and distributed by the Local Authority to every farmer within the area of the Glasgow milk-supply and to every milk-agent, to farmers' and dairymen's associations, to rural authorities and others. The plan of campaign was this. The citizens are infected and the business of the milk agent who distributes the

infection ruined. The causes are obvious sanitary defects and the actual existence of disease at the farm-steadings from which the milk comes. The local authority points out the main requirements of a dairy farm. They advise all milk agents to visit the farms before making contracts and as one of the conditions of the contract to insist upon the immediate stoppage of the supply and report of the occurrence, when infectious disease appears at the farm. A form of contract on these lines was at once adopted by the Dairymen's Association. The authorities are themselves purchasers of milk in very large quantities for their hospitals. A very stringent special form of contract was adopted requiring every milk agent who made an offer to specify his farms. These were all inspected by special inspectors, reported upon with plans to scale, and a short leet of farms finally inspected by the Medical Officer before the list of those found eligible was reported to the Committee on Contracts. The Directors of the Western Infirmary adopted exactly the same system. In the course of these enquiries and in the investigation from year to year of milk epidemics or circumstances suggesting suspicion of the milk-supply, hundreds of farms were inspected, the reports with relative plans registered, indexed and preserved in the Sanitary Office. Complaints were made to rural authorities and to the Board of Supervision. The hand of the customer in Glasgow was laid upon the factor, the landlord, and the authority ; sanitation came to be associated in their minds with self-interest. The money of the town pays the rent in the country, and it was not to be forthcoming except on certain conditions. No doubt the position of the buyer is omnipotent, provided he is intelligent enough to see it and to think it out to its ultimate issues. Milk from a pure source comes in the long run to be a matter of money—a better bargain for the man with a well-ordered steading, a better rent for his landlord, a higher contract-price to the milk-agent, a dearer article to the consumer. The dairymen of Glasgow are a peculiarly well-informed class as to

the health aspects of their trade. Everyone of them who conducts his business as advised by the local authority is an effective apostle of sanitation to the rural districts. Of course there are people in all businesses, not excepting those of landlord, farmer and milk agent, who deliberately choose a low standard. The one makes the existence of the other possible. The ultimate sufferer is the poor, thoughtless, helpless customer of the town. It is for the suppression of the former and the protection of the latter that legislation is required.

While we ascribe so large a share in the reduced fatality of Enteric Fever to the prevention of milk epidemics these are after all what may be designated acute events arising from passing causes. The chronic causes of Enteric Fever, those which sustain it as an endemic, are the daily crop of "nuisances" essentially related to excrement-removal which springs up within and about the house, which it is a great part of the business of the nuisance inspector to abolish from day to day; and defects in the cleansing and scavenging of ashpits, courts, and closes for which the Cleansing Department is responsible. The plodding work of the Sanitary Department and the intelligently-developed system of cleansing which has already been commended therefore deserve their share in the allocation of merit. The epidemic peaks rise upon a falling base and this is the work of the hospitals and those departments.

Relapsing Fever.—In March, 1870, the first cases of this disease were recognized in the Municipal Hospital. It had been first detected in this country in the London Fever Hospital in July, 1868, having apparently been introduced by Polish immigrants to Whitechapel. In January, 1870, it appeared in Manchester, in February in Edinburgh, whence it was carried by a tramp to Glasgow. The disease developed slowly until the autumn, when it outran the hospital accommodation. From the middle of October, 1870, until the beginning of January, 1871, an increasing propor-

tion of the known cases was treated at home and the fever spread like wild-fire. The authorities took prompt action. On 11th November they purchased the Belvidere estate. Wooden sheds were run up and filled as soon as finished, the first being occupied on 19th December. By the end of January the epidemic was obviously checked and in February it was on the decline. In the following autumn there was a vigorous rally, but in face of the ample hospital accommodation the disease made no headway, and it disappeared in the summer of 1872. The following is the result of the epidemic so far as concerns deaths :—

	Total Deaths.	Deaths in Hospital.	
		No.	Percentage of Total.
1870, - - -	121	24	20
1871, - - -	241	91	38
1872, - - -	34	7	21

It is very obvious from these figures that Relapsing Fever not only overwhelmed the hospitals but the whole executive. Out of 396 deaths 122, or only 31 per cent., took place in hospital. The new department was not in a position to discover more than a fraction of the existing cases, or to insist upon isolation without careful selection according to urgency. Still, over-crowding was now under control, lodging-houses were regulated, scavenging and cleansing were fairly in hand and disinfection was applied, in all which respects the circumstances were very different from those now to be contrasted.

Relapsing Fever had been epidemic in Glasgow in 1843. It is a disease which produces a low direct mortality—between 2 and 3 per cent., although it very rapidly involves a large area of the population, so that the mass of disease existing at one time is enormous. Probably encouraged by this consideration, the parochial authorities resolved to treat the poor at home. Relapsing Fever almost wholly runs along the lines of poverty so that the great majority of its victims could not get access to the Infirmary excepting at a cost to the parishes of 15s. each. To save this sum the

district surgeons were requested to treat cases and allowed to give a few shillings in the way of relief. Otherwise, of course, nothing was done in the way of prevention. The result was that in 8 months 12 per cent. of the population had been attacked. In District 11, between the New Vennel, the Molindinar and Duke street, the proportion was 27 per cent. If we take the mortality at 3 per cent., then 396 deaths in 1870-72 represents 13,200 cases in Glasgow in 3 years in a population of 492,000, whereas in 1843 there were 32,000 cases in 8 months in a population of 275,000.[1] It is, however, only fair to say that there was great destitution in the city in 1848 but not in 1870-72.

Infectious Diseases of Children.

The epidemic history of the pre-sanitation age suggests the same sort of questions as Hume's History of England and Disraeli's novels. Was there anybody but Kings and Emperors alive in those days? Is society entirely made up of Dukes and Duchesses? Were there no epidemic diseases in the first half of the 19th century, but Typhus, Small-pox, and Cholera? It is easier to explain why we hear of none but those grand diseases than why historian or novelist should so write. So soon as Registration enables us to ascertain the full facts we find epidemics of Scarlet Fever, Measles, and Whooping-cough mixed up with those of the major infectious diseases, competing closely with them in their contributions to the tale of deaths, and no doubt rivalling them in the bulk of disease existing at one time. In the 20 years 1855 to 1874, the number of deaths from *Scarlet Fever* was 11,377, from Typhus 10,356. In those 20 years the death-rate from Scarlet Fever on four occasions exceeded 2000 per million; on only three occasions in the case of Typhus. The highest death-rate attained by Typhus was 2749 per million in 1865, whereas the maxima of Scarlet Fever were 2906 in 1863 and 3358 in 1874.

[1] The parishes of City, Barony, and Gorbals.

Compared with Small-pox, Scarlet Fever had in 11 of these 20 years shown a mortality exceeding three figures per million, Small-pox in only one. *Measles* had carried off 7495 persons in the 20 years, and in 1871 reached a death-rate of 1898 per million, which had only three times been exceeded by Typhus. *Whooping-cough* was then what it is now, the most destructive of all our epidemic diseases, not because of its periodic outbreaks but its steady persistency; In the 20 years it caused 12,722 deaths, and in only three of these years failed to raise its annual tribute to four figures per million. As it was in those 20 years, there is every reason to believe it was in the first half of the century. The classification of the burial-records as to the causes of death was founded upon very dubious data, but there is less dubiety about the ascription of deaths to infectious than to other diseases. In 1813, Whooping-cough was of sufficient importance in Glasgow to lead Dr. Robert Watt, a distinguished physician of the day, to write a special "Treatise on the History, Nature, and Treatment of Chin-cough," now best known on account of the appendix :—"An enquiry into the relative mortality of the Principal Diseases of Children and the number who have died under 10 years of age in Glasgow during the last thirty years." He tells us that "next to the Small-pox formerly, and the Measles now, Chincough is the most fatal disease to which children are liable," (p. 25) and that the greatest number of deaths attributed to this disease in Glasgow during the 30 years was in 1809 when they amounted to "something more than 11½ per cent. of the whole deaths in the year." In the 40 years of registration the deaths from Whooping-cough have never quite reached the proportion of 9 per cent., and in the last 15 years never 7 per cent. Dr. Alexander Watt reports[1] that in the 5 years 1835-39 the death-rate per million from "Fever" was 3780, Measles 1960, Small-pox 1730, Whooping-cough 1720, Scarlet Fever 830. It is evident therefore that even in the heroic age of epidemics,

[1] Remarks on Mortality Bills of 1839.

if the infectious diseases of children excited no popular remark and led to no organized interference it was not because they did not exist, or, though existing, were not deadly. They were *diseases of children.* That was the reason and a sufficient one. Typhus slew the bread-winners, the house-mothers. It prostrated those who represented the vigour of the community and paralyzed its activities. The same instinct which prompted to revolt against Typhus said—let the others alone, our hands are full.

When the dust and smoke of the main battle have cleared away it is possible to discover positions which are held in strength by unbroken detachments of the enemy and to turn the forces to their attack. Every figure given above to prove that the epidemics of those (so-called) minor diseases were frequent and deadly, though overshadowed by the major epidemics, became an argument for attacking them when the latter were broken up. The last epidemic of Typhus occurred in 1869. The epidemic of Relapsing Fever which swept down upon the city like an Asiatic horde in 1870-71 overwhelmed the infant sanitary organization and compelled it to reinforce its hospital strength and extend its washing and disinfecting arrangements. When this vast outburst passed away all the added resources were left free for fresh enterprises. In 1871 the most severe epidemic of Measles on record broke out. The feasibility of dealing with children's diseases had frequently been discussed but always with a sense of hopelessness in view of the inherent difficulties. The district medical staff was instructed to endeavour to get cases of Measles into Hospital by offering to admit mothers with children. In 1873 the medical officer gave instructions to use every means to procure the removal of the first cases in tenements. In that year Scarlet Fever became unusually aggressive, the prelude to an epidemic outburst which culminated in 1874 and was by far the most destructive of any on record. In September the medical officer proposed "to enforce

removal to hospital of cases of Scarlet Fever wherever it can with propriety be done, more particularly in those parts of the city where epidemics of all kinds spread rapidly." He was authorized to do so, and a fortnight after he reported that of 122 cases known to exist 34 had been removed "in most cases under warrant." Henceforth the hospital treatment of Scarlet Fever was quietly but firmly pressed, with the result that in place of 28 per cent. of cases of which the officers became aware because of the very fact that they existed in small houses being removed "in most cases under warrant," we now remove above 80 per cent. of all existing cases without having to ask for a warrant once a year.[1] The secret is to have a well-managed hospital with a good reputation for the kindly treatment of the children, to manifest human sympathy with parents in their desire to cling to their children, but to be firm and let it be evident that the firmness is the firmness of reason and not of mere despotism. The same principle of course applies to all forms of infectious disease in children. The preventive utility of hospital isolation in the case of Measles and Whooping-cough is limited by various circumstances, The advantage as regards the individual life is undoubted in the majority of the cases treated in Glasgow—the children of tramps and denizens of lodging-houses. The extension of isolation to the infectious diseases of children included the application of all the other means of prevention, general sanitary supervision and washing and disinfection.

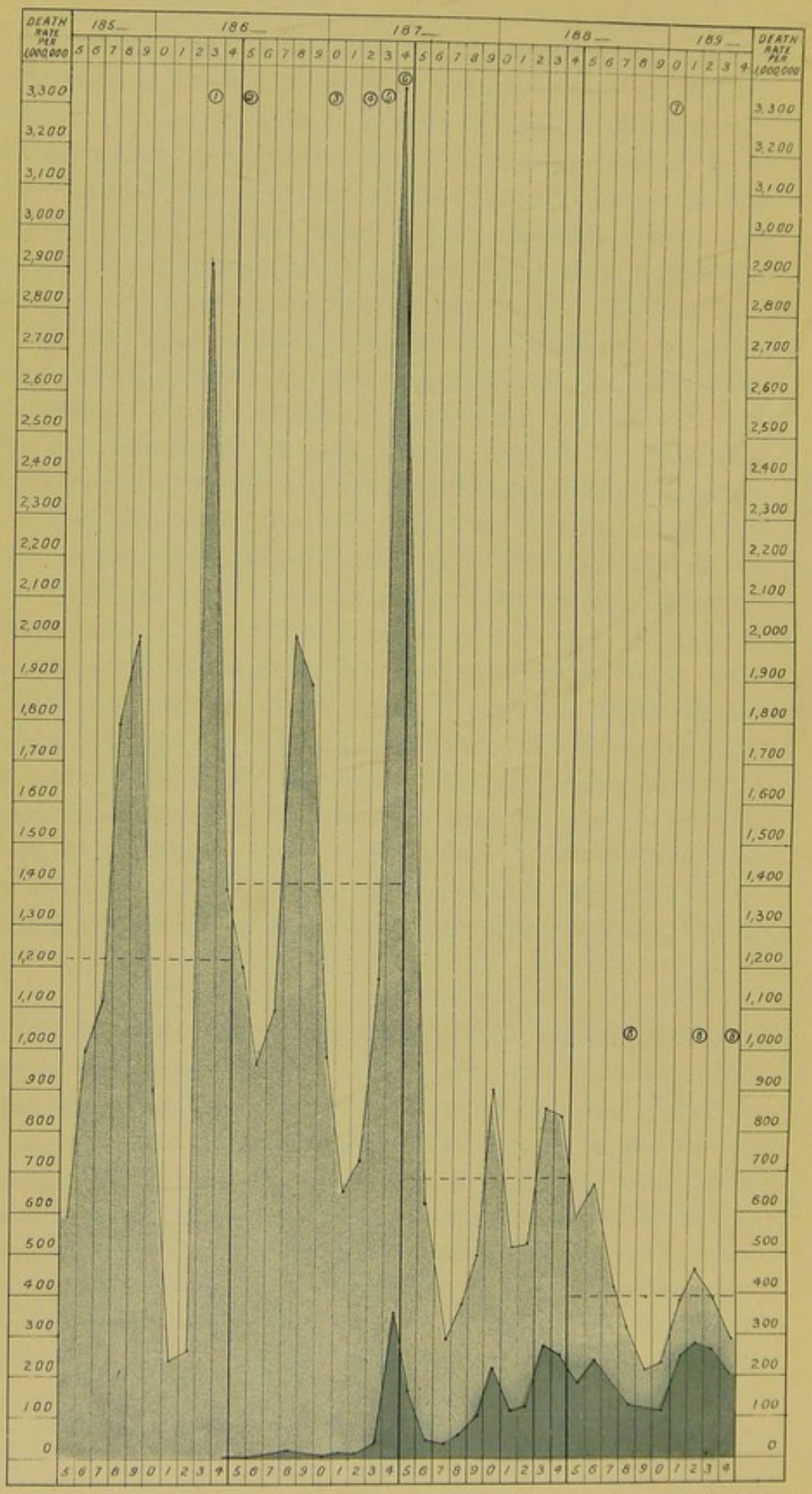
The passing of the Scotch Education Act in 1872 had a most important relation to the infectious diseases of children in various ways, not the least of which was by centralizing the control of schools, and so facilitating general regulation. In 1874 negotiations were opened between the Local Authority and the Glasgow School Board with a view to co-operation in an endeavour to prevent the spread of those diseases through schools. It was agreed that no child coming from an infected house or

[1] In October, 1895, we are removing 89 per cent. of the cases notified.

itself infected should be permitted to attend school until a certificate of immunity had been received from the Medical Officer. To secure this, a system of notices of infectious disease where there were children attending school, from the Medical Officer to the Head Teachers and from the Head Teachers and the Board to the Medical Officer was instituted. This scheme of co-operation began in September 1874, and has worked admirably ever since. When begun it had no legal sanction but this was obtained in 1890. The sending to school or receiving at school of a child from an infected house without a certificate is penalized. At the commencement of each session hand-bills containing extracts from the Act are distributed to the children through the Head-teachers. In 1874 also two popular pamphlets were issued by the Local Authority—"The Management of Scarlet Fever" and "The Law about Infectious Diseases." These have been re-edited from time to time. A copy of the former is left at every house where Scarlet Fever exists and of the latter wherever a case of any infectious disease exists. Altogether it may be said that 1875 is the first year of a new epoch in the history of the infectious diseases of children in Glasgow, for by that time all the preventive armament hitherto used only against Typhus, Small-pox, &c., had been turned upon these diseases, and other procedures specially adapted to their characteristics fairly initiated.

Scarlet Fever.—The following table shows the movements of Scarlet Fever in quinquennial periods. The first three quinquenniads show what Scarlet Fever is when left absolutely to itself. At the end of the fourth period (1870-74), as we have seen, a beginning was made. Compulsory removal was begun in the autumn of 1873, but after all only 4½ per cent. of the deaths that year took place in hospital. In the severe epidemic of 1874 the proportion increased to nearly 10 per cent. In each of the next four periods in which hospital treatment and all the general

V. GLASGOW.—Death-rate per Million from SCARLET FEVER for 40 years (1855-94), showing since 1864 the proportion of the total Deaths which took place in Hospital.



Mean Death-rate thus – – – – – – – –

Diagram No. V.—Historical References.

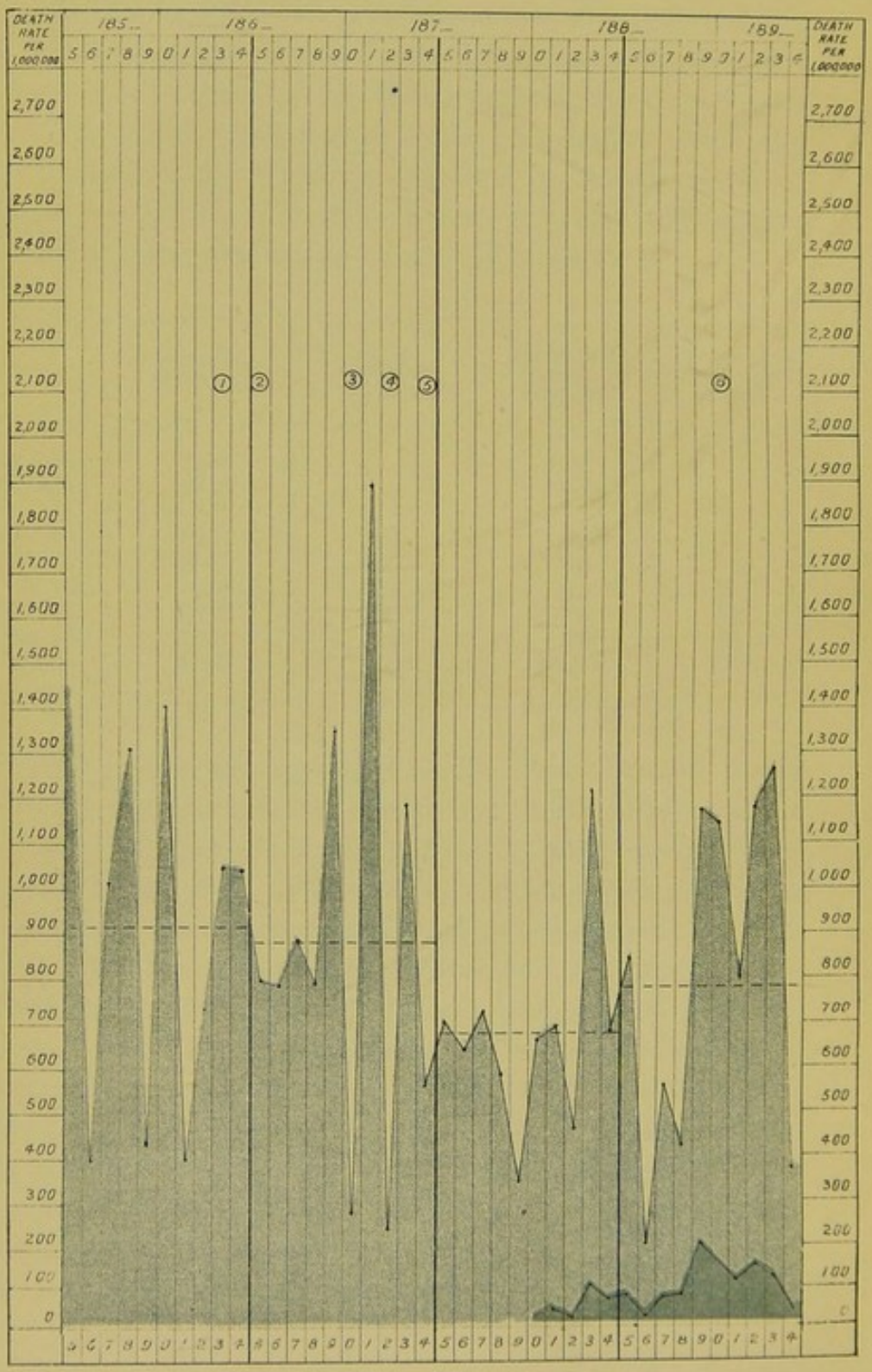
(1) *First Medical Officer of Health appointed.* (2) *First Municipal Fever Hospital.* (3) *Sanitary Department organized.* (4) *Scotch Education Act.* (5) (*September*) *Resolve to enforce Isolation.* (6) *Co-operation with School Board. Distribution of popular Instructions as to Scarlet Fever begun.* (7) *Notification Act adopted.* (8) *Milk Epidemics.*

methods of prevention as well as some special were systematically applied, the proportion of deaths in hospital rose, and the death-rate fell steadily, so that in the last five years it was exactly one-fourth of the rate which prevailed in the five years 1870-74. This result is specially gratifying and encouraging, because it must be confessed that the constant strain upon the whole resources of the Department caused by the growing proportion of patients requiring accommodation and the large demands upon beds made by a disease every case of which occupies a bed for two months or thereby, were producing a sense of despair.

Period.	Total No. of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	2427	...	1301	...
1860-64	2343	...	1141	...
1865-69	3210	25	1429	1
1870-74	3397	209	1379	6
1875-79	1622	214	645	13
1880-84	1862	508	725	27
1885-89	1161	482	435	42
1890-94	1108	729	347	66

There is nothing special to note about Scarlet Fever excepting its occasional spread by milk-infection, the peculiarity of which is that the infection may in some cases originate in the cow. There have been four milk epidemics of Scarlet Fever detected in Glasgow, two associated with human infection in 1888 and 1893-4, and two with bovine in 1888 and in 1892. The practical lesson is of the same nature in both cases, that no person who suffers from a throat affection of any kind or degree, ulcerative or congestive, with or without eruption, ought to approach dairy cows or intermeddle with milk in any capacity, and that the milk of every cow with a lesion of the teats ought to be isolated and either destroyed or sterilized. These lessons have been carefully impressed upon dairymen and farmers.

VI. GLASGOW.—Death-rate per Million from MEASLES for 40 years (1855-94), showing since 1880 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus - - - - - - - -

Diagram No. VI.—Historical References.

(1) *First Medical Officer of Health appointed.* (2) *First Municipal Fever Hospital.* (3) *Sanitary Department organized.* (4) *Scotch Education Act.* (5) *Co-operation with School Board.* (6) *Police (Amendment) Act—School Attendance Clauses.*

Measles.

Period.	Total Number of Deaths.	Number of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	1657	...	901	...
1860-64	1817	...	896	...
1865-69	2020	...	901	...
1870-74	2001	...	813	...
1875-79	1449	...	577	...
1880-84	1880	114	725	6
1885-89	1677	222	614	13
1890-94	2965	353	941	12

It is obvious from this Table that if any reduction has taken place in the mortality from Measles it is not brought out by the contrast of quinquennial periods. The following extends the periods to four of 10 years and two of 20 years.

	Death-rate per million.	
	10 Years.	20 Years.
1855-64, - - - - - - - -	898	877
1865-74, - - - - - - - -	857	
1875-84, - - - - - - - -	651	714
1885-94, - - - - - - - -	777	

We thus ascertain that the mortality from Measles has declined, but not much and not steadily. It was higher during the last decade than during the preceding, but lower in both than in either of the two decades preceding that again. We may say that whatever has been gained is to the credit of the last 20 years. The death-rate was 714 per million as against 877 in the previous 20 years. It may be argued that this is nothing more than might well arise from the general improvement in the public health which no doubt would cause the same quantity of existing disease of whatever kind to produce less death; but the decrease in the death-rate from Measles amounts to 19 per cent. whereas the decrease in the same period in the death-rate from miscellaneous general disease was only 8 per cent. It may also be recalled that we have gained nothing in diseases of the lungs. Whatever may be the conditions which favour

acute diseases of the lungs they must promote the fatality of Measles. Something therefore may be put to the credit of special repressive measures. Of these, hospital treatment does not count for much. The requirements of Scarlet Fever leave little room for Measles. The largest proportion of the total deaths which occurred in hospital was 17 per cent. in 1889, when Scarlet Fever was at the lowest ebb ever seen. But I believe the preventive results of the isolation of Measles in hospital are in any case small. The acute stage of the infectivity is over before the acute stage of the disease is fully established. Before the case is removed the most of the damage is done. The same remark applies to the ordinary washings and disinfections which are so important in dealing with the major infectious diseases. The stability of the Measles contagium is feeble and its energy through the medium of clothing, etc., small. Speaking generally, the hospital treatment of Measles gives more satisfaction from the humanitarian than the preventive point of view. The cases treated are either the children of the abject poor, those who live in lodgings or sleep on stairs, &c., or they are removed from public institutions. In many ways from the preventive aspect Measles resembles Relapsing Fever and Influenza. They all develop with such rapidity that their mere mass overwhelms ordinary organization and tactics. No infectious disease now-a-days produces such *short-time* death-rates as Measles; yet it cannot compete with either Scarlet Fever or Whooping-cough in *annual* death-rates. The reason is that although it has a low case-rate of mortality, its season is short and it rapidly covers a large area. Hospitals could not contain the cases or any considerable proportion of them although all other infectious diseases were excluded. Even with a temporarily enlarged staff and without compulsory notification, it is impossible to visit and register the cases of Measles known to exist. The washing and disinfecting establishments working day and night can barely keep abreast of their work. Yet Measles is an "infectious disease" and the law draws no distinctions but forbids with the same emphasis the

same things in Measles as in Small-pox and is equally imperative as to the duties which may be exacted of local authorities.

The exclusion from school of children likely to be incubating the disease seems the most effectual preventive measure which can be adopted, if not indeed the only one. This can be accomplished only by excluding children belonging to infected families. Though this is done under one general enactment, the nature of the risk is not the same in all diseases. In Measles it is not the risk of a healthy child conveying infection on its clothes, but of a child apparently healthy being really in the most infectious stage of the disease. Therefore, even though a healthy child is removed to another house it cannot safely go to school for a fortnight. In spite of every effort to exclude the incubating child the disease will from time to time be implanted in schools. Then the only useful measure is to close the department of the school in which the disease has appeared. This will almost invariably be the Infant Department. The object still is to separate the incubating from the healthy, and this can best be done by scattering the class and so removing the compulsory intercourse of attendance at the same school. It is not necessary to close the whole school because Measles exists in one section. The method of extension is generally this. One child is seized; in 10 days or a fortnight, two or three more in new families; and so at intervals, each brood rapidly increasing in numbers. This is perfectly certain to happen in the Infant Department. The lesson is to close the department whenever the first brood, the group of two or three, appears. The terms of the Scotch Education Code place difficulties in the way of the closure of schools and especially the partial closure, which are removed by the English Code. In England "managers must at once comply with any notice of the sanitary authority of the district in which the school is situated, or any two members thereof acting on the advice of the Medical Officer of Health, requiring them either to close the school or to exclude any scholars from attendance." In Scotland no provision is made except by

implication for any such measure. Consequently School Boards have to be persuaded and no persuasion short of a school actually ablaze with disease is likely to prevail. Total closure is preferable to partial, because while the Scotch Code like the English provides for a proportionate reduction in the minimum of 400 annual meetings requisite to entitle a school to claim for grant, "if a school has been closed during the year, under medical authority, as necessary to prevent the spread of epidemic disease," it makes no provision as the English Code does for any loss of grant owing to diminution of average attendance. If a school is only partially closed, it must have a lower average attendance and in Scotland must lose in consequence, whereas if it is wholly closed, the average attendance is not lowered. The English Code manifests a clear knowledge of the conditions of prevention and promotes their observance by making full provision for the protection of the interests of the school from the results of precautions necessary to be taken in the interest of the public. The Scotch Code manifests no such knowledge and the interests both of school-board and public suffer in consequence.[1]

[1] "If a school claiming annual grants for the first time has not been open for the whole year (Article 13); or, if a school has been closed during the year, under medical authority, as necessary to prevent the spread of epidemic disease, or for any unavoidable cause, intimation having been duly given to the Department at the time, a proportionate reduction is made from the number of meetings (400). If the school is closed on account of epidemic, or other unavoidable cause, for x weeks, the number of meetings required will be $\frac{46 - x}{46} \times 400$."—*Scotch Education Code (1895), p. 4, Exception ii.*

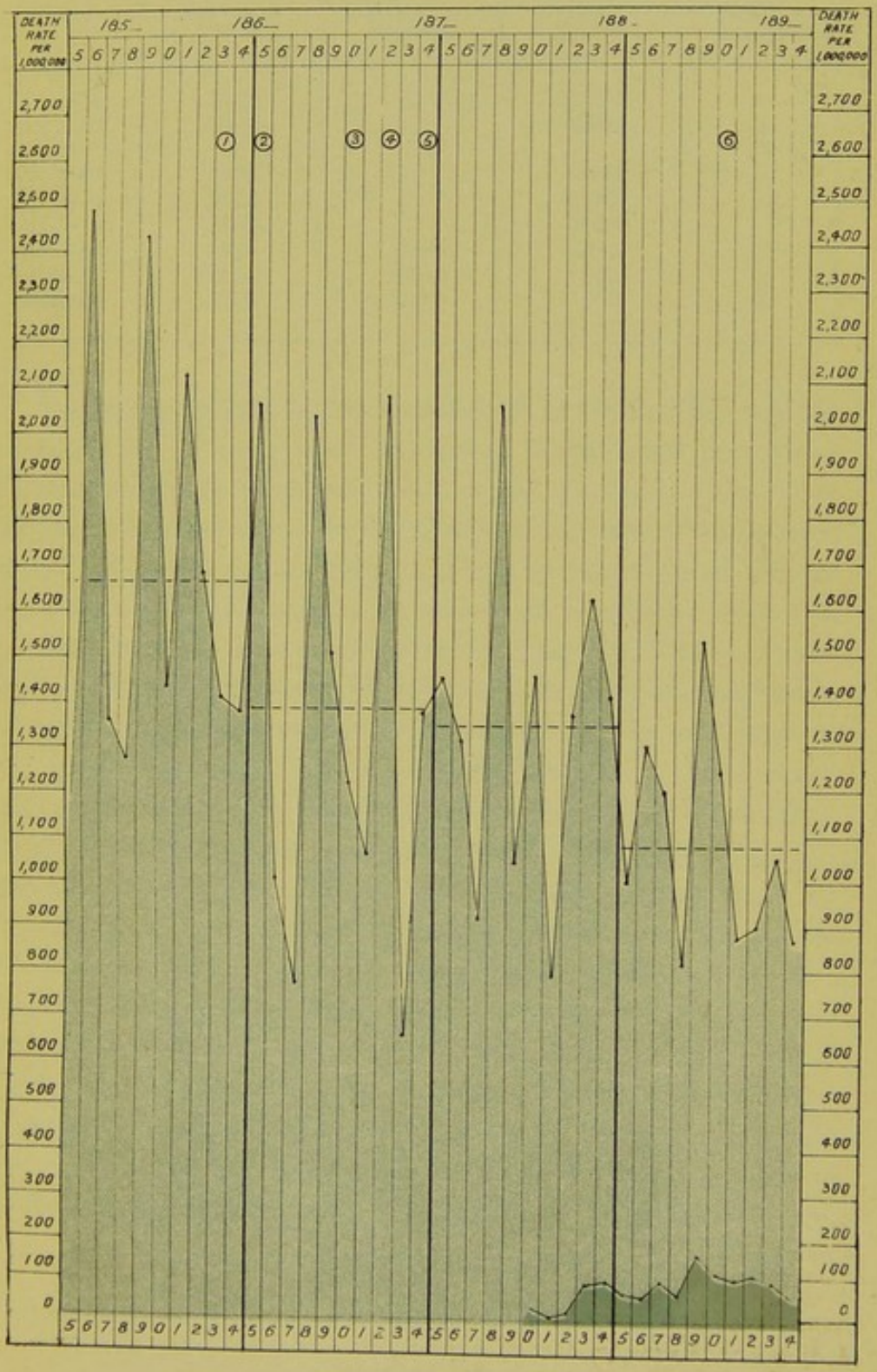
"88. The managers must at once comply with any notice of the sanitary authority of the district in which the school is situated, or any two members thereof acting on the advice of the Medical Officer of Health, requiring them for a specified time, with a view to preventing the spread of disease, or any danger to health likely to arise from the condition of the school, either to close the school or to exclude any scholars from attendance, but after complying they may appeal to the Department if they consider the notice to be unreasonable."

"101. Where the Department are satisfied that by reason of a notice of the Sanitary Authority, under Article 88 or any provision of an Act of Parliament requiring the exclusion of certain children, the average attendance has been seriously diminished and that consequently a loss of annual grant would, but for this Article, be incurred, the Department have power to make a special grant not exceeding the amount of such loss in addition to the ordinary grant."—*English Education Code (1895), Articles 88 & 101.*

DIAGRAM NO. VII.—HISTORICAL REFERENCES.

(1) *First Medical Officer of Health appointed.* (2) *First Municipal Fever Hospital.* (3) *Sanitary Department organized.* (4) *Scotch Education Act.* (5) *Co-operation with School Board.* (6) *Police (Amendment) Act —School Attendance Clauses.*

VII. GLASGOW.—Death-rate per Million from WHOOPING-COUGH for 40 years (1855-94), showing since 1880 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus – – – – – – – –

Whooping-cough.

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	3163	...	1707	...
1860-64	3214	...	1588	...
1865-69	3262	...	1462	...
1870-74	3083	...	1257	...
1875-79	3362	...	1333	...
1880-84	3437	109	1324	3
1885-89	3144	233	1153	8
1890-94	3079	288	979	10

Estimated simply by the number of its victims Whooping-cough is by a long way the most formidable infectious disease known to Glasgow. We might probably generalize and say the most formidable infectious disease of industrial cities. It shoots up into an epidemic at intervals of two to five years. In the height to which its mortality may rise in those years it is considerably excelled by Scarlet Fever alone. In the 40 years of Registration Typhus caused a somewhat higher mortality only once (in 1865), although in the great epidemics of pre-historic times it must have frequently and more decidedly exceeded. But Whooping-cough never subsides to a low level. Its line of mean prevalence is high. Hence even in the palmy days of Typhus in *quinquennial* averages Hooping-cough scores the highest death-rate (Whooping-cough, 1707 in 1855-59; Typhus, 1623 in 1865-69). On the average of 40 years it returns by far the highest death-rate, viz.—1350, no other single disease reaching four figures. Taking the last five years, after sanitation has done its best, Whooping-cough is still left in the position of most fatal disease, with a mortality of 979, but now very closely followed by Measles,

941. The following Table shows most of the figures from which these generalizations are made :—

	Death-rate per million.		Highest Death-rate per Million in 40 years.	
	40 Years 1855-94.	5 Years 1890-94.		
Whooping-cough	1350	979	Scarlet Fever	3358 (1874)
"Fevers"	985	233	Typhus	2749 (1865)
Scarlet Fever	925	347	*Whooping-cough*	2484 (1856)
Diarrhœa	805	498	Diarrhœa	2215 (1857)
Measles	796	941	Measles	1898 (1871)
Diphtheria & Croup	541	401	Diphtheria & Croup	1188 (1863)

It is so far satisfactory that a disease which is so formidable a factor in the mortality of the city, although still retaining its relative position has not resisted all ameliorative influences. This is clear from the quinquennial Table, which opens with a death-rate of 1707 per million and closes with one of 979; being respectively the highest and lowest of the 8 periods in the 40 years. Between the two extremes there is a decided though not quite unbroken gradation. The following Table exhibits these figures in four periods of 10 years and two of 20 :—

	Death-rate per million.	
	10 years.	20 years.
1855-64	1647	1503
1865-74	1359	
1875-84	1328	1197
1885-94	1066	

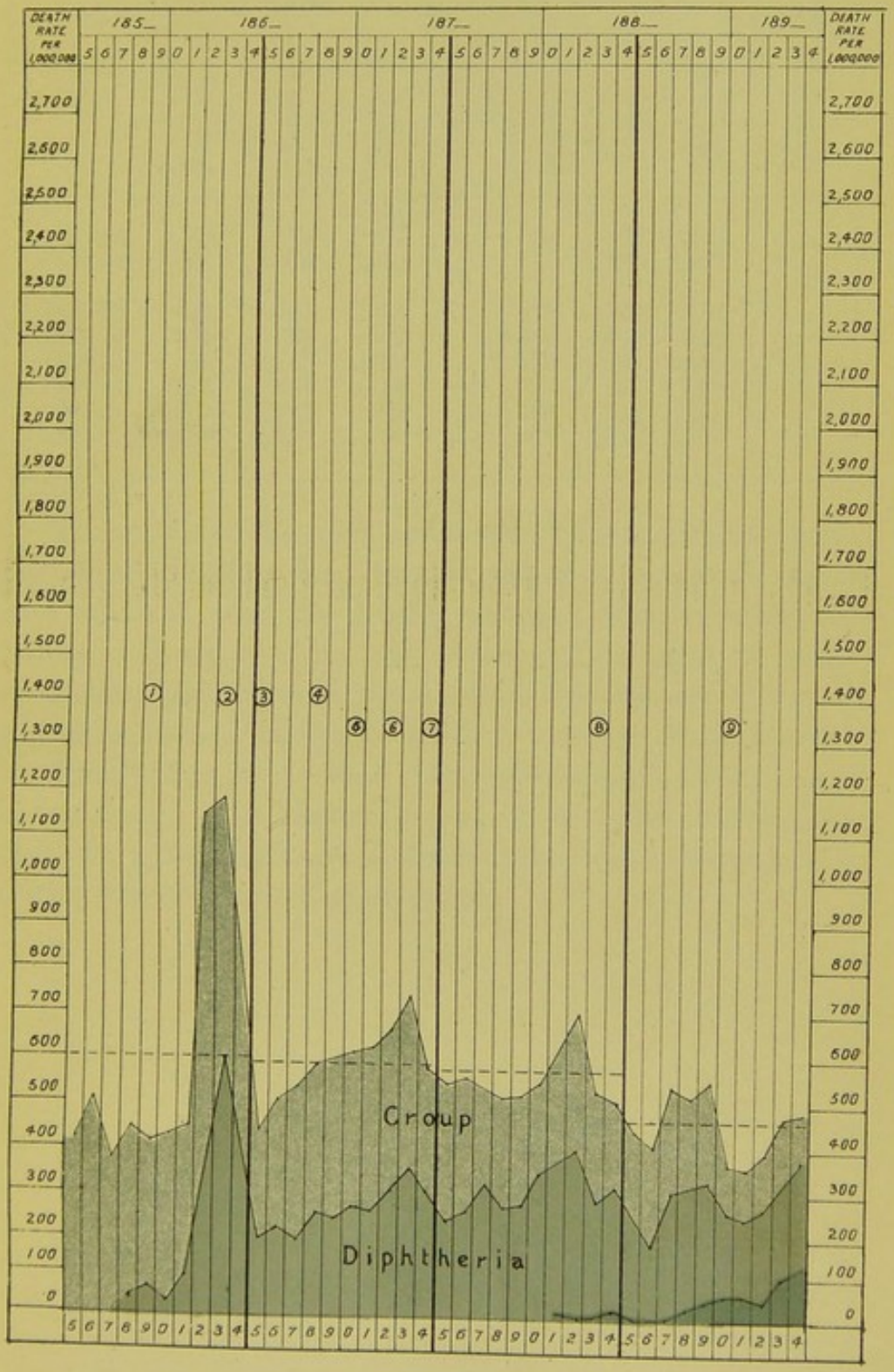
The decrease in the last period of 20 years as compared with the first is 306 per million or 20 per cent. The decrease in Measles it will be remembered was in the same period 19 per cent. As in the case of Measles we cannot credit hospital isolation with much influence. The highest proportion of the total deaths which took place in hospital was 12 per cent. in 1892. The preventive effect of isolating the class of cases admitted to hospital must be considerable in Whooping-cough though doubtful in Measles. They are

all peripatetic cases carried or trotted about by the parents. Still the aggregate result of the isolation must be small. The proportion of cases isolated must be much less than of deaths taking place in isolation. The exclusion from school of children from infected families and the application of general preventive measures to Whooping-cough, apart from any direct effect, must have tended to procure from parents, guardians and others a more respectful position for Whooping-cough than that popularly assigned to it. Perhaps the fact of greatest present-day interest in the 330 pages of Dr. Watt's Treatise on Chincough is recorded in the history of the case of his little boy aged 6. About the middle of December he showed "symptoms of a common cold." By Christmas "it appeared pretty obvious that he had got the Chincough. By the New Year this was certain." The "kinks" were fully formed and generally ended in vomiting. Dr. Watt proceeds:—"We were now disposed to take him from school but from a fear of being left behind by his companions, he was exceeding averse to the measure and therefore *continued to attend regularly* till Friday the 8th January." He was then so much worse that he "consented to leave off going to school until he was better," which, poor boy, he was never destined to be. He died on the following Thursday. This is very characteristic of the sort of paralysis of mental assimilation with reference to infectivity which now seems to us unaccountable but which was until comparatively recent times manifest in many ways. Even in Dr. Watt's mind the belief that Whooping-cough is infectious lay inert like a stone in the earth, barren of practical suggestion.

DIAGRAM NO. VIII.—HISTORICAL REFERENCES.

(1) *Loch Katrine Water turned on.* (2) *First Medical Officer of Health appointed.* (3) *First Municipal Fever Hospital opened.* (4) *Cleansing Department organized.* (5) *Sanitary Department organized.* (6) *Scotch Education Act.* (7) *Co-operation with School Board.* (8) *Systematic Drain-testing and special Summer cleansing begun.* (9) *Notification Act adopted. Police (Amendment) Act—School Attendance Clauses.*

VIII. GLASGOW. — Death-rate per Million from DIPHTHERIA and CROUP for 40 years (1855-94), showing since 1881 the proportion of the total Deaths which took place in Hospital.



Mean Death-rate thus – – – – – – – –

Diphtheria & Croup.

Period.	Deaths.			Diphtheria Deaths in Hospital.	Death-rate per Million.			% of Diphtheria Deaths in Hospital.
	Diphtheria.	Croup.	Diphtheria & Croup.		Diphtheria.	Croup.	Diphtheria & Croup.	
1855-59	45	712	757	...	24	386	410	...
1860-64	558	1012	1570	...	271	498	769	...
1865-69	431	723	1154	...	192	323	515	...
1870-74	674	883	1557	...	275	360	635	...
1875-79	641	747	1388	...	254	296	550	...
1880-84	811	664	1475	21	313	256	569	3
1885-89	707	595	1302	48	259	218	477	7
1890-94	882	397	1279	244	276	125	401	28

The answer to the question, whether Diphtheria is increasing or diminishing in Glasgow, depends somewhat upon how we deal with the deaths returned as attributable to Croup. If we run our eye down the columns of quinquennial death-rates in the above Table we see, speaking generally, that "Diphtheria" tends to increase; that "Croup" is diminishing, and that "Diphtheria and Croup" are diminishing. The matter is one of so much importance that we give the annual death-rates under those heads during the 40 years of registration.

Death-rates per Million.

Year.	Diphtheria.	Croup.	Diphtheria and Croup.	Year.	Diphtheria.	Croup.	Diphtheria and Croup.
1855	...	407	407	1875	218	321	539
1856	...	491	491	1876	243	306	549
1857	8	344	352	1877	303	353	656
1858	48	372	420	1878	247	254	501
1859	63	318	381	1879	260	248	508
1860	31	372	403	1880	316	218	534
1861	86	342	428	1881	344	269	613
1862	342	806	1148	1882	374	317	691
1863	589	599	1188	1883	248	270	518
1864	306	371	677	1884	284	208	492
1865	161	257	418	1885	214	206	420
1866	190	290	480	1886	176	215	391
1867	168	357	525	1887	283	253	536
1868	233	327	560	1888	305	195	500
1869	211	383	594	1889	317	223	540
1870	248	359	607	1890	244	119	363
1871	236	382	618	1891	229	115	344
1872	285	372	657	1892	242	130	372
1873	334	400	734	1893	307	152	459
1874	271	289	560	1894	357	109	466

We have here the whole history of Diphtheria. It was not recognized and was not classified apart until 1857. "Croup" always had a place in the nosology of death. We find it in the Mortality Bills regularly, but "Diphtheria" was then and until 1857 unknown. If we look at the parallel course of the diseases as shown by their respective death-rates we must be struck with remarkable signs of relationship. In 1862-3-4 Diphtheria burst out into an epidemic, and Croup shows a synchronous epidemic development. The figures for these epidemic years with the years preceding and following them are—

Diphtheria, -	86 :	342 :	589 :	306 :	161
Croup, - -	342 :	806 :	599 :	371 :	257

There can be but one inference drawn from this parallel movement, viz.—that the same cause produced two forms of disease so different in their symptoms, as to lead men

to call them by two distinct names, while they were in reality one disease. If we follow the subsequent course of the two diseases we observe the general tendency of the death-rate from Diphtheria is to rise and synchronously of that from Croup to fall. The mean death-rate in 40 years of the former is 233, of the latter 308. We find that in the first 20 years the death-rate from Diphtheria was *below* the mean in 11 years, and from Croup *above* the mean in 17 years; while in the last 20 years the death-rate from Diphtheria was *above* the mean in 16 years, and from Croup *below* the mean in 17 years. There is here a clear suggestion of transference by improved diagnosis and deeper vision into the character of the disease hitherto called Croup. The diagram showing the combined movements of the two diseases year by year conveys this interpretation of the apparent increase of Diphtheria more unmistakably and convincingly than any purely statistical exposition of the case. The further question arises—Is not "Croup," which in the first epidemic outburst of Diphtheria when the criteria by which that disease is distinguished were imperfectly known became so very much more fatal and which as those criteria become known is gradually being displaced by Diphtheria, in the main really Diphtheria? Of course, this involves the further question—Was Diphtheria after all a new disease? With this, however, we have nothing now to do. What we do maintain on the evidence of these facts is that we get a much more accurate gauge of the fatality of Diphtheria from year to year by including Croup than by omitting it. There may be a small residuum in Croup which is *not* Diphtheritic. Time will show. The influence of the Infectious Disease (Notification) Act has been remarkable. It requires notification of Diphtheria and Membranous Croup. The effect upon Croup was immediate. In each one of the five years during which the Act has been in force the death-rate from Croup has been less than in any one of the preceding 35 years, and in the last year it is the lowest on record.

That threatened permanent, endemic rise of Diphtheria which is being observed in London and elsewhere with so much anxiety is not yet apparent in Glasgow. This may be most quickly appreciated by looking at the diagram which shows nothing but the characteristic ebbs and flows of an epidemic disease. During the last four years it has slowly increased, but still the average of the last five years is lower than that of each of the three preceding periods of five years. As this covers the whole of the period of compulsory education it is clear either that in Glasgow the influence attributed elsewhere to schools has not been exercised or has been neutralized by some counteracting agency. The system of co-operation with the School Boards which has already been described may have had some influence. It has practically covered the whole period of compulsory education. The special pains expended in securing the soundness of the house-drains and soil-pipes of Glasgow and the improved system of scavenging and cleansing the precincts of the house as well as the general sanitary work have all helped. The hospital isolation of Diphtheria has a high preventive value, and the serum treatment now gives it also a direct return in life-saving. Notification led at once to a great increase in hospital treatment as indicated by the proportion of deaths. In the five years preceding notification 7 per cent. of the deaths from Diphtheria registered as such took place in hospital; in the five years of notification 28 per cent.; in the last year (1894) 36 per cent. As a fact 19 per cent. of the *cases* notified as Diphtheria and Membranous Croup were removed to Hospital. It is worth adding that we have hitherto not had in our hospitals that post-scarlatinal Diphtheria which is so serious a feature of the hospital treatment of Scarlet Fever in London.

Diarrhœal Diseases (*Diarrhœa, Dysentery, Cholera*). —These have an interest not only in themselves as contributing no inconsiderable share to the general mortality

but because of their relationship to Cholera and Enteric Fever in a common cause—organic, mainly excremental impurity. The degree of chronic prevalence of Diarrhœa, gives a fair measurement of the probability of Cholera becoming epidemic in a locality and indicates the soil whence a chronic crop of Enteric Fever is likely to spring. Given an impure water supply, then you have a steady and severe drain on the population from Diarrhœa, violent explosions of Cholera as often as the specific contagium is cast into their midst and a chronic prevalence, with periodic epidemics, of Enteric Fever. Given a pure water supply, then you have a drain moderated in proportion to the character and efficiency of the local system of excrement collection and disposal, to the scavenging and the infinite variety in family cleanliness in this regard which in cities especially tells heavily for or against the young. Cholera will obtain but a passing foothold, should it happen to alight, and Enteric Fever, unless distributed in the milk supply, will only occur in scattered cases.

No better illustration of these facts could be cited than is afforded by the history of Glasgow. There have been three stages in the quality of the water supply. The wholly polluted stage, when Clyde water was supplied, up to 1858; the partially polluted stage, from 1848 (February) when the Gorbals gravitation water was introduced on the south of the Clyde; the wholly pure stage from 1859, when Loch Katrine water was distributed to the north of the Clyde. In the *wholly polluted stage* "Bowel Complaints" bulk very largely in the rude nosology of the Mortality Bills. On the average of the 7 years 1838-44, they caused an annual death-rate of 3360 per million and constituted 12 per cent. of the total deaths. The *partially polluted stage* reaches within the period of registration, when the highest death-rate recorded from diarrhœal diseases was 2215 per million or 7 per cent. of the total deaths in 1857. In the *wholly pure stage* the highest recorded death-rate was 1114 in 1868 or scarcely 4 per cent. of the total deaths.

The history of Cholera is exactly such as those facts would lead us to anticipate. It is shown in the following Table prepared by the Rivers Pollution Commission.[1]

Mortality from Cholera in Glasgow.

	Polluted Water Period.			Pure Water Period.
	Wholly.	Partially.		
Year of Cholera Epidemic,	1832	1849	1854	1866
Total Mortality in Glasgow,	2842	3772	3886	68
Mortality per 10,000 of population,	140	106	119	1·6

In 1866 there were 19 cases treated in Hospital of which 13 died. The first was a seaman from a Highland smack in the harbour. This case had no known antecedent or consequent. The first native cases arose in the New Vennel and there alone was an epidemic tendency shown. The circumstances so well illustrate the only sources of risk in Glasgow now that the water-supply is pure that a note of a visit made to the spot with Dr. Gairdner may be quoted,—"At 51 New Vennel, from which the first two cases came, we found the body of a son lying on a heap of loose straw from which the old father had just been removed to die in the hospital. Saving the body and the straw, and a little precocious girl keeping an unconcerned watch over her dead brother, there was nothing else in that miserable hovel—far inferior to the burrow of a Bosjesman. The front land was soaking in unmentionable filth from basement to attics; and a kindly remonstrance from Dr. Gairdner to a female whom we chanced to encounter, elicited only angry abuse from her and a friendly advice from a workman hard by, to hold our tongue and take ourselves off as quickly as

[1] 6th Report—Water Supply, p. 153. The words "wholly" and "partially" are not in the original Table, but attention is pointedly directed to the gradation in the text of the Report.

possible."[1] Isolated cases arose in similar spots in all parts of the city. It was not any change in the general sanitation of Glasgow in 1866 which saved it from the fate of 1854. There was no essential difference between the places to which the Cholera led us in 1866 and those to which it led Dr. Sutherland in 1849; excepting that pure water abounded in the Wynds and Vennels. The New Vennel no longer exists. It is doubtful if the abode of one of the Cholera cases of 1866 could now be identified. The condition of the city has been revolutionized both structurally and as to the daily service of cleansing. Watch and ward for the advent of cholera from the continent has been maintained every summer and autumn since 1883, when under the name of "Special Cholera Precautions" extra measures were adopted to render the courts and closes and precincts of the tenement houses *clean* during the diarrhœa season. These have been renewed annually. They consist very largely in the free use of water in washing out the courts, &c., with hose. It is a mistake to limit our estimate of the health value of a generous supply of water to its use as a beverage. The unstinted supply of water for such purposes of public cleansing is of great importance and could not have been enjoyed had it been purveyed by a private enterprise.

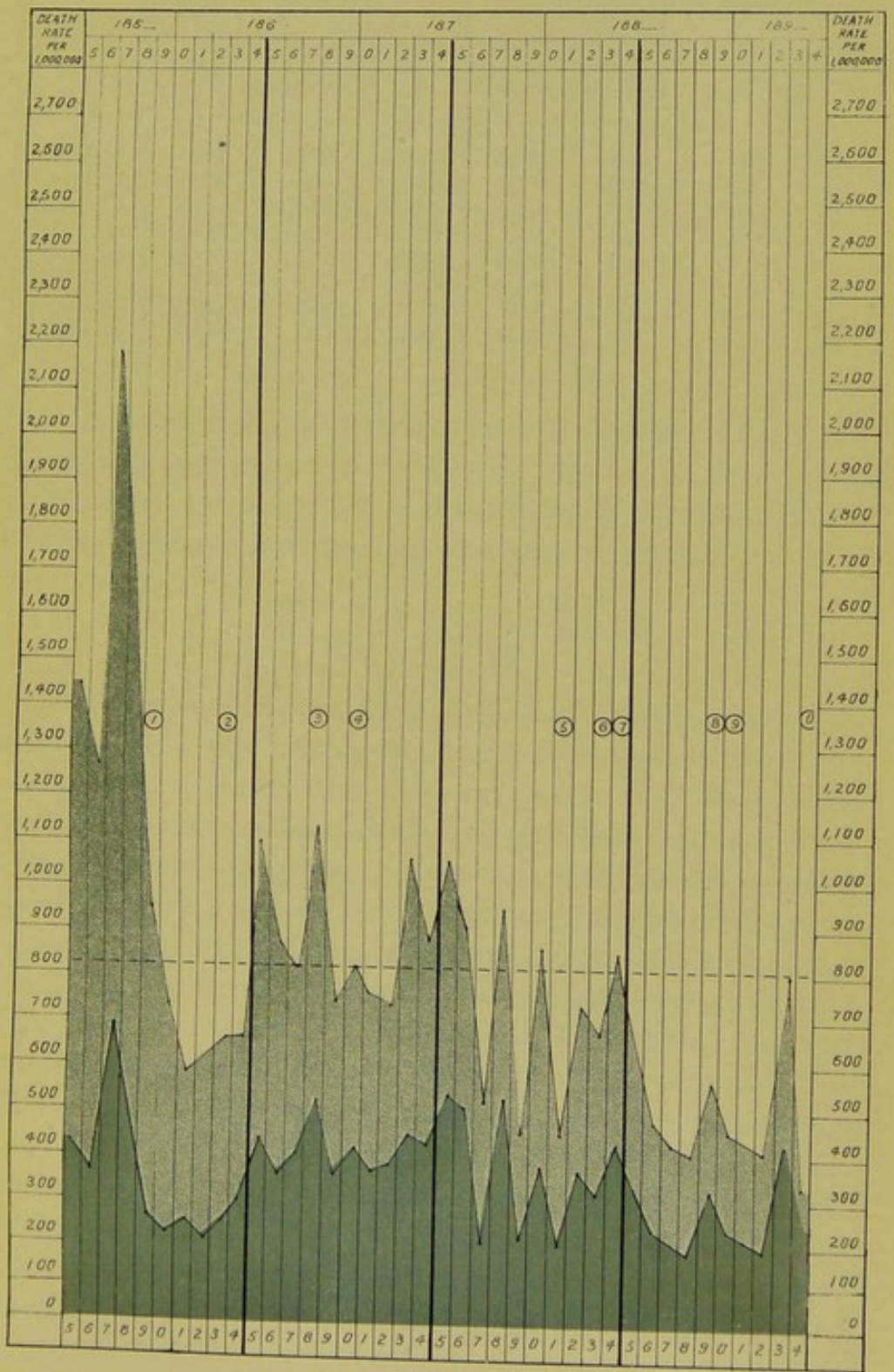
The only cases of Cholera seen since 1866 have been in the persons of two emigrants on their way to America in August, 1892. The current record of the result of progressive efforts to secure cleanliness in Glasgow as to excremental nuisance has been partially exhibited with reference to Enteric Fever. The diagram shows the history

[1] Report on the City of Glasgow Fever Hospital for the year 1866-67.

Diagram No. IX.—Historical References.

(1) *Loch Katrine Water turned on.* (2) *First Medical Officer of Health appointed.* (3) *Cleansing taken over by Municipality.* (4) *Sanitary Department organized.* (5) *First Refuse Despatch Work.* (6) *Annual Cholera Precautions begun.* (7) *Second Refuse Despatch Work.* (8) *Resolution condemning Privy System.* (9) *Third Refuse Despatch Work.* (10) *First Sewage Purification work opened.*

IX. GLASGOW.—Death-rate per Million from DIARRHŒAL DISEASES for 40 years (1855-94), showing percentage under 1 year.



Mean Death-rate thus - - - - - - - -

of diarrhœal diseases, a synopsis of which is contained in the following Quinquennial Table :—

Period.	Deaths.			Death-rate per Million living.			Percentage of Deaths under 5 Years.
	Under 5 Years.	5 Years & Upwards.	All Ages.	Under 5 Years.	5 Years & Upwards.	All Ages.	
1855-59	1614	1105	2719	6255	695	1475	60
1860-64	876	454	1330	3092	260	656	66
1865-69	1435	618	2053	4684	321	922	70
1870-74	1561	531	2092	4638	251	853	75
1875-79	1510	458	1968	4374	210	781	77
1880-84	1389	496	1885	3915	221	727	74
1885-89	1101	339	1440	3155	143	529	76
1890-94	1244	350	1594	3090	127	502	78

The first thing that strikes one is that the Diarrhœal death-rate was higher in the first 4 years of the forty than it has ever been since. The death-rates per million of the 5 individual years of the first quinquennium are—

1855	-	1445		1857	-	2215
1856	-	1263		1858	-	1507
		1859	-	493		

It was in October, 1859, that Loch Katrine was substituted for Clyde water. Although it is obvious from the subsequent course of the death-rate from year to year as well as from the quinquennial averages that there are other factors in the causation of diarrhœa, and that we cannot ascribe to this event all the coincident improvement, yet it permanently lowered the mean line of diarrhœal fatality. The mean death-rate of the 35 years of pure water is 710 as compared with 1475 in the five years of impure. All the subsequent peaks in the curve rise from a lower basis. The factor in the production of diarrhœa which is constant and beyond influence is high temperature (probably the temperature of the earth) but pure water, pure air, pure earth, cripple its noxious influence. Between the death-rate of the first five years and the last there is a decrease of 66 per cent. A remarkable feature of this decrease is the inequality

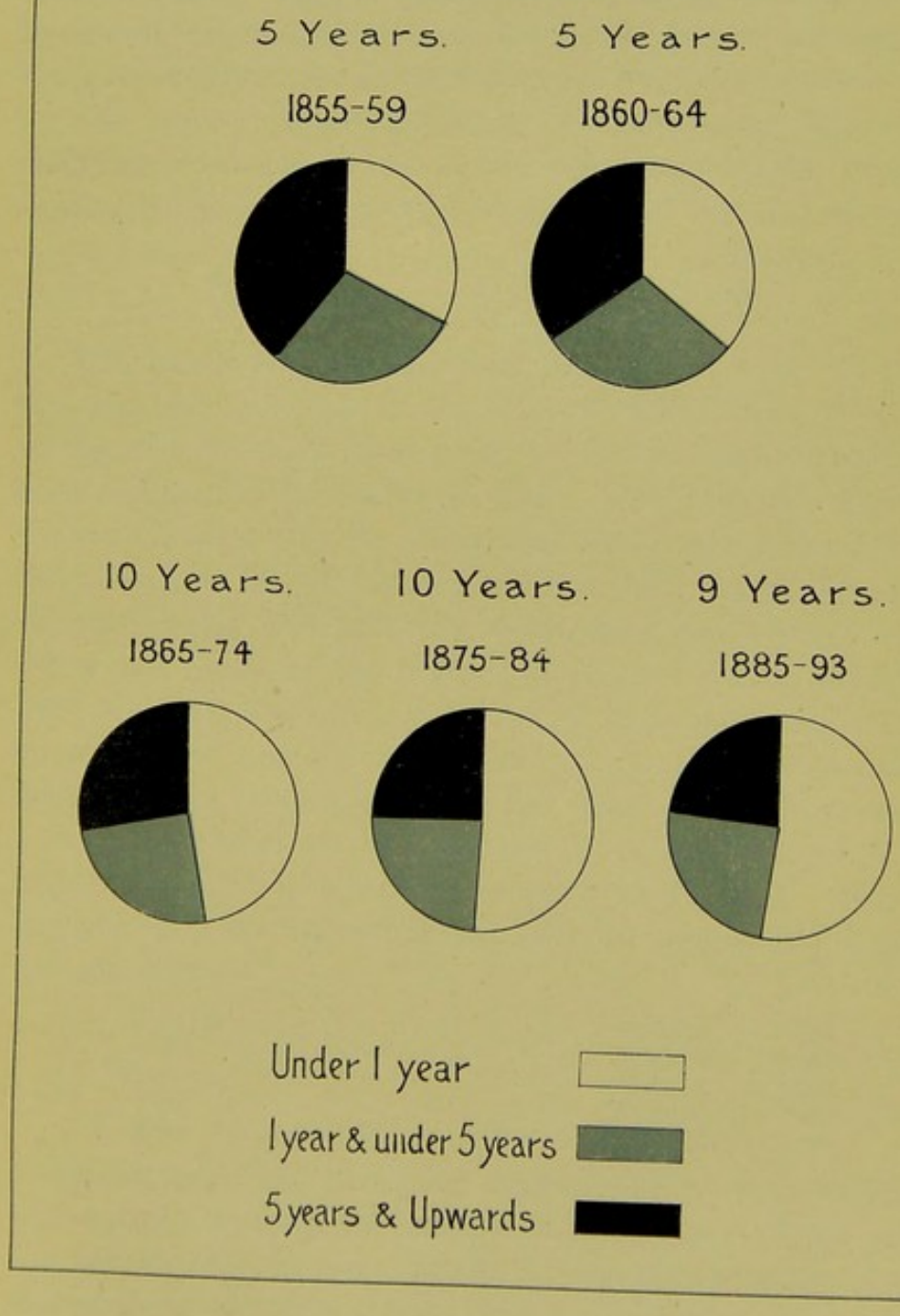
of its age distribution. This appears from the proportion of the deaths under 5 years, which increases from 60 per cent. in the first or impure water period to 78 per cent. in the most recent 5 years. Two conclusions are apparent on the face of the successive figures. The immediate effect of the change to pure water was to lower the general death-rate to less than half, but to raise the proportion of deaths of children under 5 years from 60 per cent. to 66. Therefore diarrhœa in children does not depend so intimately upon the water-supply as diarrhœa in adults. Further, the other measures which have promoted the reduction of the diarrhœa death-rate have failed to benefit children even more conspicuously than the introduction of pure water. This is proved by the fact that the proportion of child-deaths increased in spite of all those measures from 66 to 78 per cent. The actual state of the matter is that the death-rate under 5 years is now (1890-94) exactly what it was 30 years ago (1860-64) while the death-rate at 5 years and upwards is less by more than half. In the following Table this disconcerting fact seems to be brought nearer to an explanation :— [1]

Period.	Deaths.		Death-rate under 1 Year per 10,000 born.	Birth-rate per 1000.	In every 100 Deaths from Diarrhœa.		
	Under 1 Year.	1-4 Years.			Under 1 Year.	1-4 Years.	5 Years & Upwards.
1855-59	833	781	110	41	31	29	40
1860-64	500	376	60	41	38	28	34
1865-69	937	498	102	41	46	24	30
1870-74	1017	544	104	40	49	26	25
1875-79	1038	472	101	41	53	24	23
1880-84	915	474	93	38	49	25	26
1885-89	754	347	77	36	52	24	24
1890-93	738	326	87	35	55	24	21

The effect of the introduction of pure water was to diminish the number of diarrhœal deaths under 1 year 40

[1] It has been necessary to reduce the last period to 4 years as the statistics for 1894 are not yet made up. The detailed Report for 1893 is not published, but the Registrar-General has obliged me with the figures.

X. Glasgow.—Age-Distribution of 100 Diarrhœal Deaths.



per cent.; from 1 to 4 years, 52 per cent.; and from 5 years upwards, 59 per cent. The unequal incidence of the advantages of pure water raised the proportion of infantile deaths from 31 per cent. to 38 per cent. and lowered the proportion of deaths of older children from 29 to 28 per cent., and of all aged 5 and upwards from 40 to 34 per cent. This inequality has not been redressed by general sanitary measures, but in spite of them from year to year an increasing proportion of the fatal diarrhœa has been contributed by the infant population until we have now this very startling contrast between the age composition of 100 deaths at the beginning and at the end of the 40 years.—

Under 1 Year.	1—4	5 & upwards.
31	29	40
55	24	21

This result is made still more remarkable when we note that the birth-rate has in the interval fallen from 41 to 35, so that the increased proportion of deaths has been derived from a diminished number at risk. The absolute state of the case is shown by the diarrhœal death-rate under 1 year calculated per 10,000 births; and it is this. In the 34 years of pure water the infantile death-rate has always been below the mean of the 5 years of impure water, but from 1865 to 1879 there was a period of high mortality which almost wiped out the improvement. In the last 14 years, with a falling birth-rate, there has been a slow diminution in the diarrhœal death-rate, but it is still considerably above the point to which it dropped in 1860-64. This is brought out by throwing the last 30 years into longer periods, thus—

5 years	1855-59	110
do.	1860-64	60
10 years	1865-74	103
do.	1875-84	97
9 do.	1885-93	82

What were the measures which may be held to have told mainly against the causes of diarrhœa? They were the taking into its own hands by the municipality of the cleansing of the city (1868); the organization of nuisance

inspection and removal (1870); the gradual revolution in the efficiency of filth removal, the stages of which are marked by the erection of the Refuse Despatch Works in 1881, 1884, and 1891; the adoption of special summer and autumn cleansing in the tenement districts (1883); and the commencement of the abolition of the privy system (1889). It would seem that such cleanliness as is within public control does not so intimately reach the environment of the child as of the adult. In short, it is domestic cleanliness, which is under parental and especially maternal control which largely determines the purity of the surroundings—the bed-clothes, the house-air, the person—of the child and of the food. No doubt the cleansing of the court benefits the older children because it is their playground, and the substitution of water-closets for privies discourages the retention of filth in the confined house-space and so advantages all children, but the mother is after all the domestic sanitary inspector. The authorities can only give her every facility to be clean. The Female Inspectors added to the staff in 1870 were specially intended to instruct and stimulate mothers in these respects. They encourage them to go to the public washing-houses with their clothing and bedding, and give to the poorer house-wives orders for material and the loan of brushes wherewith to white-wash, &c., their houses. In 1874 a simple tract on the Management of Children was drawn up by the Medical Officer and arrangements made by permission of the Registrar-General, that every person registering a birth should receive a copy from the registrar.

Erysipelas.—In Glasgow we have always been in the habit of occasionally treating cases of Erysipelas in Hospital for humanitarian reasons. The disease is one with which it is within the powers of the Local Authority to deal, and when a destitute person came to the Office the quickest and most satisfactory course to adopt was to send the case to Belvidere. The Infectious Disease (Notification) Act

changed all that. The mention of Erysipelas in the same category as Small-pox, Typhus, &c., and the compulsory notification to the Medical Officer of all alike brought with it the implication of similar responsibilities resting upon the authorities. Medical men began to recommend removal to hospital, and above all the Inspectors of Poor referred paupers suffering from Erysipelas to the Sanitary Department. The result has been that of the 1446 persons treated in the municipal hospitals in 24 years, 926 have been treated in the 5 years of the Notification Act, and only 520 in the prior 19 years, or 185 per annum in place of 27. Erysipelas follows Scarlet Fever, though with a long interval, in the number notified, which was 5756, of which 16 per cent. were removed to hospital. This is a very troublesome result of placing Erysipelas as an infectious disease in the same category as those in the prevention of which the hospital occupies a foremost and essential place. Our experience of Erysipelas as notified is that it is either some slight condition of tumefaction and redness, frequently in the vicinity of the nose, which sits so lightly on the individual that when the inspector calls he is out, or it is a complication of some serious surgical condition, a blush on the surface of an abscess or over a periostitis, or the disease involves the deep cellular tissue and ends in a serious surgical condition. The former class of cases is the subject of jocular remark among the staff who notice that they are most frequent in the notifications of Monday mornings. The latter leads to remonstrances from the hospital where the men find themselves burdened with the care of surgical cases which require free expenditure of time in dressing and which occupy beds for months on end. Ample as the resources of Glasgow are Erysipelas is as regards hospital treatment a great nuisance. We find it impossible in times of epidemic Scarlet Fever to deal with it, and require to get assistance from the general hospitals and to appeal to the parishes to accommodate their paupers. At all times we are without the satisfaction of belief in the preventive

necessity or utility of the work. The following is the record of the mortality from Erysipelas in 4 decennial periods:—

	Deaths.	Death-rate per Million.
1855-64	449	115
1865-74	517	110
1875-84	539	105
1885-94	531	90

There has been a steady diminution in the death-rate from Erysipelas amounting to 22 per cent. in the last decennium as compared with the first. Antiseptic surgery, and the refined conception of cleanliness which has extended therefrom into all forms of surgical procedure and into hospital management, probably have had more to do with the prevention of fatal Erysipelas than anything else.

Puerperal Fever.—Much that has been said as to Erysipelas applies equally to Puerperal Fever. We have always from humanitarian motives admitted casual cases to hospital. Since the adoption of the Notification Act 361 cases have been certified and 51 of these have been removed. The enormous mortality both in hospital and in private (47 per cent. and 65 per cent.) proves that nothing can be said on the score of triviality by way of objection to the notification of such a disease. But what is "Puer-"peral Fever"? We find the following in the Nomenclature of Diseases drawn up by a Joint Committee appointed by The Royal College of Physicians of London:—

"Septicæmia. Puerperal Fever.—The term 'Puerperal "'Fever' should no longer be used. Pyæmia, Septicæmia, "and Erysipelas occurring in puerperal women should be "described as 'Puerperal Pyæmia,' 'Puerperal Septicæmia,' "and 'Puerperal Erysipelas,' respectively. The other con-"ditions included under the term 'Puerperal Fever' should "be returned according to No. 513, p. 117, under Diseases of "Parturition, the word 'Puerperal' being in all cases "prefixed to the word denoting the local process."

It is very unfortunate that in the face of such an expression of opinion, which is founded on a sound pathology, anything should have been made notifiable under the

name of "Puerperal Fever." The fact will doubtless establish and give currency to the name. The requirement raises many conscientious questionings in the minds of practitioners. The results of certifying are serious. An officer calls to enter the case and deal with it as an "infectious disease." This may not have any untoward result where the patient is lying in the far recesses of a large house and only hears what she is told, but in tenements, where the main door opens into the one-room house, or if there is more than one room, still every word spoken to a caller is audible in the lying-in room and probably a mother opens the door, the whisper of "Puerperal Fever" may have a very grave effect. After all, what is the good of notifying "Puerperal Fever," whatever it is, to the authorities? There is not a single preventive step which can be taken in consequence unless in the case of midwives, and experience shows that this is the rarest of occasions for usefulness afforded. Medical men ought to be left to be their own medical officers of health in relation to all puerperal conditions. The following are the statistics of "Puerperal Fever" under the various designations of "Metria," "Puerperal Fever (Metria)," and "Puerperal Fever" under which it has been registered in Scotland for 40 years. The maternal death-rate is calculated on the births. There is an astonishing uniformity of mortality during each of the four decennia. It is especially noteworthy that in the last 10 years, notwithstanding antiseptic midwifery, the mortality has been higher than in any previous period.

	Births.	Maternal Deaths.	Rate per 10,000 Births.
1855-64	159,231	302	19
1865-74	189,599	359	19
1875-84	201,524	389	19
1885-94	205,634	463	23

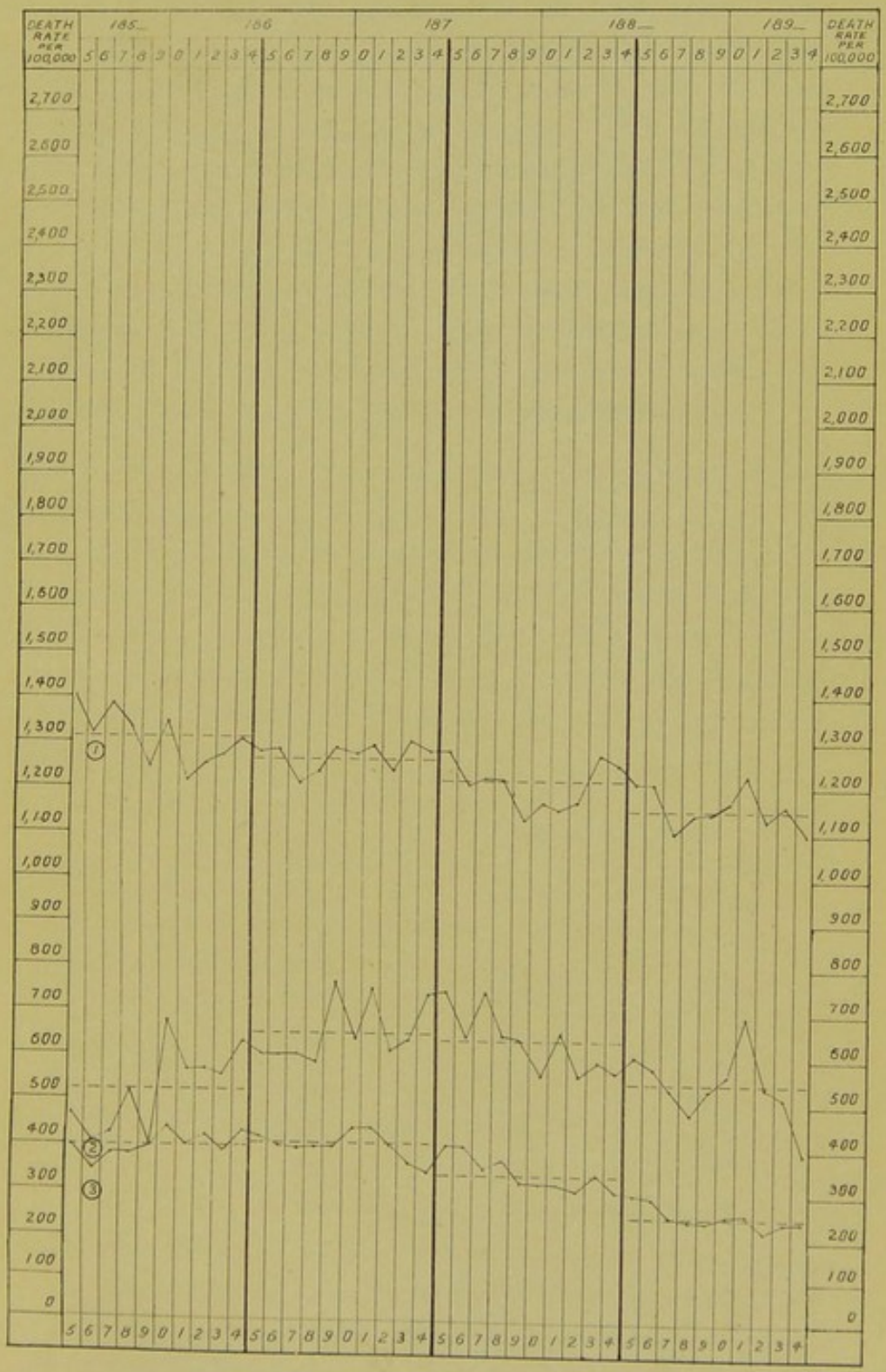
Chicken-pox—Influenza.—These diseases may merely be mentioned. *Chicken-pox* is but rarely sent in to hospital as Small-pox, from the freedom with which practitioners ask consultations with the Medical Officer of

Health as to diagnosis before committing themselves to removal. The majority is admitted as Chicken-pox, the children of tramps or persons in lodgings, brought to the Sanitary Office by their mothers. Tramps and waifs of all kinds drift to this Office in their extremity. Humanity makes one glad when an excuse can be found in their disease to send them to hospital. *Influenza* is another such excuse, and it figures among the miscellaneous infectious diseases which for the good of the individual rather than of the community have been isolated in the municipal hospitals.

Phthisis and Diseases of the Lungs.

Typhus bears the same relation to diseases of the lungs as Cholera and Enteric Fever do to diarrhœal diseases. Typhus points to measures which directly tend to remove the *domestic* conditions which favour the prevalence of pulmonary diseases—the prevention of overcrowding, the improvement of ventilation and of natural lighting inside the dwelling and in the stairs and lobbies by which it is approached; the free circulation of the general air and the distribution of sunlight in the precincts of the dwelling by the regulation of building and the proportioning of free space to height; the promotion of cleanliness in the home, in its accesses and environs. The chief *public* measures antagonistic to diseases of the lungs are—the provision of playgrounds convenient to the tenement houses which are the nurseries of the people, of parks arranged for the recreation of the youth and the adult, and above all the protection of the general atmosphere from unnecessary contamination. All of these with one very important exception Glasgow may be said to have adopted. We imbibe the purest water and inhale the impurest air purveyed to any city in the Kingdom. The position of the authorities as to the common air-supply is very much the same as if they had continued to distribute Clyde water and compelled every proprietor to provide filters and every tenant to keep the domestic stock of reserve water in special vessels.

XI. GLASGOW.—Death-rates per Hundred Thousand from Miscellaneous Unclassified Diseases, Phthisis and Diseases of the Lungs for 40 years (1855-94).



I. Miscellaneous Unclassified Diseases.
II. Acute Diseases of Lungs.
III. Phthisis.

Mean Death-rate thus - - - - - - - -

They have compelled proprietors to adopt every means to admit air in and about the dwelling and tenants to keep the air clean, but they distribute air which is, to begin with, impure. They insist upon wide streets to diminish the breadth of shadow and they allow the sunshine to be cut off from the whole city by a canopy of smoke. With wise forethought they purchase suburban estates covered with stately trees which they desire in the interest of the future to rescue from the axe of the speculative builder. Yet the bushes of the Green and the very contrast between the name and the fact of Kelvingrove predict that the next generation will never sit under the shadow of these trees if nothing is done to check the spreading blight of the city smoke.

PHTHISIS.—It is in harmony with the nature of the diseases that the effect of preventive measures upon the prevalence of Diarrhœal diseases should be prompt, while upon diseases of the lungs, especially upon Phthisis it should be slow—effect loitering considerably behind cause. The annual movement of Phthisis may be traced in the diagram. The following Table shows the death-rate in quinquennial and decennial periods :—

Period.	No. of Deaths.	Death-rate per Million.	
		5 Years.	10 Years.
1855-59	6913	3742	3918
1860-64	8298	4094	
1865-69	8859	3972	3940
1870-74	9566	3908	
1875-79	9186	3644	3396
1880-84	8159	3149	
1885-89	7074	2601	2458
1890-94	7287	2315	

The story of these figures is a short one. During the 20 years 1855-74 the mortality from Phthisis was stationary, during the 20 years 1875-94 it has steadily fallen. Between the five years 1870-74 and the five years 1890-94, there was

a decrease of 41 per cent. in the death-rate. If we start from the maximum period of fatality (1860-64) the decrease amounts to 44 per cent. The acceptance of the doctrine that every case of Phthisis is the result of a specific infection, that consequently no one is foredoomed to have Phthisis or any other form of tuberculous disease, gives great precision to our ideas of prevention. The existence and distribution of the tubercle bacillus is the first condition of infection. Since this was discovered in 1882, the knowledge has not only passed gradually into the minds of medical practitioners and so influenced the management of cases of tubercle in man, and dictated certain public measures to medical officers of health, but it has deeply penetrated the general mind. Hence the diffused effects of this doctrine in the direction of controlling the distribution of the infecting element, although impossible to estimate in amount, have been great and growing during the last ten years. In Glasgow there has been since 1889 greater stringency in excluding tuberculous meat from use as food, and since 1890 something has been done by the inspection of dairy-cows to prevent the use of the still more dangerous tuberculous milk. Greater precision and determination have also been given to administrative efforts everywhere to remove conditions known to be favourable to the distribution of the tubercle bacillus both among men and among animals:—ventilation, especially of houses and byres; the removal of dampness by subsoil-drainage and precautions adapted to the foundations and walls of houses; the abolition of dark spaces and enclosures, the dissemination of direct sunlight. The application of the power to close uninhabitable houses contained in the 1890 Act (Section 32) has been chiefly directed against damp and dark houses. But wherever we have to do with a seed we have an almost unlimited means of controlling the propagation of its kind by dealing with the soil, by making it congenial and friendly or incongenial and hostile. It is eminently true of Phthisis that the number of persons infected is but a fraction of

those who are exposed to infection; and that the higher the standard of public health and especially the sounder the lungs of the population, the fewer will succumb. Indeed theoretically it is possible to conceive of such perfect health, constitutional and local, as to confer entire immunity. Hence we may without much hesitation ascribe the greater part of the gratifying diminution in the fatality of Phthisis in Glasgow to the gradual improvement in the vital resistance of the population; and a very large share in this improvement must be credited to the limitation of infectious disease. For every youth who dies of Enteric Fever and every child who dies of Scarlet Fever a score are so debilitated as to furnish a friendly host for the bacillus of tubercle. Measles and Whooping-cough not only shatter the general health but irritate the lungs and induce the bacillus to settle there by whatever channel it has gained access to the system. One of the most powerful predisposing causes of Phthisis and one which we have not yet done much to diminish is the universal catarrh of the lungs which is provoked by our damp smoke-laden atmosphere. Lungs in such a condition are like the field ploughed and pulverized for the seed scattered by the hand of the husbandman.

Other Diseases of the Lungs.—This includes everything classified by the Registrar-General under "Diseases of the Respiratory System" except Croup. The diagram shows their movement from year to year and this Table the death-rate in quinquennial and decennial periods.

Period.	No. of Deaths.	Death-rate per Million.	
		5 years.	10 years.
1855-59	8,042	4,355	5,170
1860-64	12,127	5,984	
1865-69	14,137	6,323	6,522
1870-74	16,483	6,721	
1875-79	17,085	6,777	6,322
1880-84	15,196	5,866	
1885-89	14,585	5,360	5,329
1890-94	16,543	5,298	

The fatality of Diseases of the Lungs increased steadily during the 25 years 1855-79 and fell very slowly in the last 15 years, 1880-94, but still remains considerably above the rate of 35 years ago. If we take periods of 5 years, the death-rate is 18 per cent. higher in the last than in the first. If we take 10 years it is 3 per cent. higher in the last than in the first. On the mean of 40 years pulmonary diseases caused a death-rate of 5·8 per 1000 and contributed 22 per cent. of the total deaths. But they exhibit from year to year all the variations of an epidemic disease as is well shown in the diagram. Thus in 1859 the death-rate was 3·9 per 1000 or 14 per cent. of the total; in the following year it was 6·8 per 1000 or 21 per cent. of the total. The following are years of phenomenal mortality.

Year.	Death-rate per 1000.	Percentage of total.
1860	6·8	21
1869	7·7	23
1871	7·6	23
1875	7·4	24
1877	7·5	27
1891	6·8	27

If we consider the incidence of the fatality from diseases of the lungs within these years we find that it is seasonal, usually in winter, occasionally in spring, and associated with prolonged frost as in 1860, 1875, and 1877 or with a cold spring with east winds encroaching on the summer as in 1869. Frost in Glasgow is always accompanied with more or less fog which is no doubt the most deadly ingredient of our winters. There seems to be no limit to the possible mortality so long as the cold and fog continue. The most remarkable winter on record for the duration of these conditions was that of 1874-5 when in the seventh week of their continuance the death-rate rose to 67 per 1,000, *half of which was contributed by diseases of the lungs.* The fog in this case was more remarkable

for density than the frost for intensity. The high pulmonary mortality of 1891 is associated with Influenza. Indeed the taint of this mysterious disease pervades the whole of the last quinquennium—a fact which affords the only crumb of comfort in our review of the movements of this section of Glasgow mortality. If we have lost nothing even under this heavy handicap may we not hope to gain very decidedly when running without weight? The following is a quarterly note of the deaths attributed to Influenza during each of the last 5 years. The gravity of the figures lies not in their amount but in the fact that they are a mere index of the associated addition to the mortality from pulmonary and also from miscellaneous diseases.

	1890	1891	1892	1893	1894
1st Quarter	15	16	77	12	35
2nd do.	6	28	17	9	12
3rd do.	4	13	4	4	4
4th do.	2	115	9	59	12
Total	27	172	107	84	63

The proverbial "bolt from the blue" is unknown in sanitary matters. The epidemic springs from the ever-present ever-active violation of the laws of health. We are a catarrhal, coughing, expectorating people, because we live in a huge industrial city, situated at the seaward end of the trough of a valley, which from one end to the other is covered with smoke, drifting in wreaths and clouds with the wind or in calm filling up the trough so that nothing is to be seen between the higher ground on either side but a sea of smoke. Living thus we live constantly on the edge of a catastrophe. Whenever the scavenging of the air is interrupted by calms so that the smoke product accumulates the atmosphere of our streets thickens and the daylight becomes twilight. If a slight wind shifts so as to fold over and double the coverlid of smoke, then at mid-day we have midnight. Smoke not only loads fog with impurity but tends to produce fog as Mr. Aitken has shown. When therefore in the winter we happen upon a low temperature,

a high barometer, and a dead calm we have an Arctic night with a mephitic, irrespirable atmosphere, in which we move about choking, our eyes irritated, our faces grimy—"a purblind race of miserable men." It is then that our pulmonary mortality is run up and the death-rate of the year determined. Now-a-days the undulations of mortality depend more upon our artificial local climate than upon the rise and fall of zymotic epidemics. In the middle of the catastrophe we are helpless; as helpless as people who persist in living on the skirts of Vesuvius are when the eruption begins. If we had no winters, no fogs, no interruption of aerial scavenging, then we might continue our profligate production of smoke and suffer no great inconvenience or injury; but we must anticipate anticyclonic conditions and we ought as reasonable beings to live at all times so that it may be possible to survive them. Glasgow Fair gives us an annual objection-lesson. If it fell on a time of winter-fog we should find our streets full of a thin mist no more irrespirable than the mist on the mountain side. It may be too much to hope for such entire freedom from smoke, but in that direction lies the future reduction of our death-rate. We are approaching a point when advance will be impossible in any other direction. If we must have smoke it is well there should be no misunderstanding as to what it will cost us. How is smoke prevention to be gone about? Firstly by making up our minds that it is possible; secondly by making up our minds that it shall be done, and thirdly by resolute pegging away at the doing. Smoke is a nuisance and nuisances are all alike in this—they can only be suppressed in detail by never-ceasing vigilance and effort. As to domestic smoke, the encouragement of the use of gas in place of coal will probably go as far to mitigate it as any single measure which can be mentioned. There are a host of miscellaneous comparatively paltry sources of low-level smoke which ought to be summarily suppressed. It is quite a mistake to tolerate any smoke-production at a low-level in a city,

however trifling. Smoke-suppression is a matter of detail. As to industrial smoke, still smoke-suppression is a matter of detail. Each case ought to be dealt with on its own merits, but smoke there must not be.

There is so much analogy between smoke and the condition of the Clyde as questions of health that the one suggests the other in the consideration of atmospheric impurity as a cause of disease. The practical importance of smoke in deteriorating the physical conditions of health is limited to certain times and seasons, so also is that of the Clyde. When the temperature is low, when rain is falling and the volume of water is constantly high and floods are frequent, when there is wind, especially easterly, then the discharge of crude sewage into the Clyde though slovenly can scarcely be called culpable from our present standpoint. But when we fall upon seasons of prolonged drought, high temperature and calm or gentle airs, especially westerly, which are as usual concomitants of summer and autumn as the conditions of fog are of winter, then the Clyde becomes a serious ingredient in the complex influences which depreciate the health of Glasgow. In such circumstances the peculiar odour of the river is perceptible even in the Bridgegate, while in the normally purer air of the regions West of the Kelvin it is obtrusive even in Great Western Road and Dowanhill and befouls the air of Partick and Whiteinch. The question in what direction to look for the effects of the Clyde cannot be precisely answered. The fact that septic poisoning is now recognized as a cause of certain grave inflammations of the lungs warns us against dogmatism as to the category of disease to which air laden with the products of decomposition is likely to contribute. Popular bias would point to diarrhœal diseases as more likely. In either case it is perfectly impossible to isolate statistically or otherwise the part played by an ingredient distributed in the universal air in the production of diseases which have so many possible causes as either pulmonary or diarrhœal disease. There is no doubt that in the pollution

of the Clyde we have a condition which in certain combinations of circumstances which may arise within the six months from May to October of any year may manifest a quite unmistakable potency for mischief. If we cannot be guided by general principles in dealing with the Clyde then general principles are of no use whatever in sanitary practice.

Miscellaneous Unclassified Diseases.—This contains the large remainder of disease which does not fall within the category of Zymotics or Diseases of the Lungs and Phthisis. For the most part it is open to the influence of sanitary operations only through the measures directed against the specified diseases, partly because these measures cover the whole area of the physical conditions of health, but partly also because into this miscellany of disease fall what may be called the pathological debris of infectious and pulmonary disease. The basement of the general diagram shows this residual portion of the death-rate from year to year. In the following Table it is given for periods of 5 years and 10 years :—

Period.	Deaths.	Death-rate per Million.	
		5 years.	10 years.
1855-59	24,777	13,425	13,121
1860-64	25,989	12,817	
1865-69	28,106	12,597	12,692
1870-74	31,346	12,787	
1875-79	30,684	12,170	12,113
1888-84	31,253	12,055	
1885-89	31,551	11,588	11,566
1890-94	36,409	11,544	

There has been an extremely gradual movement downwards in the fatality of miscellaneous diseases throughout the 40 years, so gradual that the difference between the first 5 years and the last is only 14 per cent. and between the

first 10 years and the last only 12 per cent. The highest death-rate is that of the first year of the 40, viz.—14·1 per 1000; the lowest is that of the last year of the 40, viz.—11 per 1000, a range of variation which is much less than that of any of the special classes of disease previously discussed. Relatively to these classes of disease, the miscellaneous diseases contribute an increasing proportion of the total deaths—50 per cent. in the last decade in place of 43 per cent in the first. Two deductions lie on the surface of these facts. (1) That in the miscellaneous diseases we find the great substantial mass of our mortality and (2) that while absolutely this mass is contracting, relatively to the total mortality it is increasing. This is the necessary result of the interaction of two factors, one of which tends to take from, the other to add to, the deaths from miscellaneous causes. Towards these gravitate many of the lives maimed by Zymotic disease and in larger numbers those in whom pulmonary disease becomes chronic, so that any mitigation in the prevalence of these diseases necessarily diminishes the number of deaths attributed to diseases which are ultimately classified as "Miscellaneous." On the other hand, as death is the inevitable end of all, any relief of the infant, the youth and the adult from the ravages of diseases which lay violent hands upon the mechanism of life must add to the number of those who pass into old age and finally drop from the effects of ordinary wear and tear upon that mechanism. In these circumstances it is satisfactory to record even an absolute diminution in the death-rate from miscellaneous diseases. We must look within this category for a considerable proportion of the fatal results of our prevalent pulmonary disease, so that the sum of the effects of the causes which we have so pointedly referred to in discussing diseases of the lungs will be greatly under-estimated if we take account only of deaths directly ascribed to those diseases. Very little pathology is necessary to make this clear. In the cycle of organs through which the blood circulates, and which must co-operate otherwise a

strain will come upon one or other, there is none more important than the lungs. The heart feels resistance there at once and the effort to overcome the resistance leads to disease in that organ. Then may follow disease in any member of the cycle of coadjutors, or in any organ of the body. Out of our pulmonary catarrh spring diseases of the heart, liver, kidneys, brain, &c., all of which go to swell the mortality from miscellaneous diseases. Not only so, but while extreme cold is the natural enemy of the enfeebled whether from age or disease, and inevitably in the winter they die in increased numbers, to all such and to many more who have weakened hearts, diseased blood-vessels and other organic flaws and who with fair-play would see more years, the city fog is like sand thrown into a piece of machinery, it increases the friction and the wheels of life stop. The truth of all this is written large upon the sympathetic movements of the death-rate from Diseases of the Lungs and from Miscellaneous Diseases. I have pointed out the exacerbations in the pulmonary mortality in 1860-69-71-75-77 and 1891, and it will be found that in every one of these years there is a coincident rise in the mortality from miscellaneous diseases. All those facts go to make broader the grounds of my statement that it is mainly from diseases of the lungs that future reductions of the death-rate of Glasgow must be sought.

APPENDIX.

TABLE I., SHOWING HOSPITAL BED ACCOMMODATION FOR INFECTIOUS DISEASES IN GLASGOW SINCE 1865.

Year.	Parish.			Glasgow Royal Infirmary.	Local Authority.			Total Beds.	Population in Thousands.	Beds per Thousand.
	City.	Barony.	Govan.		Parliamentary Road.	Belvidere Fever.	Belvidere Smallpox.			
1865	100	120	54	200	136	...	...	610	428	1·4
1866	100	120	54	175	136	...	...	585	438	1·3
1867	...	120	54	100	136	...	...	410	446	0·9
1869	...	120	54	135	136	...	..	445	464	1·0
1870	...	120	54	100	250	250	...	774	471	1·7
1872	...	120	...	100	250	250	...	720	495	1·4
1875	...	...	...	100	250	250	...	600	500	1·2
1876	...	...	...	...	250	250	...	500	502	1·0
1878	...	...	...	...	120	250	150	520	507	1·0
1880	...	...	...	...	120	250	150	520	510	1·0
1881	...	...	...	...	120	370	150	640	512	1·2
1882	..	...	...	...	120	220	150	490	518	1·0
1887	...	...	...	...	120	390	150	660	545	1·2
1893	...	...	...	...	200	390	150	740	644	1·1

TABLE II.—CASES TREATED IN CITY OF GLASGOW FEVER HOSPITAL, OF THE HOSPITAL, 26TH APRIL,

YEAR ENDING 30TH APRIL.	TYPHUS.		ENTERIC FEVER.		RELAPSING FEVER.		SMALL-POX.		SCARLET FEVER.		MEASLES.		WHOOPING-COUGH.	
	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
1865-66	1,154	128	64	8	...	...	7	...	5	...	...	...	...	...
1866-67	384	48	17	4	...	...	34	33	21	4	1	...	...	...
,,	Treated in Parliamentary Road while reserved for Cholera only.													
,,	Treated in Greendyke Street Hospital.													
1867-68	795	72	55	9	...	...	14	1	35	8	3	...	...	...
1868-69	1,023	142	91	9	...	...	2	...	34	7	4	1	...	...
1869-70	2,023	278	77	5	119	1	1	...	12	2	2	...	...	...
1870-71	495	56	38	2	1,863	31	369	46	...	...	7	...	...	...
1871-72	7	...	2	...	42	1	614	105	31	6	22	1	...	...
1872-73	...	...	1	...	...	...	578	97	...	...	10	...	...	...
1873-74	..	...	...	...	...	...	1,475	262	7	...	16	...	...	...
1874-75	...	...	...	...	...	...	191	25	442	65	48	2	...	..
1875-76	...	...	...	...	...	...	16	2	419	49	130	2	...	...
1876-77	...	...	...	..	...	...	40	7	65	5	29	1	...	...
1877-78	...	...	...	...	...	...	80	9	...	...	2	...	...	...
Year ending 31st May														
1890-91	...	...	...	...	...	...	...	...	...	...	91	13	33	9
1891-92	...	...	...	...	...	...	...	...	...	...	60	3	...	...
1892-93	...	...	...	...	...	...	...	...	902	49	31	2	6	...
1893-94	...	...	2	...	...	...	...	...	1,827	117	...	...	...	...
Total, -	5,881	724	347	37	1,924	33	3,421	557	3,800	312	456	25	39	9
Mortality per cent.,	12·3		10·7		1·7		16·3		8·2		5·5		23·1	

KENNEDY STREET, OFF PARLIAMENTARY ROAD, FROM THE OPENING 1865, TILL 31ST MAY, 1894.

FEBRICULA.		ERYSIPELAS.		CHOLERA.		DIARRHŒA.		CHICKEN-POX.		OTHER DISEASES.		TOTAL.	
T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
24	...	...	...	...	...	...	...	...	...	64	6	1,318	142
13	...	..	...	..	...	...	...	...	...	37	6	507	65
. .	. .	.	.	12	9	18	4	...	...	10	...	40	13
. .	. .	.	.	7	4	6	...	...	...	...	...	13	4
22	1	...	...	..	...	...	...	...	...	45	9	969	100
24	...	...	...	...	..	...	...	..	...	62	12	1,240	171
19	...	...	...	...	...	...	...	...	...	77	15	2,230	301
17	...	...	...	...	...	...	...	...	...	87	39	2,876	174
...	...	...	...	...	...	...	...	...	...	24	2	742	115
1	...	1	...	...	...	...	...	...	...	24	...	615	97
...	...	...	...	...	...	...	...	1	...	70	...	1,569	262
...	...	...	...	...	...	...	...	4	...	63	2	748	94
...	...	...	...	...	...	...	...	2	...	67	...	634	53
...	...	...	...	...	...	...	...	2	...	19	...	155	13
...	...	...	...	...	...	...	...	9	...	8	1	99	10
...	...	...	...	...	...	...	...	...	...	15	...	139	22
...	...	...	...	...	...	...	...	..	...	*49	...	109	3
...	...	...	...	...	...	...	...	...	...	9	...	948	51
...	...	...	...	...	...	...	...	...	...	16	...	1,845	117
120	1	1	...	19	13	24	4	18	...	746	92	16,796	1,807
0·8		...		68·4		16·7		...		12·3		10·8	

*Including 43 Cases of Influenza.

TABLE III.—CASES TREATED IN CITY OF GLASGOW FEVER HOSPITAL, 1870, TILL

YEAR ENDING 30TH APRIL.	TYPHUS.		RELAPSING FEVER.		ENTERIC FEVER.		SCARLET FEVER.		MEASLES.		WHOOPING-COUGH.	
	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
1870-71	207	26	1,199	32	3	1	1	...	...	...	...	...
1871-72	504	55	1,702	36	83	13	12	1	6	...	...	...
1872-73	297	33	76	1	181	20	53	6	15	...	...	...
1873-74	228	33	...	...	275	26	313	36	45	1	...	...
1874-75	457	51	...	...	342	24	721	125	39	...	...	...
1875-76	530	58	...	...	527	66	22	...	3	...	...	...
1876-77	350	50	...	...	299	36	146	16	52	4	...	...
1877-78	275	37	...	...	287	44	127	21	105	10	10	2
1878-79	238	44	...	...	375	51	353	40	250	8	66	11
1879-80	239	34	...	...	407	55	536	64	115	3	98	11
1880-81	251	41	...	...	802	102	880	100	244	21	53	5
1881-82	227	33	...	...	391	57	634	54	279	14	54	5
1882-83	211	25	...	.	425	62	665	92	334	31	134	18
1883-84	345	31	...	...	338	46	1,069	123	344	24	183	28
Year ending 31st May.												
*1884-85	111	14	...	...	541	76	1,163	156	721	65	237	59
1885-86	145	14	...	...	240	36	812	83	93	6	164	26
1886-87	87	17	...	...	204	32	1,266	156	504	42	177	39
1887-88	188	20	...	...	276	45	1,265	99	338	19	166	36
1888-89	81	12	...	...	293	41	1,113	82	893	88	327	71
1889-90	76	14	...	...	389	70	903	59	815	88	286	56
1890-91	112	12	...	...	388	59	1,868	111	514	53	292	59
1891-92	121	25	...	...	487	100	1,907	114	684	84	259	57
1892-93	37	6	...	...	293	52	2,550	172	1,098	97	263	61
1893-94	57	8	...	...	653	117	799	58	394	34	400	64
Total, -	5,374	693	2,977	69	8,499	1,231	19,178	1,768	7,885	692	3,169	608
Mortality per cent.,	12·9		2·3		14·5		8·1		8·8		19·2	

* 13 Months—1st May, 1884, to 31st May, 1885.

Belvidere, from the Opening of the Hospital on 25th December, 31st May, 1894.

Febricula.		Diphtheria.		Erysipelas.		Cholera.		Other Infectious Diseases.		Other Diseases.		TOTAL.	
T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
6	...	3	2	...	...	...	...	...	...	30	10	1,449	71
54	...	...	...	1	...	...	.	...	...	188	42	2,550	147
45	...	...	...	...	...	...	...	...	...	65	21	732	81
40	...	...	...	3	..	...	...	...	...	103	24	1,007	120
25	...	...	...	2	...	...	...	...	...	224	40	1,810	240
31	...	...	...	2	...	..	...	...	...	88	18	1,203	142
53	1	2	...	5	...	...	...	...	...	123	11	1,030	118
30	...	2	2	3	1	...	...	...	...	125	23	964	140
35	...	3	2	6	2	...	...	...	...	184	23	1,510	181
37	...	2	...	10	1	...	...	...	...	152	20	1,596	188
58	...	7	...	15	2	...	...	...	...	267	23	2,577	294
64	3	11	7	18	...	...	...	...	...	254	34	1,932	207
41	1	7	4	49	4	...	...	...	...	342	45	2,208	282
58	3	7	3	58	5	...	...	...	...	406	55	2,208	318
63	...	11	6	85	5	...	...	...	...	535	66	3,467	447
27	...	8	5	94	7	...	...	...	...	295	39	1,878	216
20	...	4	3	68	3	...	..	31	1	419	23	2,780	316
22	...	12	5	104	5	...	...	52	3	316	27	2,739	259
7	...	38	17	79	13	...	...	15	2	318	21	3,164	347
4	...	51	24	141	15	...	...	22	...	351	33	3,038	359
22	...	105	42	202	17	...	...	20	5	325	30	3,848	388
19	...	70	29	302	23	...	...	49	4	469	35	4,367	471
6	...	93	36	53	3	2	...	36	6	317	24	4,748	457
2	...	181	74	146	14	...	...	40	11	243	26	2,915	406
769	8	617	261	1,446	120	2	...	265	32	6,139	713	56,328	6,195
1·0		42·3		8·3		...		12·1		11·6		11·0	

TABLE IV.—CASES TREATED IN CITY OF GLASGOW SMALL-POX HOSPITAL, BELVIDERE, FROM THE OPENING OF THE HOSPITAL, 6TH DECEMBER, 1877, TILL 31ST MAY, 1894.

Year ending 30th April.	Small-pox.		Scarlet Fever.		Measles.		Whooping-cough.		Febricula.		Chicken-pox.		Other Diseases.		Total.	
	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
1878-79	13	...	...	...	...	...	...	...	...	...	3	...	4	...	20	...
1879-80	1	...	...	...	...	...	...	...	...	...	9	...	1	...	11	...
1880-81	11	3	...	...	...	...	...	...	...	...	11	...	6	...	28	3
1881-82	6	...	...	...	...	...	...	...	...	...	8	...	4	...	18	...
1882-83	12	1	1	...	...	...	...	...	...	...	6	...	2	1	21	2
1883-84	139	14	...	...	...	...	...	...	...	...	20	...	10	...	169	14
Year ending 31st May.																
1884-85	66	3	1	...	...	...	...	...	...	...	19	...	9	...	95	3
1885-86	56	7	...	...	...	...	...	...	...	...	12	...	4	...	72	7
1886-87	...	...	...	...	...	...	...	...	...	...	10	...	...	...	10	...
1887-88	2	...	...	...	...	...	...	...	...	...	16	..	3	...	21	...
1888-89	2	...	...	...	1	...	...	...	...	...	15	..	8	1	26	1
1889-90	4	...	...	...	1	...	...	...	...	...	28	...	5	...	38	...
1890-91	1	...	...	...	4	...	1	1	...	...	19	...	6	1	31	2
1891-92	10	...	1	...	4	...	1	...	...	...	31	1	6	...	53	1
1892-93	434	30	1	...	1	...	...	...	2	...	18	...	20	1	476	31
1893-94	54	5	...	...	4	...	...	...	...	...	23	1	9	1	90	7
Total, -	811	63	4	...	15	...	2	1	2	...	248	2	97	5	1179	71
Mortality per cent.,	7·8		..		...		...		...		0·8		5·2		6·0	

TABLE V.—GLASGOW—POPULATION; BIRTHS AND DEATHS; BIRTH-RATES AND DEATH-RATES PER 1000, ALSO DEATHS UNDER 1 YEAR AND DEATH-RATES UNDER 1 YEAR PER 1000 BORN, FOR 40 YEARS (1855-94).

Year.	Population.	Births.	Deaths.	Birth-rate per 1000.	Death-rate per 1000.	Deaths under 1 Year.	
						Number.	Rate per 1000 born.
1855	356,355	13,242	10,655	37·2	29·9	2,600	196
1856	362,606	15,170	10,298	41·8	28·4	2,713	179
1857	369,318	15,706	11,375	42·5	30·8	2,851	182
1858	376,131	15,889	11,472	42·2	30·5	2,846	179
1859	382,756	15,947	10,832	41·6	28·3	2,448	154
1860	389,843	15,943	12,436	40·8	31·9	2,905	182
1861	397,673	16,537	10,936	41·6	27·5	2,544	154
1862	405,789	16,400	11,565	40·4	28·5	2,562	156
1863	413,944	16,986	13,329	41·0	32·2	2,774	163
1864	420,738	17,411	13,674	41·4	32·5	3,051	175
1865	428,123	17,956	13,914	41·9	32·5	3,097	173
1866	437,850	18,288	12,829	41·8	29·3	2,905	159
1867	446,028	18,347	12,578	41·1	28·2	2,895	158
1868	455,000	18,607	13,832	40·9	30·4	3,127	168
1869	464,332	18,495	15,648	39·8	33·7	3,411	184
1870	471,453	19,355	13,955	41·1	29·6	2,991	155
1871	491,900	18,867	15,790	38·4	32·1	3,608	191
1872	494,824	20,158	14,053	40·7	28·4	3,198	159
1873	494,847	19,487	14,499	39·4	29·3	3,255	167
1874	498,270	20,039	15,845	40·2	31·8	3,240	162
1875	499,480	20,825	15,384	41·7	30·8	3,388	163
1876	502,299	20,981	13,763	41·7	27·4	3,166	151
1877	504,487	21,124	13,823	41·9	27·4	3,106	147
1878	507,420	20,622	14,157	40·6	27·9	3,285	159
1879	508,048	19,751	12,498	38·8	24·6	2,504	127
1880	509,732	18,912	13,304	37·1	26·1	2,842	150
1881	512,034	19,106	12,916	37·3	25·2	2,745	144
1882	517,904	19,735	13,046	38·1	25·2	2,959	150
1883	523,154	19,911	14,577	38·1	27·9	3,091	155
1884	528,459	20,557	13,942	38·9	26·4	3,094	151
1885	533,817	19,861	13,492	37·2	25·3	3,100	156
1886	539,231	19,862	13,104	36·8	24·3	2,786	140
1887	544,700	19,328	12,135	35·5	22·3	2,676	138
1888	550,226	19,309	11,681	35·1	21·2	2,560	133
1889	555,808	19,503	13,139	35·1	23·6	3,008	154
1890	561,447	19,279	13,374	34·3	23·8	2,880	149
1891	567,143	19,857	14,324	35·0	25·3	2,946	148
1892	669,059	22,815	15,218	34·1	22·7	3,168	139
1893	677,883	23,173	15,798	34·2	23·3	3,649	157
1894	686,820	22,647	13,674	33·0	19·9	2,940	130

TABLE VI.—GLASGOW—DEATHS FROM ZYMOTIC DISEASES, PHTHISIS, AND OTHER DISEASES OF THE LUNGS AND ALL CAUSES FOR 40 YEARS (1855-94).

Year.	Chief[1] Zymotics.	Balance[2] of Zymotics.	Phthisis.	Other[3] Diseases of Lungs.	Other Causes.	All Causes.
1855	2,426	175	1,417	1,624	5,013	10,655
1856	2,598	167	1,237	1,479	4,817	10,298
1857	3,170	169	1,393	1,516	5,127	11,375
1858	2,960	146	1,406	1,940	5,020	11,472
1859	2,945	144	1,460	1,483	4,800	10,832
1860	2,623	207	1,687	2,641	5,278	12,436
1861	2,103	163	1,586	2,240	4,844	10,936
1862	2,352	145	1,670	2,290	5,108	11,565
1863	3,983	184	1,588	2,306	5,268	13,329
1864	3,592	174	1,767	2,650	5,491	13,674
1865	3,762	328	1.770	2,574	5,480	13,914
1866	2,666	188	1,720	2,630	5,625	12,829
1867	2,543	179	1,722	2,719	5,415	12,578
1868	3,594	165	1,804	2,657	5,612	13,832
1869	4,048	226	1,843	3,557	5,974	15,648
1870	2,598	335	2,030	2,994	5,998	13,955
1871	3,111	450	2,138	3,731	6,360	15,790
1872	2,737	239	1,957	2,971	6,149	14,053
1873	2,904	241	1,760	3.137	6,457	14,499
1874	3,882	250	1,681	3,650	6,382	15,845
1875	2,986	283	1,973	3,701	6,441	15,384
1876	2,323	239	1,927	3,168	6,106	13,763
1877	1,816	324	1,750	3,764	6,169	13,823
1878	2,524	283	1,865	3,270	6,215	14,157
1879	1,614	278	1,671	3,182	5,753	12,498
1880	2,571	315	1,607	2,853	5,958	13,304
1881	1,789	260	1,593	3,372	5,902	12,916
1882	2,173	342	1,587	2,851	6,093	13,046
1883	2,800	205	1,758	3,127	6,687	14,577
1884	2,472	250	1,614	2,993	6,613	13,942
1885	1,965	223	1,584	3,216	6,504	13,492
1886	1,752	177	1,552	3,118	6,505	13,104
1887	1,838	192	1,361	2,776	5,968	12,135
1888	1,411	209	1,285	2,552	6,224	11,681
1889	2,374	200	1,292	2,923	6,350	13,139
1890	2,082	208	1,403	3,125	6,556	13,374
1891	1,755	373	1,371	3,860	6,965	14,324
1892	2,329	307	1,463	3,571	7,548	15,218
1893	2,841	255	1,500	3,354	7,848	15,798
1894	1,766	233	1,550	2,633	7,492	13,674

[1] Typhus, Small-pox, Enteric Fever, Scarlet Fever, Measles, Whooping-cough, Diphtheria and Diarrhœal Diseases.

[2] Erysipelas, Puerperal Fever, Influenza, etc.

[3] "Diseases of Respiratory System" less Croup.

TABLE VII.—GLASGOW—DEATH-RATES PER MILLION FROM ZYMOTIC DISEASES, PHTHISIS, AND OTHER DISEASES OF THE LUNGS AND ALL CAUSES FOR 40 YEARS (1855-94).

Year.	Chief [1] Zymotics.	Balance [2] of Zymotics.	Phthisis.	Other [3] Diseases of Lungs.	Other Causes.	All Causes
1855	6,808	491	3,977	4,557	14,067	29,900
1856	7,165	460	3,411	4,079	13,285	28,400
1857	8,583	458	3,772	4,105	13,882	30,800
1858	7,869	389	3,738	5,158	13,346	30,500
1859	7,693	377	3,814	3,876	12,540	28,300
1860	6.729	530	4,327	6,775	13,539	31,900
1861	5,288	410	3,988	5,633	12,181	27,500
1862	5,796	357	4,116	5,643	12,588	28,500
1863	9,621	445	3,837	5,571	12.726	32,200
1864	8,537	413	4,200	6,299	13,051	32,500
1865	8,787	766	4,135	6,012	12,800	32,500
1866	6,089	429	3,928	6,007	12,847	29,300
1867	5,701	402	3,861	6,096	12,140	28,200
1868	7,900	362	3,965	5,839	12,334	30,400
1869	8,717	488	3,969	7,660	12,866	33,700
1870	5,510	711	4,306	6,350	12,723	29,600
1871	6,324	915	4,346	7,585	12,930	32,100
1872	5,531	483	3,955	6,004	12,427	28,400
1873	5,868	488	3,557	6,339	13,048	29,300
1874	7,791	502	3,374	7,325	12,808	31,800
1875	5,978	567	3,949	7,411	12,895	30,800
1876	4,624	476	3,836	6,307	12,157	27,400
1877	3,600	642	3,468	7,462	12,228	27,400
1878	4,975	557	3,676	6,444	12,248	27,900
1879	3,178	546	3,289	6,263	11,324	24,600
1880	5,045	617	3,153	5,597	11,688	26,100
1881	3,495	507	3,111	6,586	11,526	25,225
1882	4,196	660	3,064	5,505	11,765	25,190
1883	5,352	392	3,361	5,977	12,782	27,864
1884	4,678	473	3,054	5,664	12,513	26,382
1885	3,680	419	2,967	6,025	12,184	25,275
1886	3,249	328	2,878	5,782	12,064	24,301
1887	3,374	353	2,499	5,096	10,956	22,278
1888	2,564	380	2,336	4,638	11,312	21,230
1889	4,271	360	2,324	5,259	11,425	23,639
1890	3,708	370	2,499	5,566	11,677	23,820
1891	3,094	658	2,418	6,806	I2,281	25,257
1892	3,480	460	2,187	5,337	11,281	22,745
1893	4,192	375	2,213	4,948	11,572	23,300
1894	2,570	341	2,257	3,833	10,908	19,909

[1] Typhus, Small-pox, Enteric Fever, Scarlet Fever, Measles, Whooping-cough, Diphtheria and Diarrhœal Diseases.

[2] Erysipelas, Puerperal Fever, Influenza, etc.

[3] "Diseases of Respiratory System" less Croup.

TABLE VIII.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM TYPHUS FOR 40 YEARS (1855-94), SHOWING NUMBER AND PERCENTAGE WHICH TOOK PLACE IN HOSPITAL FOR 30 YEARS (1865-94).

Year.	Deaths.		Death-rate per Million.	Percentage 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

TABLE IX.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM SMALL-POX FOR 40 YEARS (1855-94), SHOWING NUMBER AND PERCENTAGE WHICH TOOK PLACE IN HOSPITAL FOR 30 YEARS (1865-94).

Year.	Deaths.		Death-rate per Million.	Percentage 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

TABLE X.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM ENTERIC FEVER FOR 30 YEARS (1865-94)* SHOWING NUMBER AND PERCENTAGE WHICH TOOK PLACE IN HOSPITAL.

Year.	Deaths.		Death-rate per Million.	Percentage of Total Deaths in Hospital.
	Total.	In Hospital.		
1865	192	9	449	4·7
1866	181	13	414	7·2
1867	228	13	513	5·7
1868	270	29	595	10·7
1869	269	15	579	5·6
1870	195	13	413	6·7
1871	204	25	415	12·3
1872	221	47	446	21·3
1873	271	49	548	18·1
1874	220	45	441	20·5
1875	305	81	611	26·6
1876	234	50	466	21·4
1877	196	40	388	20·4
1878	218	61	430	28·0
1879	144	32	284	22·2
1880	290	109	569	37·6
1881	182	66	356	36·3
1882	178	60	344	33·7
1883	177	55	338	31·1
1884	205	89	388	43·4
1885	106	38	198	35·8
1886	91	35	169	38·5
1887	104	48	191	46·2
1888	68	26	123	38·2
1889	128	63	230	45·3
1890	120	70	214	58·3
1891	145	86	256	59·3
1892	104	68	155	65·4
1893	122	82	180	67·2
1894	150	115	218	76·7

* Prior to 1865 Enteric Fever was not classified separately.

TABLE XI.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM SCARLET FEVER FOR 40 YEARS (1855-94), SHOWING NUMBER AND PERCENTAGE WHICH TOOK PLACE IN HOSPITAL FOR 30 YEARS (1865-94).

Year.	Deaths.		Death-rate per Million.	Percentage of Total Deaths in Hospital.
	Total.	In Hospital.		
1855	205	...	575	...
1856	361	...	996	...
1857	420	...	1,137	...
1858	669	...	1,779	...
1859	772	...	2,017	...
1860	344	...	882	...
1861	102	...	257	...
1862	112	...	276	...
1863	1,203	...	2,906	...
1864	582	...	1,383	...
1865	513	...	1,198	...
1866	422	2	964	0·5
1867	484	7	1,085	1·4
1868	918	11	2,018	1·2
1869	873	5	1,880	0·6
1870	466	4	988	0·9
1871	319	8	649	2·5
1872	362	6	732	1·6
1873	577	26	1,166	4·5
1874	1,673	165	3,358	9·8
1875	732	81	1,465	11·0
1876	313	30	623	9·6
1877	137	20	272	14·5
1878	190	31	374	16·3
1879	250	52	492	20·8
1880	467	109	916	23·3
1881	261	58	510	22·2
1882	272	71	525	26·1
1883	452	140	864	31·7
1884	428	130	810	30·9
1885	299	98	560	33·0
1886	359	139	666	39·2
1887	235	103	431	43·3
1888	170	73	309	44·5
1889	112	69	201	64·5
1890	127	66	226	52·0
1891	210	139	370	66·2
1892	304	191	454	62·8
1893	263	184	388	70·0
1894	204	149	297	73·0

TABLE XII.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM MEASLES FOR 40 YEARS (1855-94), SHOWING NUMBER AND PERCENTAGE WHICH TOOK PLACE IN HOSPITAL FOR 15 YEARS (1880-94).

Year.	Deaths.		Death-rate per Million.	Percentage of Total Deaths in Hospital.
	Total.	In Hospital.		
1855	522	...	1,465	...
1856	134	...	370	...
1857	359	...	972	...
1858	486	...	1,292	...
1859	156	...	408	...
1860	541	...	1,388	...
1861	150	...	377	...
1862	275	...	678	...
1863	419	...	1,012	...
1864	432	...	1,027	...
1865	330	...	771	...
1866	333	...	760	...
1867	388	...	870	...
1868	348	...	765	...
1869	621	...	1,337	...
1870	120	...	255	...
1871	934	...	1,898	...
1872	108	...	218	...
1873	577	...	1,166	...
1874	262	...	526	..
1875	344	...	689	...
1876	310	...	617	...
1877	355	...	704	..
1878	281	...	554	...
1879	159	...	313	...
1880	330	11	648	3·3
1881	351	16	686	4·6
1882	227	6	438	2·6
1883	625	48	1,195	7·7
1884	347	33	657	9·5
1885	436	38	817	8·7
1886	91	10	169	11·0
1887	298	34	547	11·4
1888	211	33	383	15·6
1889	641	107	1,153	16·7
1890	640	81	1,140	12·7
1891	439	58	774	13·2
1892	781	98	1,167	12·5
1893	855	87	1,261	10·2
1894	250	29	364	11·6

TABLE XIII.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM WHOOPING COUGH FOR 40 YEARS (1855-94), SHOWING NUMBER AND PERCENTAGE WHICH TOOK PLACE IN HOSPITAL FOR 15 YEARS (1880-94).

Year.	Deaths.		Death-rate per Million.	Percentage of Total Deaths in Hospital.
	Total.	In Hospital.		
1855	376	...	1,055	...
1856	901	...	2,484	...
1857	495	...	1,340	..
1858	463	...	1,231	...
1859	928	...	2,424	...
1860	545	...	1,398	...
1861	842	...	2,117	...
1862	681	...	1,678	...
1863	575	...	1,389	...
1864	571	...	1,357	...
1865	879	...	2,053	...
1866	432	...	987	...
1867	331	...	742	...
1868	926	...	2,035	...
1869	694	...	1,495	...
1870	563	...	1,194	...
1871	516	...	1,049	...
1872	1,026	...	2,073	...
1873	305	...	616	..
1874	673	...	1,351	...
1875	717	...	1,435	...
1876	643	...	1,280	...
1877	447	...	886	...
1878	1,040	...	2,050	...
1879	515	...	1,014	...
1880	734	12	1,440	1·6
1881	399	3	779	0·8
1882	709	11	1,369	1·6
1883	857	37	1,638	4·3
1884	738	46	1,396	6·2
1885	526	37	985	7·0
1886	698	29	1,294	4·2
1887	643	54	1,180	8.4
1888	430	28	782	6.5
1889	847	85	1,524	10·0
1890	708	65	1,261	9.2
1891	484	53	853	11·0
1892	592	68	885	11.5
1893	711	55	1,049	7·7
1894	584	47	850	8·0

TABLE XIV.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM DIPHTHERIA AND CROUP FOR 40 YEARS (1855-94), SHOWING THE NUMBER AND PERCENTAGE OF DEATHS FROM DIPHTHERIA WHICH TOOK PLACE IN HOSPITAL FOR 15 YEARS (1880-94).

Year.	Deaths.			Number of Deaths in Hospital.	Death-rate per Million.			Percentage of Total Deaths in Hospital.
	Diph.	Croup.	Diph. & Croup.	Diphtheria.	Diph.	Croup.	Diph. & Croup.	Diphtheria.
1855	...	145	145	...	...	407	407	...
1856	...	178	178	...	...	491	491	...
1857	3	127	130	...	8	344	352	...
1858	18	140	158	...	48	372	420	...
1859	24	122	146	...	63	318	381	...
1860	12	145	157	...	31	372	403	...
1861	34	136	170	...	86	342	428	...
1862	139	327	466	...	342	806	1,148	...
1863	244	248	492	...	589	599	1,188	...
1864	129	156	285	...	306	371	677	...
1865	69	110	179	...	161	257	418	...
1866	83	127	210	...	190	290	480	...
1867	75	159	234	..	168	357	525	...
1868	106	149	255	...	233	327	560	...
1869	98	178	276	...	211	383	594	...
1870	117	169	286	...	248	359	607	...
1871	116	188	304	...	236	382	618	...
1872	141	184	325	..	285	372	657	...
1873	165	198	363	..	334	400	734	..
1874	135	144	279	..	271	289	560	...
1875	109	160	269	...	218	321	539	...
1876	122	154	276	...	243	306	549	...
1877	153	178	331	...	303	353	656	...
1878	125	129	254	...	247	254	501	...
1879	132	126	258	...	260	248	508	...
1880	161	111	272	...	316	218	534	...
1881	176	138	314	6	344	269	613	3·4
1882	194	164	358	3	374	317	691	1·5
1883	130	141	271	4	248	270	518	3·1
1884	150	110	260	8	284	208	492	5·3
1885	114	110	224	4	214	206	420	3·5
1886	95	116	211	3	176	215	391	3·2
1887	154	138	292	4	283	253	536	2·6
1888	168	107	275	12	305	195	500	7·1
1889	176	124	300	25	317	223	540	14·2
1890	137	67	204	32	244	119	363	23·4
1891	130	65	195	31	229	115	344	23·8
1892	162	87	249	31	242	130	372	19·1
1893	208	103	311	63	307	152	459	30·3
1894	245	75	320	87	357	109	466	35·5

TABLE XV.—GLASGOW—DEATHS AND DEATH-RATES PER MILLION FROM DIARRHŒAL DISEASES (DIARRHŒA, DYSENTERY, CHOLERA) AT CERTAIN AGES AND ALL AGES, ALSO DEATH-RATES UNDER 1 YEAR PER 10,000 BIRTHS, FOR 40 YEARS (1855-1894).

Year.	Deaths.				Death-rate per Million.			Death-rate under 1 Year per 10,000 born.
	Under 1 Year.	1 and under 5 Years.	5 Years and upwards	All Ages.	Under 5 Years.	5 Years and upwards	All Ages.	
1855	158	143	214	515	6,046	698	1,445	119
1856	133	139	186	458	5,369	596	1,263	88
1857	266	224	328	818	9,497	1,032	2,215	169
1858	170	161	236	567	6,299	729	1,507	107
1859	106	114	141	361	4,114	428	943	67
1860	90	80	111	281	3,121	331	721	56
1861	96	59	78	233	2,790	228	586	58
1862	87	86	85	258	3,052	244	636	53
1863	97	74	103	274	2,957	289	662	57
1864	130	77	77	284	3,522	213	675	75
1865	196	128	142	466	5,512	384	1,089	109
1866	157	79	152	388	3,926	404	886	86
1867	181	80	88	349	4,262	229	782	99
1868	241	131	135	507	5,955	344	1,114	130
1869	162	80	101	343	3,765	252	739	88
1870	204	98	97	399	4,666	238	846	105
1871	178	97	91	366	4,072	214	744	94
1872	195	90	79	364	4,195	185	736	97
1873	231	129	155	515	5,299	363	1,041	119
1874	209	130	109	448	4,955	254	899	100
1875	281	126	114	521	5,952	264	1,043	135
1876	256	92	99	447	5,061	228	890	122
1877	108	73	86	267	2,621	197	529	51
1878	289	126	85	500	5,974	194	985	140
1879	104	55	74	233	2,286	169	459	53
1880	200	111	126	437	4,457	286	857	106
1881	101	55	76	232	2,225	172	453	53
1882	202	107	89	398	4,358	199	769	102
1883	171	92	98	361	3,672	217	690	86
1884	241	109	107	457	4,838	235	865	117
1885	182	80	91	353	3,831	196	661	92
1886	140	73	63	276	3,083	134	512	70
1887	124	60	62	246	2,636	131	452	64
1888	113	64	58	235	2,511	121	427	59
1889	195	70	65	330	3,721	134	594	100
1890	145	69	55	269	2,975	112	479	75
1891	140	58	57	255	2,725	115	450	71
1892	141	69	73	283	2,475	125	423	62
1893	312	130	101	543	5,141	171	801	135
1894	180		64	244	2,067	107	355	..