

DOCUMENT 10–III (Online Companion):

Extracts from Appendix B, “Sanitary report on epidemic cholera as it prevailed in London” by Richard D. Grainger, in the General Board of Health’s *Report on epidemic cholera in Great Britain during 1848 and 1849*¹

Richard Dugard Grainger was born in Birmingham. He attended medical school in Edinburgh, qualifying as a surgeon in 1822. Shortly thereafter, he moved to London at the request of his brother, Edward, the founder and director of the Webb Street School of Anatomy. Edward Grainger was in failing health, so he transferred the directorship and teaching responsibilities to Richard Grainger, who carried on for twenty years. In 1842, Grainger closed the Webb Street School and became a lecturer in Anatomy and Physiology at St. Thomas’s Hospital School of Medicine.²

He was living and practicing medicine in Norwood (Surrey), at the southwestern edge of metropolitan London, when the General Board of Health hired him as a full-time inspector. His first assignment as inspector was to investigate, in conjunction with John Sutherland, a suspicious case of Asiatic cholera in Hull aboard a vessel from Hamburg. Shortly thereafter, Grainger travelled to Hamburg to study the nature and mode of propagation of cholera in that city. On his return to England, he was the superintending medical inspector for metropolitan London for the duration of the 1848–49 epidemic.

[3] My Lords and Gentlemen,

I beg respectfully to present my report on the late epidemic as it prevailed in the metropolis in 1848–49. In doing so, it may be proper to state that the document is essentially a sanitary report. It would have been foreign to the objects of the General Board to have considered either the pathology or treatment of cholera.

It is the opinion of a large number of medical observers that cholera is nothing else than a form of fever, according to some of the **typhoid type**, whilst others regard it as of the intermittent form allied to **ague**. . . . Whatever may be the essential nature of cholera, it evidently belongs to the great epidemic class and has, especially as concerns its habitat and activity, a close relation to typhus—the causes influencing the one affecting the other. . . . Proportionally as well as absolutely, the cholera of 1848–49 [in the London metropolis] was more severe than that of **1832–33**. This decided increase would appear to be in keeping with the steadily increasing prevalence of fever in the metropolis during the three years preceding the arrival of cholera. . . . [4] Th[e] increase of typhus [doubling between 1844 and 1848] is not the

Typhus Often Precedes Cholera

typhoid type: Probably typhus, although the prevalence of fever in epidemic typhus caused some at the time to lump it with typhoid fever.

ague: Intermittent fever, now commonly known as malaria

1832–33: A recurrence of the epidemic of 1832, largely limited to the metropolis.

Recent Increase in Diarrhoea in London

¹ Richard D. Grainger, *Appendix B to GBoH, Report on the Epidemic Cholera of 1848 and 1849* (London: HMSO, 1851); 210 pages. Square brackets in text contain page numbers.

² James B. Bailey, “Medical Institutions of London: Rise and Fall of the Private Medical Schools,” *BMJ* 1 (22 June 1895): 1389–90.

zymotic diseases:

Diseases believed to be caused by a process analogous to fermentation (zymosis).

Diarrhoea in London Associated with Increase in Putrid Atmospheric Conditions

only circumstance to be noticed. The whole class of **zymotic diseases**, which constitute the true gauge of the healthiness or unhealthiness of a community, has in late years received an immense development . . . [table omitted]. Excluding the middle year, 1843, there been in the last five, as compared to the first five years, an increase of 31 percent . . . independent of cholera . . .

Among the principal zymotic diseases, the only one which has through the whole eleven years, with two slight exceptions, gone on progressively increasing is diarrhoea—a point of interest since, according to my observation, one of the most certain tests of the operation upon the human body of an atmosphere charged . . . with putrid animal effluvia is the prevalence of diarrhoea [table omitted] . . .

[5] The state of health in the metropolis immediately antecedent to the arrival of cholera may be judged of by [a] comparative table, showing the mortality of the diseases named in the quarter ending 30 September in the years 1845–48: [all zymotic diseases doubled, smallpox increased six-fold, scarlatina eight-fold, typhus tripled, and diarrhea doubled]. . .

[7] The facts set forth in the preceding pages disclose a most grave condition of the metropolis as regards epidemic diseases. It proves that the causes of unhealthiness are so potent in their operation as to allow of scarcely a perceptible diminution in the most fruitful sources of mortality . . . The opinion often entertained, that persons who would die of other diseases are those who principally constitute the subjects attacked by cholera, is by these statistics proved to be erroneous . . . The ordinary diseases still have their ordinary supply, . . . which is unquestionably due to the enormous sanitary evils connected with this great metropolis.

It is an important consideration that there is such an intimate relation between the whole class of zymotic diseases—an inseparable connexion between them as to their predisposing causes, their spread, and their prevention—that what applies to one applies, generally speaking, to all. If a certain district combines the conditions favourable to the development and extension of **low fever**, it will assuredly give force to other epidemics—to smallpox, to scarlatina, to cholera. If, on the other hand, by efficient and well-matured sanitary improvements, typhus is diminished or eradicated, the most destructive pestilence may come but it will acquire little or no footing in a locality thus prepared for resistance. . .

The same conditions which favour or control the spread of fever, promote or oppose the ravages of cholera. . . And yet, according to the reports of the medical [7/8] inspectors, in many of the most densely populated districts, the inspectors of nuisances have been dismissed [since the end of the 1848–49 cholera epidemic]; the cleansing operations have been relaxed; and there is too much reason to apprehend that the courts and alleys will lapse back again to their accustomed filth; that privies and cesspools will

Sanitary Improvements Would Prevent Future Fever Epidemics

low fever: Low-grade fever (temperature below 103F°).

again be allowed to overflow; that houses, proved by the evidence of medical officers, inspectors, and local authorities to be unfit for human habitations, “will long continue to remain pest-houses, spreading disease around”; and that, in the midst of all these tolerated and accumulated evils, the industrious classes will continue as before to be decimated by fever or, should it again break out, cholera. . .

[Statistical details for] a population of two millions and a quarter would, . . . under any circumstances, be most difficult of attainment. . . Cholera came upon the metropolis [in 1848] when, for the most part, [it was] as unprepared with any systematic arrangements as in 1832. Among other evils which flowed from this state of things was the impossibility of obtaining accurate and complete reports of the daily progress of the disease. And yet, this information was indispensable to the General Board of Health, the body intrusted with directing the various measure demanded on the occurrence of the epidemic, among which the amount of medical aid required was of course the most essential. Repeated attempts were made to procure from the local authorities daily returns showing the fresh attacks, but in vain. A most serious impediment to the application of prompt measures of relief thus arose.

It was not till the Registrar-General, after considerable difficulty and when the disease had made great progress, succeeded in obtaining a daily return of the deaths in each sub-registration district that any reliable information was procured. If, unhappily, there should be any recurrence of the disease, some efficient plan ought to be devised for securing from every part of the metropolis regular and accurate daily returns, not only of mortality, but especially of new cases of both cholera and diarrhoea. . .

[9] In the absence of more precise data, the sources of information of which I have principally availed myself are as follows: 1. The reports of the several medical inspectors who superintended the house visitation. 2. The evidence of the medical officers of the metropolitan unions and parishes. 3. The mortality returns of the Registrar-General.*

The first undoubted case of cholera in London took place on 22 September 1848 at Horsleydown, Southwark. This case proved fatal in 11 hours. The last death recorded appears in the return of the Registrar-General [on] 22 December 1849. The whole of the epidemic thus occupied a period of 15 calendar months. There is little or no doubt, however, that some

* As these returns do not altogether correspond to the more commonly known parochial divisions, it is proper to explain that for the purpose of registering births, deaths, and marriages, the metropolis is first of all divided into 36 “superintendent registrars’ districts,” and then again into 135 sub-registration districts. These latter, or “sub-districts,” will be found, when properly grouped together, to correspond, with some trifling exceptions, to the several unions and parishes. In this way, the respective mortality in these more familiar divisions will appear. (See the tinted map of the metropolis appended to this Report.)

Difficulties in Obtaining Reliable Information about Cholera’s Progress in London

Duration of Recent Epidemic

isolated cases of true Asiatic cholera occurred earlier than reported. But they were returned as English cholera. . . .

The history of the first cases of cholera occurring in any new locality is obviously a point of much interest in connexion with the question of contagion. The Board of Health was therefore desirous that the first attacks in London should be investigated. The inquiry was intrusted to Dr. Parkes, who had had considerable experience of cholera in India. The following particulars of these cases are extracted from the Report of the General Board on quarantine. . .

The first case, as stated above, occurred on 22 September 1848. "From this period to 10 October (twelve days), 28 cases occurred. An analysis of these cases, from **Dr. Parkes' report**, gives the following results: 1. These 28 cases occurred in ten different localities. 2. These localities were not near each other, but were situated at remote distances. 3. In not a single instance, as far as could be traced, had the first person attacked in one locality been in contact or proximity with a person previously [9/10] sick in another locality, and in some instances such contact or proximity was impossible. . . . A similar examination [by Sutherland] of the circumstances connected with the outbreak of cholera in the several towns of England in which it successively appeared, as far as the analysis has been completed, gives a like result. The manner in which the disease spread through particular establishments in the metropolis, wherever an opportunity has been afforded of making a [10/11] correct observation of facts, fully confirms the conclusion derived from this general experience. . . . The conclusion is inevitable that the first cases of cholera in London, whether occurring in the metropolis generally or in particular establishments, did not originate and spread by contact or proximity of the infected with the uninfected. . . ."

There was only what can be called one epidemic since, within the period specified, there was no single week in which the metropolis was entirely free from cholera deaths. Yet, it was evidently divided into two distinct and well-marked periods, not only in London, but also with some considerable differences as to dates, in other [11/12] parts of England. In the metropolis, the first period may be considered as having extended from 22 September 1848 to the end of March 1849, during which the [total] mortality [from cholera] amounted to 988. In the month of April, the deaths sank from 5 and 2 in the first and second week, to 1 in each of the last two weeks. In four weeks in May, the deaths were respectively 4,3,1, and 5. The second, and much more fatal period, evidently commenced in June, when the deaths rose to 9, increased in the last week to 124, and then went on rapidly and uninterruptedly increasing till the acme was obtained in the week ending 8 September, when deaths from cholera were 2,026, and from diarrhoea 272. From this

First Cases in London Were Non-contagious, Localized Outbreaks

Dr. Parkes' Report: For a different interpretation of Parkes' findings, see the review in Document 4-III.

Metropolitan Epidemic of 1848-49 Had Two Distinct Periods

time the disease declined and ultimately ceased . . . [on] 22 December 1849. . . . The total mortality from cholera for the 62 weeks ending 24 November 1849 was 14,601. The total mortality in the same time from diarrhoea was 3,857. Deducting the average mortality from this disease for a similar period during the ten years 1838-47 (namely 1,063) leaves 2,794 deaths in excess, a large proportion of which must be attributed to the epidemic influence of cholera. The total mortality from dysentery amounted to 464 in the period in question, which is an excess of 278 above the average The [total] mortality in London from the late epidemic [thus amounts to] 17,673. The estimated population of the metropolis in 1849 was 2,206,076. It will thus appear that 1 person died of cholera in every 151 of the inhabitants, or 0.66 percent, independently of the deaths from diarrhoea and dysentery.

It is important to show the relation between the late epidemic and that of 1832-33. The latter commenced in London on 16 February 1832 and finally ended on 7 September 1833. There [were], however, two distinct periods or, rather, two epidemics since there was a complete interval of eight months. The first attack lasted from 7 February to 30 November 1832, the second from 1 August to 7 September 1833. The progress of the disease, as the deaths and cases were reported to the Privy Council, is shown by the following table: [12/13]

Mortality in the Metropolitan Epidemics of 1832-33 and 1848-49

	Attacks.	Deaths.		Attacks.	Deaths.
1832.					
Week ending Feb. 23	14	14	Brought forward -	3,291	1,850
" " March 2	104	57	Week ending July 20	787	394
" " " 9	277	139	" " " 27	1,064	445
" " " 16	381	195	" " Aug. 3	787	299
" " " 23	389	225	" " " 10	501	190
" " " 30	396	279	" " " 17	637	234
" " April 6	364	198	" " " 24	783	325
" " " 13	170	94	" " " 30	795	350
" " " 20	87	34	" " Sept. 7	567	309
" " " 27	50	27	" " " 14	291	144
" " May 4	27	20	" " " 21	301	147
" " " 11	34	12	" " " 28	96	43
" " " 18	18	16	" " Oct. 5	162	81
" " " 25	12	7	" " " 12	285	150
" " June 1	28	17	" " " 19	78	37
" " " 8	27	13	" " " 26	89	61
" " " 15	20	15	" " Nov. 2	84	48
" " " 22	57	34	From Nov. 2 to Nov. 30	26	13
" " " 29	179	116	Total - - -	10,624	5,120
" " July 6	162	99	Omitted - - -	396	155
" " " 13	495	239	1833.		
Carried forward -	3,291	1,850	From Aug. 1 to Sept. 7	3,124	1,454
			Grand total -	14,144	6,729

Proportion of deaths to cases, 47 per cent.

In 1832, the population of London was 1,681,641. [Therefore,] in the epidemic of 1832–33, one person died in every 255 inhabitants, or 4/7 less than in 1849.

In the Appendix [no. 1 to this report] will be found a table showing the weekly mortality in each sub-district of the metropolis for a period of 60 weeks [in 1849], as published by the Registrar-General, together with the population.

The following table shows the monthly mortality of cholera for 62 weeks in 1848–49 (including diarrhoea), as given by the Registrar-General:

1848.			1849.		
	Cholera.	Diarrhoea.		Cholera.	Diarrhoea.
September, last two weeks	11	90	January - - -	262	82
October - - -	122	145	February - - -	181	109
November - - -	215	117	March - - -	73	92
December - - -	131	113	April - - -	9	56
			May - - -	13	65
			June - - -	246	119
			July - - -	1,922	490
			August - - -	4,251	780
			September - - -	6,644	1,187
			October - - -	464	319
			November - - -	27	93
			Total - - -	14,601	3,857

[14] If the weekly progress of the epidemic were compared to the mean weekly temperature, it would appear that, although there is not a uniform relation between the elevation of the thermometer and the progress of cholera, in London (as in other parts of Europe) the main force of the disease corresponded with the three hot months—July, August, and September. . . . When the epidemic was at its acme, from 18 August to 15 September, the temperature was, without exception, high with a thick and stagnant temperature. . . . There were considerable variations in the temperature during the quarter, amounting in the whole of England to 56°, the extremes being 86° and 30°. The highest temperature in London for the three months was 87°; the lowest at the Observatory, Greenwich, 39.5°. The horizontal movement of the air during the months of August and September was about half the usual amount. This observation applies to an elevation at Greenwich, 200 feet above the level of the sea. At lesser elevations, the movement was much less. . . .

Temperature and State of the Air in the Third Quarter of 1849

[15] It is impossible to attempt an accurate calculation of the number of persons actually attacked by the late epidemic in London. . . . It is, for example, most difficult to assign any limits, which would be universally acceded to by medical practitioners, between cholera and diarrhoea. The fact is that the latter runs so insensibly into the former in a large number of cases as to defy rigid separation. To which category, for instance, are those numerous cases of rice-water purging, without collapse, to be referred? Are they cases

Difficulties in Distinguishing Diarrhea from Cholera

of cholera or diarrhoea? . . . The consequence of all this was that during the last, as in the preceding epidemic of 1832, there was the greatest discrepancy of opinion among medical men in all parts of London. Some applied the term, cholera, to attacks which others called diarrhoea. . . . A large part of this incertitude has arisen from the circumstance of so little attention having been formerly paid to the diarrhoea which so extensively prevails during an attack of cholera. . . .

In all its proceedings and documents, the General Board of Health reported those only to be cases of cholera in which there was actual collapse—that is to say, where the pulse was either extremely weak or entirely lost, . . . great prostration of strength, shrunken features, coldness [15/16] of the surface, a marked diminution or total suppression of the urinary secretion, and the characteristic rice-water evacuations. Although pathologically, all cases of choleraic diarrhoea and even many other forms of disturbance of both the alimentary canal and other organs are . . . part and parcel of the epidemic, . . . some arbitrary limit must . . . be assumed [for the time being]. The [Board of Health] definition, resting on a marked and easily recognized stage of the disease, appears to be sufficient for all practical purposes

GBoH's Definition of True Cholera

The experience of other European countries, although it is like that of this country imperfect, will throw considerable light on the number of attacks as compared with the deaths. . . . [19] From various sources of information, I believe it may be safely stated that in Western Europe, in fully developed cases . . . when there is collapse, great diminution or complete suppression of urine, with the pulse extremely weak or lost, the mortality [for the entire epidemic] will amount to from 45 to 50 percent of the attacks. Assuming this as a mean and there there were 14,601 deaths, it would appear that the total number of developed cases of cholera in London amounted to 30,000. . . .

Estimated Number of True Cholera Attacks in London

[21] Owing to the deficiency of statistical information, no satisfactory deductions can be formed . . . concerning the mortality of cholera as connected with occupation. As the Registrar-General remarks, “occupations were only returned for the metropolis in a very general way by the Census Commissioners in 1841, and in the trades, masters were not distinguished from the men.” . . . At present, it can only be stated in a general way what is known from other sources of information, that the great pressure of the epidemic has, with scarcely an exception, fallen in all parts of the metropolis on the labouring classes; that tradesmen and their families have suffered next in degree; and that the higher classes or gentry experienced a comparative exemption. . . .

Estimated Cholera Mortality by Occupation

[24] Notwithstanding the general appreciation of the fact that defective

drainage, accumulations of filth, imperfect water supply, and especially overcrowding and the want of ventilation conduce to the spread of disease, and especially to the most destructive of all diseases, the zymotic; and notwithstanding the many strenuous efforts which were made both by the Board of Health and the public press to expound and enforce this vital truth, . . . all this did not prevent . . . a great neglect of sanitary precautions on the part of the local authorities. Nor was a certain amount of scepticism wanting amongst the highest ranks of the medical profession. It was my lot frequently to listen to expressions of such incredulity, mingled with something of contempt, when the all-powerful influence of local causes in the propagation of fever, cholera, and other zymotic disease was asserted. . . .

*Cholera Can Appear
Contagious*

[25] In viewing the progress of cholera, whether from country to country, from city to city, or even among the inhabitants of any one city, there is, no doubt, much on the surface which appears to indicate that it extends from man to man. This is, therefore, the conclusion which one would expect the generality of mankind to form, as indeed they have formed, on the subject. It is seen, for example, that great masses of Hindu pilgrims come together at their annual festivals in some sacred city free of cholera, and that soon afterwards the epidemic breaks forth among them and spreads with destructive energy, sweeping off thousands of victims, and then ceasing so soon as the vast crowd disperses in fright. Or . . . in some European kingdom, the epidemic decimates the cities, where men abound and intercourse is excessive, and spares the open country where the population is limited and communication slight. Or still further, persons in immediate contact with each other, so to speak, the members of the same families, the inmates of the same house, the wife who watches by the side of her husband's bed, the nurse who waits upon the sick—these, being exposed to direct communication with an affected person, are sometimes attacked in succession. It has been said that those who have washed the linen of cholera patients have been seized with the fatal malady. Then, again, it is affirmed, and with much truth, that the disease often follows the great tracts of human intercourse; that it passes, for example, along the banks of navigable rivers, where they form, as in many parts of the Continent, the main channels of communication.

*But this Notion Is
Deceptive*

That these and a thousand other instances of a like character which might easily be collected should have led to the inference above stated is not surprising. But when they are more carefully scrutinized, much, if not the whole, of their weight disappears. It has been found, for example, by experience that when the Hindu worshippers quit the pestiferous and foul hovel in which they have been crammed together in their sacred city, though many carry with them the seeds of the affection and die after their arrival in the pure air of the country, they do not communicate the disease to the vil-

lages around. Although it is true the towns of Europe suffer more than the country, yet, when the circumstances both of the attack and the exemption are cautiously investigated, it becomes evident that neither the one nor the other can be explained on the ground of numbers. For it can be abundantly shown that great masses of people in incessant communication, if [25/26] living in cleanly and well-ventilated dwellings, escape; whilst the scattered inhabitants of villages, even of isolated houses in the country, may be, and often have been, decimated by cholera if their sanitary state is unfavourable. . . .

[27] The progress of the late epidemic through Europe, when carefully studied, has demonstrated that the principal determining cause of the spread of the disease—I do not here speak of the efficient cause of cholera, which is at present altogether unknown—is locality. In thus broadly advancing a position which is, with different modifications, held by the large majority [27/28] of those who are practically acquainted with cholera, it is not of course intended to deny the powerful influence of other causes—such as [bodily] constitution, mode of living, occupation, age, and so forth. What is meant to be asserted is that, whether the general march of the epidemic be considered, or the progress of it in individual cities and in parts of cities, the main influential cause is connected with locality. . . . In several European countries—in Germany, France, and England—the lines of intercourse have been greatly changed in the interval between the first and last epidemics, between 1832 and 1848. . . . But it is a striking fact that in the midst of all these changes and deviations, the cholera has steadily held its course through one path. So bound is it to definite localities that, with some exceptions, it has so far as Europe is concerned . . . visited and avoided precisely the same countries and the same cities. It has reappeared in the interior of towns on each occasion in its old haunts. It has come back after an interval of years into the same districts and streets. Nay, it has in various instances even revisited identical houses and, it is affirmed, the same rooms. This unmistakable feature of the epidemic is even indicated by its general progress from one quarter of the globe to another, from east to west. Although there are some inconsiderable deviations, the disease observed rigorously the same route, attacking in the same order the same countries and the same cities in 1846–48 and 1830–32. . . .

*Decisive Influence of
Locality*

[29] The general progress of the epidemic . . . in the metropolis has amply illustrated the influence of noxious localities. With some few exceptions, where other obvious causes were in operation, the neglected, filthy, and overcrowded parts have been the special seat of the disease. In order to present a general view of the habitat of cholera, the two following tables have been prepared: The first shows the relative mortality of the epidemics of 1832–33 and of 1848–49 in the superintendent-Registrars'

*Filthy Localities Are the
Special Habitat,
or Seat, of Cholera*

districts; in the second table, these districts are arranged according to the severity of the attack and . . . distinguished according to their relation to the Thames. . . .

[Tables are not duplicated here since data for 1832–33 was approximate and registration districts were not established until 1836.]

In the Appendix to the Report will be found a more important document [No. 1] since it illustrates the weekly progress of the epidemic in the sub-districts during the 60 weeks from 7 October 1848 to 24 November 1849, inclusive, which, for all practical purposes, may be considered as including the whole period of the attack as only three deaths occurred subsequently, the last being registered in the week ending 22 December 1849. . . .

[32] For the construction of an accurate cholera map of the metropolis, it would have been requisite to have obtained the amount of disease in each street. But the expense, delay, and difficulties which this would have involved prevented the realization of an object in itself most important. Under these circumstances, a map has been prepared . . . showing the mortality in each sub-registration district. In the tinting, the depth of which shows the amount of mortality, the assistance of the medical inspectors has been given. Several of the medical officers have likewise kindly given much valuable aid in regard to the affected localities. . . . Several spots are marked, indicating local and circumscribed attacks of great severity. Lines have also been drawn on the cholera map, and sections corresponding to them are represented on a separate map for the purpose of showing the elevation of the different parts of the metropolis above the level of high-water mark, together with the relative mortality, which is indicated by tinting. . . . Of the parishes of Bethnal-green and Shoreditch, more exact maps have been prepared under the direction of Dr. Gavin, resting on his own investigations, by which every death from cholera has been traced, not only to the particular street in which it occurred, but even to the individual house. . . .

[33] By referring to the tinted map of London which shows the . . . precise seat of the mortality in each district, the intimate relation existing between the activity of the disease and proximity of the river will become still more apparent. The dark colour, which indicates the relative mortality, shows, even at a distance, the general course of the Thames. A similar effect was produced by the river Lea as it runs through Hackney union. . . . [34] This relation between cholera and rivers running through large towns has been very generally remarked. Extended observation seems to show that one main cause of it is the large evaporating surface of foul water which is thus formed. It is almost needless to point out that when numerous sewers of a city reach the stream, one part of their contents, widely mingling with a

*Tinted Cholera Maps
for London*

*High Cholera Mortality
Associated with Rivers
containing Sewage*

large body of water, undergoes solution and thus presents a physical condition favourable to its subsequent escape into the atmosphere in the form of mephitic gases. Other portions [of sewage], owing to diminished velocity, sink to the bottom near the edge of the river and thus become deposited on the banks of putrid mud which will, at the next tide, being laid bare to the action of the sun and air, exhale poisonous effluvia. . . .

Whatever may be the other circumstances affecting the inhabitants of river localities; whatever may be their mode of life, the quality of the water they consume, or the nature of their occupation—those who reside on the borders of rivers, whether in cities or small towns, in England or in other countries, become the special victims of cholera. It is difficult to arrive at any other conclusion than that streams polluted by the refuse of large masses of people, so deteriorate the air as to operate in the time of destructive epidemics, when all depressing agents have increased force, injuriously on the human frame and thereby predispose it to attacks of disease.

[35] Another cause operating injuriously on river localities is doubtless their low and damp situation, a condition which particularly applies to the parts of London lying south of the Thames which are built, in fact, upon what was originally a marsh and the drainage of which is still most defective. . . . An interesting diagram published by the Registrar-General shows the average elevation of the several districts, together with the relative mortality, during the 52 weeks ending 29 September 1849. The general result is that the deaths have diminished in proportion to altitude. . . . The rule, however, is by no means rigorously observed. . . . The whole question is one of importance, especially as concerns the site for public institutions, in some of which, owing to a bad selection, a large sacrifice of life has occurred.

In examining the mortality tables and comparing the several districts, one with another, it may excite some surprise to find that localities which combine more noxious influences than others have escaped with fewer losses. . . . [36] Although they cannot in the existing state of knowledge always be satisfactorily explained or understood, they should be regarded like the so-called exceptions in physical and physiological science, and should in no degree be permitted to mislead the observer as to the essential circumstances which determine the active seat of the disease. A country or city may escape, although it contains spots suitable to the development of the epidemic if the germs of it are sown. Another country or town, perhaps even more healthy, may suffer. Yet it is found that, whenever and wherever the efficient cause of cholera is present, it selects as the special sphere of action but one class of localities. Whether the attack concerns the heart of London, a country village, or even a single group of houses, the general condition of these places will be the same.

*Polluted River Air a
Predisposing Cause of
Cholera*

*Suggestive Impact of
Elevation on Cholera
Mortality*

*Epidemic Law of
Locality Explains
Progress of Cholera
and Typhus*

One of the most constant laws connected with the progress of cholera—which is as evidently dependent on locality as it is inexplicable on the score of human intercourse—is that, when the epidemic makes its appearance in a city, town, or even village, it attacks in groups. The disease seizes on a certain number of courts, alleys, streets, or on a certain cluster of houses, decimates their inhabitants, then ceases and breaks out in a similar manner elsewhere, occasionally returning again to the first locality. All who have seen the disease are familiar with this feature, which exactly corresponds with what is observed in typhus, which often attacks certain houses in towns and cottages in the country. Single farm houses have often been thus elected. In such instances as these—and many very striking ones occurred in London during the late epidemic—the pestilence is often as definitely bounded by locality as if surrounded by an impassable line. And, which is important, when it assaults a fresh locality, it does not do so by continuity, passing from one court into the next adjoining, but it leaps suddenly, so to speak, to some distant place. The same remark applies to different countries, so that we have seen that, at one bound, it has passed from London to Paris, missing the intervening places. There is so much certainty as to this mode of attack that those who are engaged in the management of the epidemic, and especially in house-to-house visitation, must look for it and make their arrangements accordingly. It will not escape observation that, although this peculiarity makes alertness essential, it at the same time greatly facilitates the application of preventive measures, as a staff of medical visitors could be readily transferred, as the occasion arose, from district to district, a procedure which was often adopted by the medical inspectors.

*Law of
Locality Facilitates
Response to Epidemics*

*Cholera Often Attacks
Localities Facing
Certain Directions*

Another and well known peculiarity, which evidently is not connected with persons, is that cholera attacks in certain definite directions, herein again conforming to another member of the zymotic class, the plague. Thus, localities facing in a particular direction have, in India and Europe, suffered whilst others, immediately con- [36/37] tiguous, have escaped. One side of a street, for example, may so suffer and the opposite side be exempt. A remarkable instance of this occurred in Rotherhite, where many of the houses on one side of a street, occupied by respectable, private families, were attacked whilst only one house on the other side suffered. . . .

*Fever and Cholera
Inhabit Filthy Localities*

In proceeding to inquire what is the condition of all those places in which the force of the epidemic is specially developed, a clue will be found in the fact, so clearly established by the researches of the Metropolitan Sanitary Commission, that the habitat of fever and the habitat of cholera are one and the same. So clearly did this great truth appear that, prior to the return of the dreaded epidemic to our shores, the Commissioners did not hesitate to affirm that the typhus track would, on the reappearance of cholera, become the cholera track—a prediction which, amidst all the

seeming capriciousness of the disease, has been but too fatally realized in the late visitation. It is, doubtless, a painful thing to make out, with the demonstrable evidence of statistical returns, all the elementary parts which go to form this common track of sickness, suffering, and death. And yet, as the great desideratum in sanitary, as in all other investigations, is the attainment of certainty, it is a point of infinite promise for the future to demonstrate that, whatever may be the aspect of the epidemic which is traced to its home—typhus, scarlatina, smallpox, or cholera—we find but one class of causes, or to typify the whole in a single word, but one cause, and that filth, standing in the relation of the prolific parent of all this diversified offspring, as it presents itself in the courts and alleys of London. It is not a question of food, for people worse fed than thousands who have become the victims of these diseases, provide they breathe day and night the fresh and bracing atmosphere of the country, escape. [On the other hand,] instances are not wanting of persons amply provided with every physical comfort, lacking only pure air, falling under epidemic attacks. . . . A remarkable example of the latter kind was afforded by an institution in which young women were received for the purpose of reformation. So destructive an outbreak of cholera occurred that, out of 96 inmates, 40 were seized with cholera, of whom no fewer than 15 died. . . . The only reasonable cause that could be assigned was an impure atmosphere caused by the want of ventilation in the dormitories, in several of which the windows had been partly closed up and which were, moreover, much crowded.

[38] It is then in filth, that is, decomposing organic matter, that the main predisposing causes of epidemic diseases are to be sought out—filthy alleys, filthy houses, filthy air, filthy water, and filthy persons. This being so, and as in the spread of zymotic affections, the agency of the predisposing is even more important than the mere presence of the efficient causes, it is evident that sanitary science—when all its capabilities and applications shall have been developed and the resources of filth of every description shall have been obviated—will reduce within comparatively narrow limits a class of disease which so often sets at defiance the powers of medicine, so long as these are only aimed at a curative result. The reports of the medical inspectors abound in facts, derived from every part of the metropolis, confirmatory of the positions here assumed. . . .

[Grainger then summarizes and quotes from Dr. **Gavin's** investigations in Bethnal Green, [East London] where cholera and diarrhoea mortality was particularly high in some streets during 1849.] [39] It is impossible to give in any detail an account of the sanitary state of the localities where such destructive ravages have been committed. A few extracts only are permissible. In alluding to the influenza which prevailed in 1847, Dr. Gavin mentions

*The Filth-Sanitarian
Creed*

Question
If filth is the determinate cause of epidemics, how might Grainger explain why the "respectable, private families" living in houses on one side of a street in Rotherhite were attacked by cholera?

*Decomposing Organic
Matter (Filth) Is the
Main Predisposing
Cause of Epidemic
Diseases*

Hector Gavin: MD, Edinburgh (1836); MRCS, Edinburgh (1843). General Practitioner, with a surgery on Hackney Road in Bethnal Green; surgeon to the London Orphanage Asylum and to British Penitent Female Refuge; lecturer in Forensic Medicine, Charing Cross Hospital Medical School.

*Selected Examples of
Filthy Localities and
Epidemic Disease in
Bethnal Green*

soil: In this context, night-soil, "the excrementitious matter removed at night from cesspools, etc." (*OED*).

night-men: Those who empty cesspools of night-soil, often undertaken at night.

a most elucidative fact. He says, while there was little increase in the usual mortality in the healthy and clean streets, the mortality was quintupled in the unhealthy and dirty streets. Among the principal causes of filth he places the accumulation of solid refuse. Nor can this be a matter of surprise when it is stated that the solid refuse is never completely removed from the premises. In the process of time, the back yards in several localities have by this accumulation been so raised as to be nearly on a level with what might be termed the first floor of the houses.

House drainage is nearly entirely wanting, so that the poor inhabitants are compelled to throw their fluid refuse into the gardens, yards, or streets. As showing the utter neglect of this important point, it may be stated that a few years ago, 1000 yards of sewer were [laid in one street], yet not a dozen houses formed a connexion with it.

Privies.—“One open privy for numerous families, and for 20, 30, or 50 persons, is surely most objectionable, but it is quite a common occurrence. [39/40] In many instances, the **soil** has infiltrated the walls and percolated through into the houses. In some cases the floors have been saturated and have thus been rotted and rendered very quagmires of filth.” The landlords of the poorer tenements very rarely remove the contents of the cesspools, and neglect to do so till compelled by the devastation which the exhalations produce in the form of fever, alarmed lest their property should get a bad name. The poor, left to rot in their filth, sometimes attempt to rid themselves of this nuisance, and fancy they effect it by burying the soil in their yards.

Water Supply.—In some instances the water supply is from wells placed in these yards, so that the water necessarily becomes tainted. In an immense number of instances, no water is laid on, the only supply being a stand-pipe, and sometimes only one of these for 20 or even 30 houses. The supply is as usual, thrice weekly, for two hours at a time. To many houses there is no supply whatever, and the inhabitants beg it, or procure it as best they can. . . .

Nuisances.—There are several serious nuisances, especially **night-men**'s yards, slaughter houses, etc., which greatly deteriorate the air and operate deleteriously in the propagation of cholera.

Bad Construction of Houses.—All these evils are much aggravated in consequence of the houses having been generally built without any regard to levels. When the streets and footpaths are properly made and levelled, the houses are frequently sunk below the surface and thus become excessively damp. The ground floors often resembles underground cellars. Yet, these are the houses which are altogether unprovided with drains.

[Dr. Gavin reports that the Hackney Road sub-district, one of four in Bethnal Green] “exceeds all the others in filth, disease, mortality, poverty

and wretchedness. It abounds with the most foul courts and is characterized by the prevalence of the greatest nuisances and perennial foulness. For many years, this [sub-]district has been notorious as the hotbed of epidemics. This is easily explained when the foulness of the streets, and the nearly total absence of drainage and house cleansing are considered. The [street] drainage is, in fact, characteristic of barbarism. Some of the houses are built over the drains, which are very near the surface. The streets are perpetually covered with the most offensive mud. The population is very dense, as many as 30 [40/41] persons in a single house. Each room contains a family, with a bed common to all; generally, it is a workroom as well as a dwelling-room. Ventilation in these rooms is in the most defective state. The atmosphere is most oppressive and loaded with unhealthy emanations. It is a common practice to retain the fecal remains in the rooms to avoid exposure and the perfect nastiness of the common privies.” . . .

The general result of Dr. Gavin's experience of these evils is thus expressed:—“There is scarcely an exception to the almost absolute rule that, where filth prevails, there cholera locates itself. The more closely I have examined the localities where cholera prevails, the more profound is my conviction of the truth that, with the exception of a very limited number of other predisposing causes—such as emotions of the mind and constitutional debility, predisposition from previous disease, impropriety or abuse of diet—local causes alone determine who shall escape and who shall perish from cholera.” . . .

[42] Specimens of the kind of localities in which the epidemic more especially prevailed in other parts of the metropolis. . . . [56] Instance of Albion Terrace, Wandsworth Road.—Dr. Milroy has given another important report relative to one of the most severe outbreaks of cholera that occurred in the metropolis . . . This place consists of 17 houses, letting for 50£ and 60£ a year, and having the appearance of commodious, comfortable dwellings. Calculating seven persons to each house, the total population would amount to about 120 persons. The first case of cholera took place on 28 July 1849 at no. 13. Up to 12 August, no fewer than 42 cases occurred, of which 30, or 71.4 percent, proved fatal. It is evident that there must have been some unusual circumstances to explain this awful mortality. And the information obtained by Dr. Milroy shows very unequivocally what these circumstances were:

“About 200 yards in the rear of the terrace is an open black ditch, known as the ‘sewer in Battersea fields,’ which receives the drainage from Clapham, Streatham, and Brixton Hill. The inmates of several of the houses complain of offensive effluvia perceived in their gardens behind when the wind sets in a particular direction. But it would seem that there is a source

*Cholera Locates Itself
Where Filth Prevails*

*Dr. Milroy's Reports
on the Albion Terrace
Outbreak*

of foul exhalations much nearer the dwellings than this black ditch. In almost every house, the servants complain of a stench in different parts of the kitchen [level] floor, and more especially over the sink in the back kitchen. [56/57] This nuisance, always present to a greater or less degree, became much worse immediately after the heavy storm of rain on 26 July. At the very same time the water was found to be, not only muddy, but positively fetid so that it was unfit for use.

“Besides the effects of the late storm, . . . a drain or sewer, which crosses the Wandsworth Road and passes under no. 8, burst open on the evening of 26 ult. [July] and inundated the whole of the lower premises of that and of the adjoining house, no. 9, with its black and fetid contents. The cellars of these houses are still damp and offensive. There was another and most pernicious source of insalubrity that is still more to be deplored, seeing that it might have been so easily prevented. I allude to an enormous accumulation of most offensive rubbish in a cellar of no. 13. It appears that this accumulation must have been going on for 18 months or a couple of years at least as, when removed on the 30th or 31st ult., it amounted to seven or eight cart loads of what is described as a most disgusting compound, swarming with maggots and exhaling a putrid effluvium.

“It was at this house, no. 13, that the first case of the fatal disease occurred on 28 July in one of the servants, who had been affected for a day or two previously with diarrhoea and had not attended to it. Her sister, who had come from the country to nurse her, was seized a few days afterwards and also died. Most of the members of the family were affected with diarrhoea. They had gone to the country and the house was deserted [when Milroy made his inquiries]. About the same time, the disease began to manifest itself in other houses of the terrace, in many instances with terrible virulence. The entire household of no. 6 has been swept away.”

The nature of the water supply is very important. On this, Dr. Milroy remarks: “The whole of the underground arrangements for the supply of water to, and the removal of the drainage from, the houses was found to be most faulty and imperfect. The suspicion expressed in my former report that the water tanks or cisterns and the cesspools were in close proximity to each other, and that the water in the former had become contaminated with the contents of the latter after the heavy storm of rain on 26 July, proved on examination to be correct.”

The influence exerted by graveyards in the development of cholera is intimately connected with the point under consideration. . . . Abundant evidence has been connected, especially by Dr. Milroy, to prove that in the metropolis the most offensive putrid effluvia escape from the burial grounds. These are predisposing causes of disease, especially of fever, disturbance of

the alimentary canal, and of various affections depending on the poisoned condition of the blood, that in the houses immediately adjoining these places cholera was observed to prevail. It is known that a most distinguished surgeon, whose valuable life fell a sacrifice to the late epidemic, resided in a house [in which] the back windows looked directly into a graveyard. He was much in the habit of sitting at these windows when opened. He complained to his servant several times shortly before his attack of the offensive smell proceeding from the burial ground, in which some cholera corpses had been interred. On the very day of the fatal seizure, a grave had been dug which attracted his attention as having increased the noxious effluvia. [57/58]

The enormously overcrowded and filthy condition of the common lodging houses of London is well known to the parochial authorities, among whom, so far as I have made inquiries, there is a general wish that they should be improved, inasmuch as they are a known source of epidemic disease as well as of every species of moral contamination. . . [Examples follow of severe overcrowding (20 persons in a room, 12 feet square, etc.), filth, and overpowering stench reported by medical visitors and Poor Law Guardians]. [59] It is essential to point out that these common lodging houses are not only, in all seasons, a cause of disease to their unhappy and neglected inmates, and of a heavy pecuniary loss to every parish where they exist. They often prove a source of direct infection to the surrounding districts. It is well known to the parochial medical officers that they are a hotbed of fever of every kind, often of a virulent and contagious nature. . . . I have obtained evidence which shows that [smallpox] is very frequently introduced among the permanent inhabitants of populous districts of the metropolis by unvaccinated [59/60] sojourners, especially new-comers from Ireland. . . . There is at present no efficient legal power to regulate common lodging houses in the metropolis. Although some control is given by the Nuisances Removal Act to the Guardians of the Poor as to cleansing operations, the prime evil of these places, overcrowding, is left untouched. . . .

Owing to the increasing and urgent demand for house accommodation for the poor in every quarter of the metropolis, it has become the practice in many decent and respectable streets . . . for the occupier to [rent] to separate families the underground kitchens which, it must be understood, were originally never contemplated, as assuredly they are unfit, for human habitation. . . . [On room Grainger visited was six feet below street level; [its] height, 5 feet 6 inches; [had] one window, 3 feet 3 inches by 2 feet [60/61]. . . . In the small sunken area, there was a drain from which proceeded the foulest stench I think I have ever smelt. Close to this drain was a water butt, the contents of which must of necessity have become tainted by absorbing the noxious gases emitted.

In a very small sunk court behind were a foul privy and heaps of

ult.: Ultimo, the preceding month. Milroy first investigated Albion Terrace in August 1849.

Question
Could Milroy consider water contaminated by cesspool drainage a presupposing cause of cholera in the terrace without necessarily accepting Snow’s hypothesis (Document 3)?

See Grainger’s physiological explanation of the “evils of defective water supply” on p. 91.

Graveyards

Common Lodging Houses as Contagious Fever Nests

Inhabited Cellars

phthisis or consumption: Pulmonary tuberculosis, “progressive emaciation or wasting away” (*DMS*).

refuse. In this kitchen, which in the broad daylight was so dark and gloomy that it looked like a cell, lived a man and his wife and five children. As the cubic space equalled about 580 feet, the allowance to each person was about 83 cubic feet, or one-sixth of that which, at the lowest estimate for sleeping rooms, is compatible with health. One of the children was ill from inflammation of the chest, the others looked sickly, whilst the mother of this unhappy family had been removed to the workhouse, labouring under **phthisis or consumption**—a disease which depends more frequently on breathing a foul atmosphere than any other one cause. With the light thus excluded, the air tainted, and the water poisoned, the vital forces are so reduced that when any disease arises, medicine loses its powers. . . .

[63–64] Progress of cholera in barracks of the metropolis.

[64–70. Prisons in the metropolis, two of which (Bridewell and the Model Prison at Pentonville) were constructed “on sanitary principles” and had no cholera. But Giltspur Street Prison was totally exempt from cholera, and Newgate very nearly so, although] “these prisons [were] situated in the very heart of the metropolis and at no great distance from a district which suffered severely” . . . [68–69].

[70–73] Cholera in Public Asylums.

[73–74] Progress of cholera in workhouses.

[74–83] Exemptions from the epidemic and the results of sanitary improvements in Berlin, Hamburg, and London.

[77–81] Model Lodging Houses and Buildings.—Among the illustrations [or exemptions due to application of sanitary principles], none are of such a special and instructive character as those furnished by the various model establishments provided for the labouring classes. . . . These institutions are . . . by their beneficent and enlightened founders, erected for the express purpose of testing and demonstrating . . . the direct influence of structural arrangements and sanitary precautions in mitigating the ravages of disease. These buildings receive labourers and artisans of various occupations; persons of all ages, from the infant at the breast to aged widows, are received. The establishments are situated in diverse quarters of the metropolis, several of them in the lowest and unhealthiest districts. . . .

[81–83] Exemptions in public institutions. . . .

[83] The following observations refer strictly to the secondary and predisposing causes, or, in other words, to those conditions which, by favouring

Model Lodging Houses
Examples of Proper
Sanitary Principles

Predisposing, or
Secondary, Causes of
Cholera

the action of the essential and at present unknown cause, tend to the reception and spread of the disease. . . . In glancing over the multitudinous forms of disease to which the human body is subject, it soon becomes apparent that, although secondary or predisposing causes are most important in all, their influence is specially operative in the great zymotic class to which the various forms of fever, as well as cholera, belong. Observation and experience have further shown that in this class, the predisposing causes are more susceptible of detection and, which is still more important, of removal than in more ordinary and sporadic diseases such as inflammation of the lungs, stomach, or brain. . . . [84] The predisposing causes [in zymotic diseases] are, to a great extent, external to the body and thus open to investigation. . . . Some of the most valuable evidence obtained during the late epidemic is that relating to the various circumstances which favoured its extension, or the predisposing causes of the affection. . . . It will now be proper to consider them individually, so far as sanitary measures are concerned and to explain in what way they operate injuriously on the human body. . . .

The quality of the air which is habitually breathed is a matter, before all others, of supreme importance to health. . . . It may appear almost incredible that by many persons, even of the middle ranks of life, the foul exhalations of privies, stables, and cow stalls are deemed to be innocuous, or even beneficial. . . . [85] Even by many of those who have paid some attention to the sanitary question, the grosser and more palpable contaminations of the air of towns by smoke has attracted more general attention, and has given rise to more stringent legislation for its removal, than the infinitely graver evils arising from those subtle, invisible, but all-powerful effluvia proceeding from decomposing organic matter, whether animal or vegetable, which . . . lay the foundation for those diseases which so frequently debilitate or destroy numbers of the labouring classes. . . . Thus, if an animal breathe an atmosphere containing an injurious amount of poisonous gas [such] as carbonic acid, sulphuretted hydrogen, chloroform, etc., the gas is taken up by the blood, . . . carried into the very substance of the vital organs, and either seriously affects the system or destroys life. . . . There are several ways in which aerial contamination may be caused so as to predispose to disease: . . .

Overcrowding is a relative term. It has reference not simply to the absolute number of individuals lodged in a given cubic space, but . . . to the means of renewing the air. A comparatively small number of persons may be injuriously crowded in a large room wanting ventilation, whilst a larger number may safely occupy even a smaller apartment, provided proper precautions be taken. . . . [86] Of all the causes which predispose to preventable disease, the most influential and deleterious, so far as my observations extend, is overcrowding. . . .

[87] Next in order as to the extent to which it prevails and the evil

Debilitating Effects
from Inhaling a
Poisonous Atmosphere

Overcrowding Is Chief
Cause of Preventable
Diseases

Privy Atmosphere
Nearly as Dangerous

results produced is, in my experience, what may be called “the privy atmosphere” arising from neglected privies and overflowing cesspools, which abounds in poisonous gases (sulphuretted hydrogen being one of the most abundant and deleterious). A large body of evidence . . . distinctly proves that persons habitually exposed to such an atmosphere are thereby predisposed . . . to fever and other sickness. In courts and alleys, those persons who reside in the houses immediately adjoining foul privies—all other circumstances as to food, lodging, etc., being equal—suffer more from typhus than other inhabitants. So much is this the case that houses so situated have [87/88] been pointed out to me by the medical officer as being the constant seat of fever, families after families coming to reside in them, and all in succession being attacked.

Many facts induce me to believe that the action of the bowels is particularly prone to be disturbed by breathing privy air, and that this is the most common cause of the diarrhoea so generally prevalent among the poor of crowded cities. Night soil must be regarded as consisting essentially of decomposing animal matter. The gaseous products of such matter will induce severe diarrhoea, as has been proved by a number of well-marked cases. . . .

[90] A supply of water, unlimited, pure, and of suitable qualities, is one of the prime and essential conditions of health. . . . It is essential as an article of food. It is necessary to personal cleanliness. It is essential to external cleansing, whether of houses, streets, water closets, or sewers. . . .

[91] It has been proved by unquestionable evidence that the water used by the poor of London, and even by many of the higher class, is contaminated in various ways by decomposed organic and noxious matter; by the absorption of deleterious gases when kept in tanks, butts, and tubs; by percolation into wells of the contents of cesspools, graveyards, drains, etc.; [and] by the original impurity of the supply, as in the case of the water taken from the Thames by so many of the water companies. . . . It is one of the most familiar truths of physiology that . . . all matters dissolved in [water] are taken up . . . by the blood vessels of the alimentary canal Thus, a second great inlet is established by which injurious substances in a liquid form . . . find their way into the circulating blood, [just] as noxious aerial agents do by way of the respiratory apparatus. . . .

[92] In populous localities, the different causes of unhealthiness are so combined together as to render it difficult to demonstrate their isolated influences. In the [previous] section on the habitat of cholera, several well-marked instances are given, however, in which it is difficult to arrive at any other conclusion than that the use of water polluted by decomposing organic matter acted intensely as a predisposing cause. Such a case is that of Silkmill Row, Hackney, where those persons only who made use of the filthy

Evils of Defective Water Supply

Ingestion of Impure Water Is Second Portal of Entry for Cholera and Other Injurious Substances

water were attacked with cholera and diarrhoea, whilst the other inhabitants, who were supplied from other sources, escaped. . . . Albion Terrace, Wandsworth Road, and the locality first attacked at Rotherhithe are, in my opinion, similar instances. In one court (Surrey Buildings, Horsleydown), consisting of 13 small houses, each generally occupied by one family, no fewer than eight deaths occurred in one week, and another in the ensuing week. All the houses were supplied with water from a sunken tank, the edge of which was even with the pavement, so that the washings of the court ran into it. In another court, in Lambeth, two most severe cases of cholera having occurred, the surgeon was induced to examine the water supplied by a pump. He found it discoloured and so foul that “it stank at a distance of the contents of a cesspool.” The piston of the pump was removed, and no other case of cholera occurred in the court up to the date of the report recording this case. . . .

[Mr. Walsh, a medical inspector, visited] a well known and miserable locality called Jakob’s Island, . . . “the name given to a portion of the parish of Christchurch, Bermondsey. It is surrounded by the tidal ditch or mill stream. In the island and on the banks of the ditch are 300 or 400 houses, inhabited chiefly by persons employed in the wharves and shipping, called long-shore men, and their families The drains and sewers of all the houses that are drained empty themselves into the ditch. The refuse of the neighbouring houses and the contents of their privies are also thrown into the almost stagnant water. . . . One hundred and fifty of the houses have no water supply whatever. When I first visited here in August [1850], many of the inhabitants were in the habit of using the water [in the ditch] for cooking and other purposes. Nay, had even drunk it unboiled during the heat of the summer. Some of the houses are totally unsupplied with water from any other source than the ditch. A few have wells which communicate with it. The analysis shows the immense quantity of organic matter which it contains. Some of the water bottled in November [1850] was opened this week [92/93] (30 March 1851); the stench is unbearable. . . . The following analysis . . . will demonstrate the quality of this ditch water; other analyses are added for the sake of comparison:

TABLE* showing the Quantity of Organic and other Matters contained in an Imperial Gallon of Water taken from the

	Artesian Wells of		Water-works of Hampstead.	Thames at			Tidal Ditch of Jacob’s Island.
	Grenelle.	Trafalgar Square.		Twickenham.	Greenwich.	London Bridge.	
Organic matter	0·014	1·008	1·97	3·48	4·08	7·0	13·36
Total residue } on evaporation }	9·87	69·40	40·11	22·49	28·04	28·59	37·07

Question
Does Grainger’s view that ingestion of impure water may predispose susceptible individuals to a disease of the blood (p. 91) mean that his assessment of the Surrey Buildings cholera outbreak is closer to Grant (Document 2) than to Snow (Document 3)?

Walsh: Perhaps Charles R. Walsh, General Practitioner. LSA (1830); MRCS (1831).

. . . [94] That the use of such polluted water should not produce the most serious results was impossible. Decomposed organic matter, principally of an animal character, is precisely the agent calculated to induce relaxation of the bowels, a most pernicious thing during epidemic cholera, and which has in a multitude of instances led to an attack. . . .

In regard to the pipe-water supplied by the water companies, this being so generally used, it is impossible to demonstrate its injurious influence by special instances. But, as it is known that this water abounds in impurities and that even, as Dr. **Hassall** has demonstrated, the water which is submitted to filtration before it is delivered to the public still contains much solid organic matter, no other inference can be formed but that such water would be liable to disturb the bowels, especially during an epidemic as cholera. In this way it would act as a predisposing cause of the disease. Nor can there be any doubt, recollecting how actively water absorbs noxious gases, that the use of open tanks, tubs, etc., would, by promoting such absorption and by exposure to the atmosphere favouring decomposition, increase the evil, especially in poor and crowded localities. It also a point of vast importance to be understood that . . . organic substances completely dissolved, and in the condition precisely adapting them for absorption into the blood, are not removed from water derived from a foul source . . . by filtration. . . .

[95] Independently of the evil consequences following the internal use of impure water, the want of an ample supply of water as regards personal cleanliness has, in various ways, a marked influence on the health of the poor in large towns. . . .

With respect to the supply of water for the purposes of external cleansing, the necessity of this is generally recognised. Without an unlimited supply, the filth cannot be washed from courts and alleys, even when the expense of **flagging** them has been incurred. Drains and sewers wanting such a supply invariably, and of necessity, become loaded with foul deposits. Nor, in the absence of this prime sanitary requirement, can the disgusting cess-pools which are an unceasing and most active source of disease, be replaced by water closets.

Abundant evidence was afforded during the late epidemic that habitual drunkards were highly predisposed to cholera; of them, a large number perished. Occasional excesses also led to a vast number of attacks. . . . [96] Excess either in drinking or eating, particularly if improper food was used, such as pork, cabbage, etc., being followed by attacks . . . There is no doubt that many attacks of cholera were also indirectly induced by defective nourishment and by the use of improper food among the more destitute part of the population. . . . In weighing the influence of the predisposing causes noticed in this section, it must be borne in mind that during the epidemic,

when at all active, great multitudes of persons are in a state in which the slightest possible cause will turn the balance. Many instances were related to me where a sudden fright brought on an attack. . . . There is no doubt that many attacks were brought on by grief, attending a relative suffering from the epidemic, **night-watching**, etc., which were often attributed to **direct infection**. In fact, the most trifling circumstance, bodily or mental, was often sufficient to give a fatal force to the efficient cause of the disease. . . .

[97] One of the most fundamental questions of the whole inquiry concerns the primary seat of the disease, a question which has been answered principally in three ways: 1. It has been affirmed that one or other part of the nervous system is the true seat of the disease. 2. By another and more numerous class of observers, it is said the alimentary canal, and especially the small intestine, is the part primarily affected. 3. The last and more prevalent doctrine is that according to which cholera is a disease of the blood.

The first of these opinions has many advocates, especially among the Russian physicians. . . . These views have been received with little favour either in England or on the Continent [Europe]. . . .

[98] It is not surprising that the intestinal canal should, by many observers, be regarded as the part primarily affected in cholera. The vascular injection of the mucous membrane, the enlarged state of the glands, the enormous discharges, and the important changes in the epithelium—all these are such striking phenomena as would naturally lead to such a conclusion. But, as so often happens in analogous instances, these obvious features of the disease would seem after all to be but secondary, depending on certain antecedent and essential changes which they mask and conceal. . . .

[99] As regards the doctrine which teaches us that cholera is a blood disease, it may be remarked that it is advocated by many of the most distinguished pathologists in Europe who have examined the subject. Further, it is in strict keeping with modern physiology. If, as is generally admitted, cholera depends on some aerial agent, it is certain that such would, of necessity, first operate on the human body through the way of respiration and on the blood. The incessant introduction of atmospheric air into the lungs and the well-ascertained fact . . . that the blood, as it moves through these organs, has in itself no power of selection; it absorbs even the most deadly poisons, provided they are presented in the gaseous form. [There is also] the analogy afforded by the production of intermittent and remittent fever from the respiration of a malarious atmosphere, and by continued fever being caused, either directly or indirectly in the way of predisposition, by the inhalation of certain effluvia mingled with the air. These are [the] circumstances which tend [99/100] powerfully to corroborate the view here advocated and to demonstrate the supreme importance of, in regard to the

night-watching: Sitting with a sick person during the night.

direct infection: Contagious propagation by inhalation of emanations from a cholera victim; effluvial infection.

Potential Primary Seats of Cholera

Nervous System

Alimentary Canal

Grainger Considers Cholera a Blood Disease

Arthur Hill Hassall: General Practitioner and expert in microscopy. MRCS (1839); LSA (1841).

Water Contaminated by Decomposing Organic Matter a Predisposing Cause of Cholera

flagging: Paving with flag(flat)stones.

Drunkenness, Excesses, Bad Food, and Fright as Predisposing Causes of Cholera

healthy condition of the body, of the quality of the inspired air. . . .

The view here advocated is, then, that which attributes cholera to a poisoning of the blood, and which regards the profuse discharges as an effort of the *via medicatrix naturae*, the various morbid changes in the intestines and other organs being strictly of a secondary character. To those who do not well consider the forcible efforts so often made to remove even a local source of irritation, as daily seen in [100/101] surgical practice, and the large amount of liquids required to carry out of the system excretory matter, this may perhaps appear an unlikely explanation. But if, as is the conviction of so many pathologists, the whole mass of the circulating fluid be poisoned in cholera, an effort at **deparation**, commensurate with the extent of the morbid change, would obviously be demanded.

In considering this theory, the character of the blood in cholera, and the nature of the discharges poured into the stomach and intestines, become points of much interest. Animal chemistry is not sufficiently advanced to reveal what is the essential change induced in the blood. . . . It is essential to recollect that almost every analysis yet made relates to blood taken from patients after severe purging and vomiting had occurred, usually when collapse had supervened and sometimes, even, after death. . . . Thus the blood of cholera patients is thicker, tar-like, and less coagulable. It contains less water and more solid matter than is normal. . . . It is much regretted that the attention of chemists has not been directed to the condition of the blood in the very outset of the attack, that is, on the first occurrence of the premonitory symptoms. . . .

[103] The valuable reports, both of the Metropolitan Sanitary Commission and the General Board of Health, distinctly prove the general existence of a premonitory stage in cholera, consisting of diarrhoea. But . . . there is still some difference of opinion among medical practitioners on several points connected both with the extent and signification of the diarrhoea accompanying an outbreak of cholera.

It has often been said that persons, particularly in India and other places where the efficient cause operates with intense force, are occasionally struck down as by a cannon ball. Many such cases were reported during the late outbreak in London, persons having sometimes fallen down in the street in collapse, having been suddenly seized at their work or whilst at home, especially early in the morning. In these instances, it was often stated there were no premonitory symptoms, the individuals being (as it was affirmed) in perfect health up to the very time of the attack. The result of extended inquiries and observations, induces me to doubt if any case whatever of collapse occurs without a premonitory stage. But in advancing this opinion, it is not meant to be asserted that diarrhoea is the invariable

precursor. There are many other, though less obvious, signs of the coming attack . . . [104] —depression of the spirits, loss of appetite, uneasiness about the bowels and an inclination to go to stool, but without effect; dizziness, noises in the ears and other disturbance of the sensorium; . . . uneasiness in the legs, with slight twitching or spasms which, for the most part, preceded the profuse evacuations and evidently indicated the approaching cramps. . . .

The phenomena just enumerated are some of the indications of the disturbed state of the system prior to the full development of cholera, to which during the prevalence of the epidemic attention should be paid, both by the patient and the medical practitioner, as warnings of the mischief which may follow unless warded off by prompt treatment. But the general precursor is, as is well known, diarrhoea, often accompanied with vomiting and other symptoms such as spasms, sinking, and coldness of the surface. . . .

[104–15. Extracts from reports on premonitory diarrhoea, including influence of diet and various treatments.]

[115] Notwithstanding the various measures adopted by the authorities to advertise the poor of the necessity of early application, patients were, as a rule, first seen by the medical officers when in collapse. This unhappy result was dependent on several distinct causes The most generally operative of these causes was unquestionably ignorance of the connexion between looseness of the bowels and cholera. This prevailed far and wide, as is indicated in the reports of the visitors. The apparently slight nature of the attack, and especially *the absence of pain*, lulled thousands into a fatal apathy and security. . . .

[116] Another very fertile source of neglect was the aversion felt by a large class of the poor—more especially in the more populous and impoverished districts, whose straitened circumstances at the same time made it difficult for them to pay for medicine and advice—to apply for parochial medical aid. This feeling which, according to the reports of the visitors, is most deeply seated, appears to depend on several causes: the loss of time, and consequently loss of wages, in procuring orders and obtaining medicines; the unkindness shown in some instances by petty parish officials; and the conviction that the medicines furnished are selected rather for their cheapness than their efficiency. . . . [117] Another and deeper feeling is that strong aversion existing among the independent and industrious poor to the receipt of any aid which may seem to convert them into paupers. In some parishes, the necessity of obtaining an order was entirely suspended. In many others, however, orders were still required, and this operated most injuriously in repelling those who were in want of medical aid. . . .

[118] A large number of diarrhoeal attacks must have been ne-

via medicatrix naturae:
Nature's way of healing.

deparation: Unable
to locate a definition;
perhaps a variation on
departure; perhaps a
typographical error.

*Premonitory Stage
of Cholera Definitely
Exists, but Symptoms
May Vary*

*Diarrhoea Most
Frequent Symptom of
Premonitory Stage*

*Why the Poor Often
Neglect Premonitory
Symptoms*

Other Reasons for Ignoring Premonitory Symptoms

glected, almost of necessity, by persons being seized when engaged at their work and when absent from home. These persons, returning in the evening, usually delayed obtaining aid and were usually seized in the night with cholera. Whilst others, attacked with diarrhoea in the early morning just before going to their daily vocation, could only have obtained medical advice by sacrificing a part of a day's employment. In this way, numerous cases were neglected, often with the most fatal results.

Various other subordinate causes led to the neglect or concealment of diarrhoea, even when express inquiries were instituted. Thus, in work-houses the fear of being placed on sick diet operated in some instances Adopting the plan pursued in India where, when cholera breaks out among the troops, sentinels are placed over the privies to detect anyone suffering with diarrhoea, I advised that the water closed should be watched. On the first day, several persons with relaxation were thus discovered. . . .

[119] If our poorer fellow-citizens are to be guarded by sanitary measures against the never-ceasing ravages of typhus, small pox, and other destructive but preventable diseases, a desideratum infinitely more important than protection from the occasional invasions of cholera, some more efficient machinery than has hitherto been employed must be devised. . . .

As London and its vicinity are excepted from the operation of the Public Health Act, all the measures calculated to arrest the progress of cholera in the metropolis depended on the Act for Removal of Nuisances and Prevention of Contagious Diseases. The provisions of this enactment, so far as the Board of Health is concerned, apply so long only as they are put in force by an order of the Privy Council, which order must be renewed every six months. When thus in operation, the General Board is authorized to issue such regulations for the prevention or mitigation of epidemic, endemic, or contagious diseases as the Board shall think fit. They are further empowered to require the guardians of the poor to put such measures into execution. But in connexion with this point, it is necessary to explain a circumstance which led, in various instances, to the most injurious results.

This enactment not only contemplates the **guardians of the poor** as the executive body for the removal of nuisances and cleansing of streets, etc. Various other local authorities are named, such as the town council, trustees or commissioners for draining, paving, lighting, and cleansing any city, town, borough, or place; and also commissioners of sewers. Divided powers, and consequently a divided responsibility, are thus created. And, as in most of the metropolitan unions and parishes there exist, independently of the guardians of the poor, such local bodies for paving, lighting, and other purposes, it is not surprising that, when regulations were issued by the Board of Health, [those] related to external cleansing and the removal of nuisances

Flaws in Current Public Health Act for Implementing Sanitary Measures

guardians of the poor:
A local authority in parishes reorganized as Poor Law Unions. Governors and directors of the poor served as the equivalent authority in parishes with temporary exemptions.

were considered by the guardians as appertaining to the authorities specially charge with such matters. It is true that the Act provided that, where there is default or delay in the execution of the regulations by the bodies above named, the responsibility shall fall on the guardians. But in the absence of any officer or officers to see to the execution of the directions of the Board of Health, the enforcement of them was, under such circumstances, difficult or, rather, impossible. The following is a case in point.

On 19 November 1848, [119/120] up to which time seven deaths from cholera had taken place in the Whitechapel Union, the guardians received from their local medical officers lists of places where epidemic and infectious diseases had lately prevailed. Upon which, the Board resolved that their clerk should communicate the particulars of these reports to the respective local boards and inform them that it became their duty to cleanse the places referred to every twenty-four hours. On 21 December, when, in consequence of 20 additional deaths having occurred, I visited this union, I found on carefully inspecting it that almost all the courts were still in a very dirty and filthy state. In many of them, foul water and black mud were accumulated and **ordure** lying about, so as still further to infect the air. The privies were in a most disgusting state and totally unfit for the use of human beings. And that, among many other nuisances, [there] were two dung heaps . . . where there as at the time a case of cholera, and which had been reported several times to the **beadle** by the medical officer, but without leading to the removal of the evil. . . .

It is also to be borne in mind that the Act of Parliament had only just come into operation (on 4 September 1848), and that the General Board of Health was scarcely formed, when cholera broke out in London. Various new and important measures were to be instantly adopted and carried into effect by **unpaid authorities** not accustomed to such proceedings and occupied, moreover, with other and onerous duties in respect to the relief of the poor. . . . But they might, by zeal, have been overcome and cannot be received as a valid reason for the great and general neglect of sanitary measures during the late epidemic. Independently of [these] difficulties, others . . . arose from the unfitness of the authorities charged with the administration of the Act of Parliament for the duties imposed upon them. By that enactment, various measures are prescribed which interfere with private interests, and especially with [120/121] interests which, in all parishes but particularly in large and populous ones, are largely represented in boards of guardians. For example, in many instances owners of small houses and cottage property, to which class of dwellings the provisions of the Act more particularly apply, are themselves members of such boards. When this is not the case, they can exert an influence not the less powerful because it is indirect. This interest often conspired to impede efficient sanitary measures,

ordure: Excrement.

beadle: A parish bailiff.

unpaid authorities:
Guardians were elected volunteers; Governors and directors of the poor were unpaid members of parish vestries.

even in cases where there was a general wish among the local authorities to effect improvement.

As the boards of guardians are subject to annual election by the ratepayers, an inclination to economize parish funds, as far as possible, is a natural and obvious result. This feeling was unhappily allowed to very generally operate during the prevalence of cholera whenever the question was mooted as to the adoption of the several proceedings indicated by the Board of Health as essential for the protection of the public health. Local interest even operated when cholera actually prevailed in a parish. The great apprehension was that, if active and really efficient measures were adopted, the trade of the neighbourhood would suffer. In one instance, when the epidemic had extensively prevailed among the poor, its existence was denied and house visitation resisted. After considerable delay and loss of life, a number of shopkeepers were attacked by the disease and all opposition ceased.

Another obstacle arose from the absence of that knowledge which is indispensable to the superintendence and execution of a code of sanitary regulations. . . .

Throughout the epidemic, another great evil arose from the delay imposed with respect to active measures of relief. The boards of guardians usually meet once a week. Till towards the close of the disease, no arrangement was made to secure more prompt action. [121/122] Owing to this circumstance, and to other sources of delay, much valuable time was lost in all parts of London which, in such a pestilence, was equivalent to a considerable sacrifice of life.

The last and the most influential of the causes which operated injuriously during the late epidemic . . . was the want of proper power on the part of the medical officers of the several unions and parishes, on the one hand, to initiate and carry out those general and enlightened measures of sanitary improvement by which the progress of the epidemic might have been controlled. And, on the other, to provide suitable aid for the relief of the persons actually attacked. The Act of Parliament gave no power to the parochial surgeons to act without the previous direction and sanction of the guardians. . . .

The powers bestowed on the General Board of Health by the Nuisances and Contagious Diseases Act are of a two-fold order. The first, and by far the most important for they strike at the very root of the evil, are those which relate to the removal of nuisances, the cleansings of streets, alleys and courts; the cleansing, purifying, and whitewashing of all dwelling houses; the cleansing of foul drains, ditches, and cesspools; in fact, the removal of all causes injurious to the public health, so far as they come within the operation of the Act. The powers and duties of the second class relate to the limitation and prevention of epidemic or contagious diseases. {However,} . . .

in any parish or union, the guardians are required to provide such additional medical officers and to adopt such other measures as may be needful. Ample powers were given [the guardians] to enforce these measures. If, for example, the owners of houses neglected to put them into a proper state, the guardians could order the necessary works be done and compel payment. Or, if the owners were too poor to pay, then the expenses could be charged to the poor rates, out of which were also to be defrayed any outlay rendered necessary for cleansing streets, courts, and alleys. . . .

[122–145. Examples of General Board of Health regulations and orders not executed by various metropolitan boards of guardians.]

[145] The Metropolitan Sanitary Commission, to which body the members of the Board of Health were attached, had prior to the arrival of cholera in this country collected some most important evidence showing the great success that had attended the early treatment of premonitory diarrhoea at Bilston in 1832 . . . [146] The main feature . . . was the opening of a dispensary for giving early assistance to persons labouring under bowel complaints, a measure always of great importance. At Bilston, [this approach] had a most marked and immediate influence in putting a stop to the ravages of cholera.

It does not appear that any system of house visitation, the only complete plan of procedure, was established [at Bilston]. The merit of devising [this approach], as well as fully realising the great principle of seeking out and promptly treating the epidemic in its first stage, is due to the General Board of Health. It is right to state that when, in October 1848, the whole procedure was by the General Board reduced to a system, nothing of the kind had been attempted in Europe. On visiting Berlin and Hamburg, I found no method adopted for the seeking out of the epidemic in its first stage. All the arrangements of the authorities were directed, not to preventive treatment, but to the provision of medical aid when it was sought for by the people. It is also remarkable, considering the great success that had attended the management of the disease [in Bilston], that even in this country no efforts commensurate with the supreme importance of early treatment were made to secure it. . . . There was, in the highest ranks of the medical profession in the commencement of the epidemic, considerable scepticism as to the value of preventive treatment in the diarrhoeal stage. . . .

It was the earnest desire of the General Board of Health that, from the very commencement of the epidemic in 1848, the system of house visitation should be vigorously put into operation throughout the country. In Scotland, . . . the instructions of the General Board were promptly and zealously adopted by the local authorities with the happiest results. . . . Ef-

Dispensary Model for Treating Premonitory Diarrhea

House-to-House Visitation Model

Epidemic Exposed the Insufficient Authority of District Medical Officers

fectually to have applied the system to London, the various districts of the metropolis ought to have been regarded as so many smaller towns, and in each of these a complete machinery should have been provided: a medical superintendent, medical visitors, nurses, dispensaries open day and night, houses of refuge, and a limited number of hospitals judiciously placed in different parts of the metropolis. But nothing of this efficient character was attempted, notwithstanding repeated and urgent representations. . . .

[147] In the last week of August 1849, when the weekly mortality from cholera had mounted to upwards of 1,200, the system was put into execution. This was only partially effected, [however, since] several unions and parishes, among them some of the most populous, refused to conform with the directions of the General Board, whilst in others delays occurred in the appointment of the requisite number of medical visitors. The consequence of all this was that, in some large districts of the metropolis, the system was never applied at all. Even in those parishes where it was adopted, there was not one in which it could be said the visitation was thoroughly carried out. . . .

On 24 August 1849, the General Board . . . engaged the services of [eight] medical men to superintend the system of house visitation in the metropolis. . . . The medical visitors were appointed and paid by the unions and parishes, their number being determined, [based] on the reports of the inspectors, by the General Board. With some few exceptions, these gentlemen were legally qualified; a few senior [medical] students were selected where difficulty was experienced in procuring members of the College of Surgeons or the Society of Apothecaries. . . . The ordinary payment was **4£**, **4s** per week, and for this remuneration it was required that those engaged should give up their whole time, the period devoted daily to actual visitation being usually about eight hours. . . . In all circumstances, medicine was provided by the local authorities. . . . Little progress was made in actual visitation till the first week of September The last report was published on 27 October, the whole period thus occupying about eight weeks. . . .

[148. List of 26 unions and parishes in which visitation occurred, and the seven parishes in which the system was not adopted (St. James, Westminster did not).]

[148–149. Duties of medical inspectors: Determine localities with most cholera; make daily lists of streets and houses for visitation; give medical visitors their assignments; personally supervise visitation in affected localities; alert local authorities to presence of nuisances, etc.; assign tasks to nurses and inspectors of nuisances; and make daily reports to the General Board.]

[149. Duties of medical visitors for each sub-district in a parish or union: Visit every family in each house on the daily list at least once; administer medicines to anyone suffering premonitory symptoms or cholera (taking charge of diarrheal cases until cured, but transferring cholera cases to district medical officer); to educate public about early symptoms and danger of delay in responding to them; “to inquire into and report on all nuisances, accumulations of filth, overflowing cesspools, houses requiring cleansing, etc.”; to complete daily Visitors Return and submit it to the medical inspector.]

[149–150. Lay visitors appointed in some parishes to assist medical visitors.]

[150–178 . Details, general results, and selected examples (by unions) of house-to-house visitation.]

[178] Having day after day, for months in succession, been a witness of the great evils springing from the neglected sanitary condition of the metropolis, I have felt no choice was left me but to place on record the more important facts respecting it which have been brought before my notice. . . . [179] It is, indeed, one of the great difficulties those who are anxious to ameliorate the condition of the poor experience, that a large part of the influential classes of society now personally so little of the localities and dwellings occupied by them. . . . I have myself never conversed with anyone well acquainted with the subject who was not profoundly impressed with the evils connected with it. The members of the medical profession in the presence of these physical evils when they are, as so often happens, concentrated, find their science all but powerless. The minister of religion turns from these densely crowded and foul localities almost without hope. Whilst the administrators of the law, especially the chaplains and governors of prisons, see that crime of every complexion is most rife where material degradation is most profound. . . .

The time is come when efforts in some degree commensurate with these great and pervading evils can no longer with safety be deferred. Although the higher and middle ranks of society experience a comparative immunity from the ravages of epidemics, . . . it is yet well known that, when these diseases attain a certain intensity, they break through their ordinary barriers and, as happened a few years ago at Liverpool (the most unhealthy city in England), spread death and alarm among even the highest classes. . . . [180] Turning from . . . the selfish view of the question to the fact that thousands of the poor are compelled, owing to the scarcity of one prime necessity of life, to use for domestic purposes, nay, even to drink, water drawn from ditches and wells polluted with the fetid overflowings of cesspools, a motive for the exertions and self-sacrifices of philanthropy is indicated

Medical Visitors

Lay Visitors

Grainger's Closing Remarks

Metropolitan House-to-House Visitation in 1849

4£, 4s: Four pounds, four shillings; see currency in Glossary.

Superintending Medical Inspectors

[Concludes report with expressions of gratitude to several superintending medical inspectors, medical visitors, the person who prepared statistical tables for the report, and the General Board of Health.]

10 June 1850

R. D. Grainger

Grainger's Appendices

[181. List of thirteen appendices]

186–188. No. 5. Dr. Walter Lewis' report on alleged cases of contagion from washing cholera clothing; "in my opinion, not a single case can be proved to be owing to contagion" (187).

194–195. No. 9. Duties of medical superintendents and visitors.

196. No. 10. Sample of daily return of a medical visitor (superintended by Dr. Gavin). [Medical visitors were expected to distinguish between diarrhea, approaching cholera (diarrhea passing into rice-water purging, or rice-water purging passing into cholera) and cholera.]

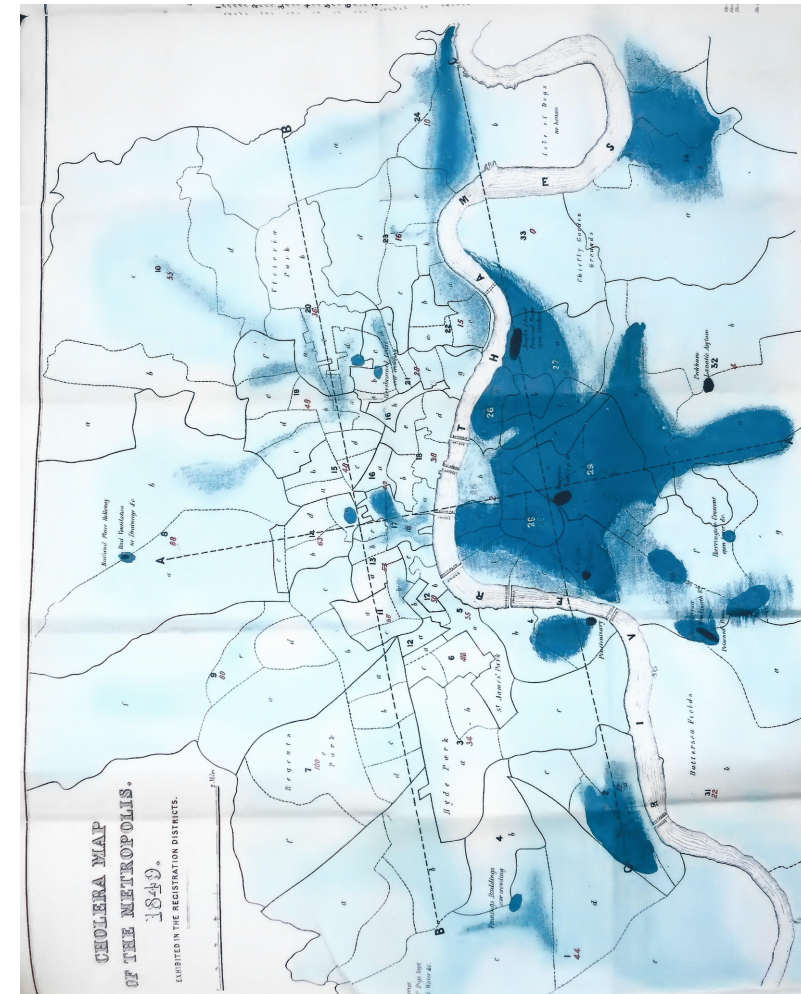
201. Cholera map of Hamburg [frontispiece]. This map, copied from the interesting work of Dr. Rothenburg, which indicates by the depth of the red tinting the severity of the epidemic of 1832, . . . places in striking point of view the predominating influence of locality over the progress of the disease. . . [Dr. Rothenburg concluded:] "The part that suffered least was the western part of the town, which was at that period the airiest and newest portion, and traversed by a greater number of straight streets . . . A closer analysis places in a still stronger light the predominating influence of locality. . . Irrespective of poverty, irrespective even of crowding, . . . among the poor residing in the most unhealthy part of Hamburg, there were five times as many attacks of cholera and nearly four times as many deaths as among the poor living in the most healthy district."

Facing 202. No. 1. Oversized Chart containing GRO *Weekly Returns* of deaths in the metropolis for 60 weeks ending 24 November 1849.

[St. James, Westminster: Berwick Street (21; 1841 population, 10,449); Golden Square (22; 1841 population, 13,612); St. Anne, Soho (49, 1841 population 16,480).]

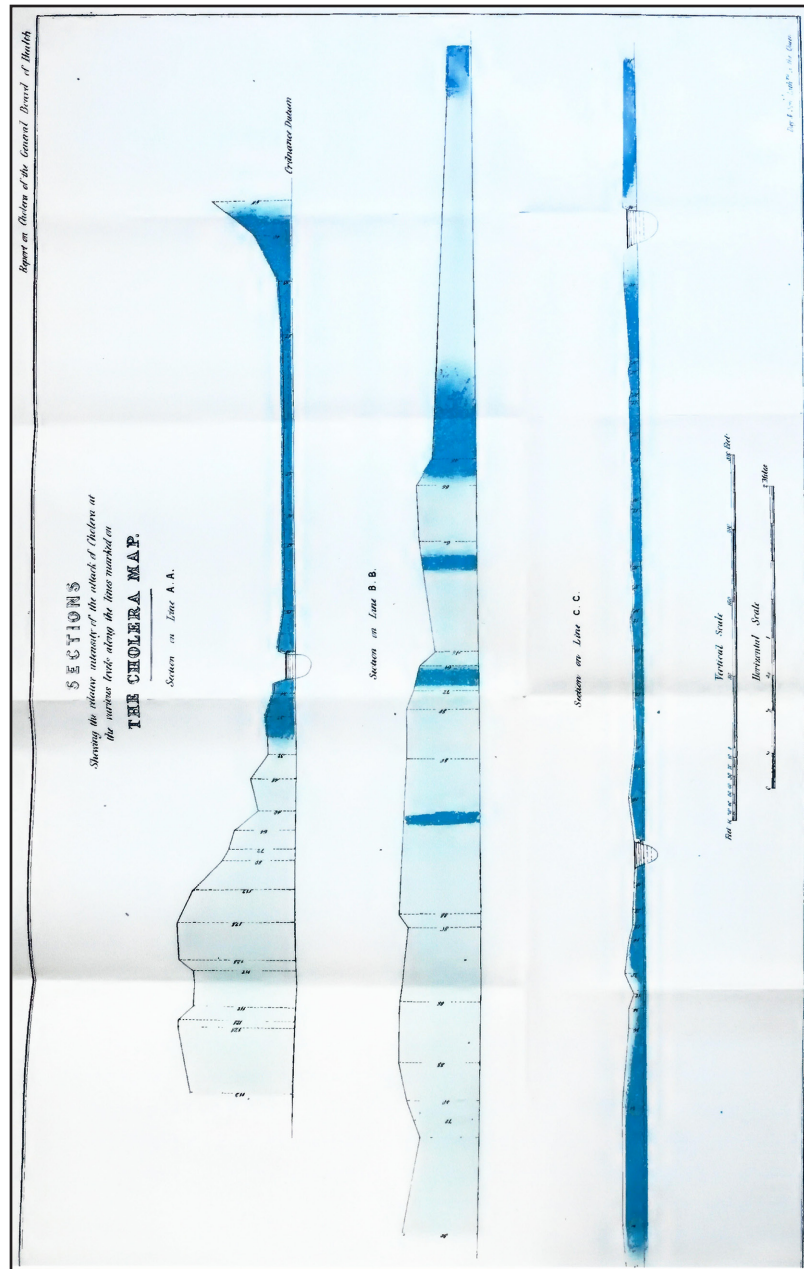
REFERENCE,
REGARDING THE MORTALITY FROM CHOLERA
IN NEW REGISTRATION DISTRICT

1. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
2. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
3. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
4. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
5. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
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12. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
13. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
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29. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
30. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
31. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
32. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
33. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.
34. Report on the Cholera Epidemic in London, 1849, by the General Board of Health.

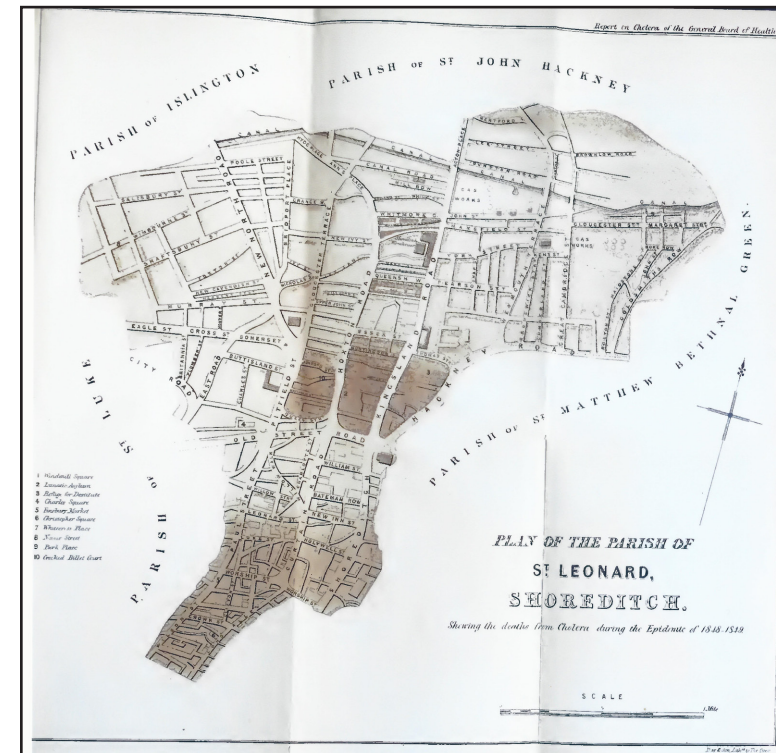


[Facing 204] Grainger, *Cholera map of the metropolis, 1849, exhibited in the registration districts* [variations in shades of blue; three section lines; registration districts and sub-districts numbered; reference list attached to side].

See larger, high-resolution image 1851: General Board of Health (Grainger) in the Supplementary Figures section of the Online Companion.



[Facing 206] Grainger, *Sections showing the relative intensity of the attack of Cholera at the various levels along the lines marked on the Cholera Map.* [A-A, B-B, C-C].



[Facing 208] Hector Gavin, *Plan of the Parish of St. Leonard, Shoreditch showing the deaths from cholera.*

