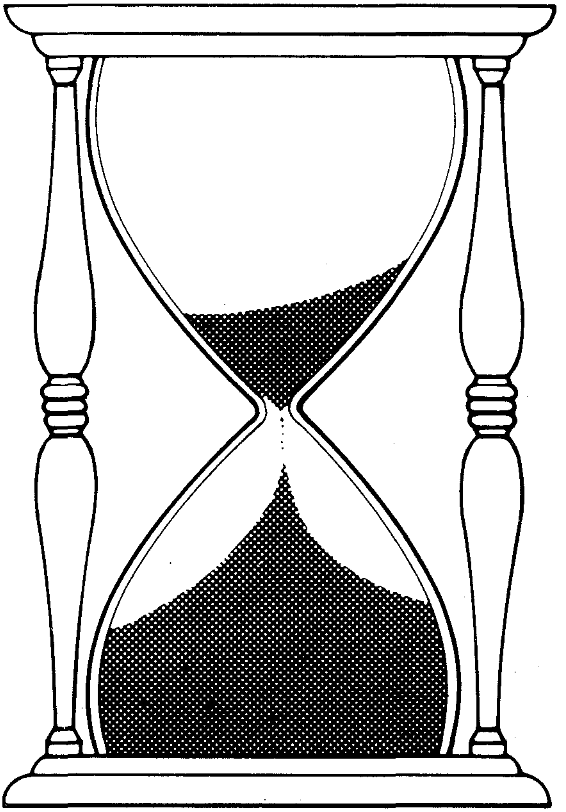
Historical Geography Research Series

URBAN EPIDEMICS AND HISTORICAL GEOGRAPHY: CHOLERA IN LONDON, 1848-9

GERARD KEARNS



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Gerard Kearns Urban Epidemics and Historical Geography

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HISTORICAL GEOGRAPHY RESEARCH SERIES

No. 15

URBAN EPIDEMICS AND HISTORICAL GEOGRAPHY: CHOLERA IN LONDON, 1848-9

by

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INTRODUCTION

This paper reviews some technical and conceptual problems in reconstructing patterns of epidemic mortality within cities. Its core is an attempt to disentangle the causes of inaccuracy in the returns of cholera deaths in London during the epidemic of 1848-9. These efforts draw upon an analysis of a set of registrations of cholera deaths from 10th September to 13th October, 1849. These 3272 returns open a window on the process of registration, contemporary social attitudes and on the accuracy of the returns of cholera deaths.

A central theme of the essay is the claim that historical work in geography must submit to what Thompson (1972) has termed 'the discipline of historical context'. This enjoins one to pay close attention to the way that historical evidence is embedded in a specific environment when one is framing one's research. In geography, however, there is the paradox that the most quantitative analyses of historical epidemics show the least sensitivity to the source materials. Harris has suggested that 'science has always consisted of an interplay between induction and deduction, between empiricism and rationalism; any attempt to draw the line on one side or the other conflicts with actual scientific practice' (Harris, 1979, p.8). In geography, at least, these two aspects of science are rarely seen in such close company.

The criticisms of positivism in human geography, developed during the last decade, appear to have passed over medical geography. This is because there has been a divergence within Spatial Diffusion research. Brown has suggested that 'innovation-diffusion research was prominent in the establishment of the behavioural approach in geography' (Brown, 1981, p.124) and clearly the implicit behavioural assumptions of this research were powerful examples when the case was being made for a more explicitly behavioural approach in human geography drawing on 'the postulates about human behaviour that (other social sciences) can provide' (Brown, 1981, p.124). Brown has discussed how these criticisms were responded to within innovation-diffusion research. However, an alternative series of responses took spatial modellers away from the study of processes which worked through subjective human activity into the study of processes which did not. The spatial modelling of diseases was a popular source of illustrations when this, largely deductive, research was being presented. This paper complements this work by drawing attention to some of the difficulties encountered when historical data are used in this way. It also seeks to pose some historical questions about the relations between disease and society in nineteenth-century Britain and the contribution that the study of urban epidemics might make to answering those questions. The paper examines some general issues about the measurement of death rates, the mapping of epidemics and the spatial analysis of such maps. It then surveys the material available for the study of British epidemics before moving to a detailed analysis of the potential of one particular source: the registrations of the London cholera epidemic of 1849. A final section returns to the question of the contextual embedding of historical evidence and comments on the contemporary construction of the cholera crises as significant events to which public health reformers could refer in making a case for legislation.

SOME GENERAL ISSUES IN THE HISTORICAL GEOGRAPHY OF URBAN EPIDEMICS

There are a number of narrowly technical issues which all studies of urban epidemics must confront and this part of the paper indicates some of those encountered in measuring death rates, mapping them and, interpreting those maps.

The measurement of death rates

The study of the geography of mortality rests upon the presentation of indices of mortality for particular areas. In this section, I shall suggest that, because of the variation in the size of the units for which data are recorded, the use of rates of mortality is to be preferred to total numbers of deaths. I shall then discuss the problem of calculating rates of mortality in the absence of reliable population data. The section concludes with a consideration of the effects of the variation in age-structures between areas on their respective rates of mortality. These three issues will be illustrated with reference to the work of historical geographers on London epidemics.

If all the statistical and administrative units of London were alike in area, size of population, and demographic structure, a comparative analysis of the total numbers of epidemic deaths in each area would be an adequate basis for a historical geography of disease. But this is far from being the case. Any distribution map of the total number of deaths, therefore, may largely reflect the distribution of parishes of differing populations and areas rather than the pattern of the severity of the disease. A recent study of the Great Plague of London of 1665 illustrates this problem: Shannon and Cromley's (1980) maps of total deaths are crucially affected by the disposition of large parishes on the periphery of London and smaller parishes in the centre, resulting in higher values in the peripheral parishes. Such maps are unreliable indicators of the healthiness of the different parts of London.

There is, with seventeenth-century epidemics, the additional problem that there are no reliable population data for the London parishes which makes it impossible to weight the deaths in each parish by the population at risk. As an alternative, Graunt (1662, p.33) used the ratio of plague deaths to total deaths as an indicator of the severity of plague. He also used the ratio of burials to christenings as an indicator of general mortality (cf. Sutherland, 1963, 1972). Finlay compares plague years with other years by calculating the number of times burials in plague years exceeded those in normal years. The ratio of plague deaths to total deaths tells something about the progress of plague through London and indicates the differential contribution that plague deaths make to total deaths in each parish. This ratio will not fully represent the range of healthiness in London since, in those parishes with higher levels of mortality, a more severe rate of plague mortality will be needed to result in a similar contribution of plague deaths to total deaths, than in parishes with generally lower levels of mortality. Nevertheless, it is probably the best indicator available to the medical geographer working on the weekly pattern of seventeenth-century plagues.

However, a further problem is introduced by the small size of many City parishes. The ratio of plague deaths to total deaths is not stable where only a few total deaths are involved, as is the case in many weeks for smaller parishes. For this reason, it is important to weight these proportions in a way which provides some indication of the statistical significance of the observed ratios. This may be achieved in a number of ways; one is to calculate an average ratio of plague deaths to total deaths for the areas as a whole in a particular period and compute a chi-square value (cf. Visvalingam, 1976; Visvalingam & Dewdney, 1977) for each parish comparing its observed and expected number of plague deaths on the assumption that the parish had the same proportion of plague deaths in its total deaths as the areas as a whole. The statistical significance of each chi-square value gives a more robust ranking of the parishes on the basis of the contribution of plague deaths to total deaths than the untransformed ratios. Figure 1 shows those London parishes which, on this basis, had a significantly above-average ratio of plague deaths to total deaths in 1665.

Where the information is available, the ratio of deaths to population provides the most reliable way of indicating the rate of mortality. This was a widely-used health indicator in the nineteenth century and much may be learned from contemporary discussions of its utility (Eyler, 1976; 1979, pp.66-96, 190-201). Critics were especially exercised over the effect that differing age-structures might have upon crude rates of mortality. Because certain age-groups are more vulnerable than others, an area with a high proportion of its population in those age-groups will, other things being equal, have a higher crude death rate than average. To cope with these problems, area-specific indices based on age- and sex-specific death rates, may be derived by calculating life expectancy at certain ages or by working out standardised death rates for each area (cf. Jones, 1981, pp.16-21). There are various ways of standardising death rates but they all attempt to control death rates for variations in age-structures between areas. Unfortunately, the annual reports of the Registrar General do not permit the calculation of the disease-specific standardised death rates for Registration Subdistricts. However, an analysis

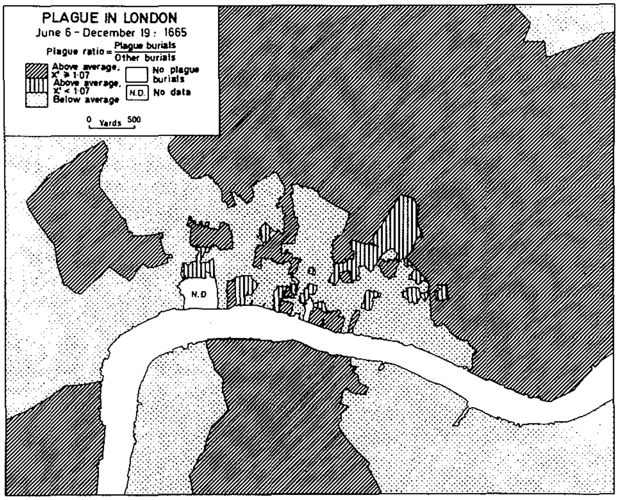


Figure 1. Plague in London, June 6th to December 19th, 1665; parishes with a significantly above-average ratio of plague deaths to total deaths.

of standardised mortality ratios for the 36 London Registration Districts throws some light upon the distortions introduced by the use of crude, instead of standardised, death rates.

Table 1 shows the age- and sex-specific mortality rates for London as a whole in 1847, as well as the age-sex distribution for London in 1851. The age-sex pyramid had two bulges: the under-fives and 20-24 age group. In the 36 Registration Districts, the proportions of the population comprised by the different age-groups varied widely. The lowest death rates in London were in the 10-14 age-group and the death rates increased either side of that group to over 700 per ten thousand among the under-fives and greater than that rate again from about 65. The range of mortalities about these means was wide. The death rate of under-fives ranged from 273 (Females, Hampstead) to 1379 per ten thousand (Females, St. Olave, Southwark); and the death rate of the 10-14 age-group was 19 per ten thousand for males in St. Saviour, Southwark, and ten times this for females in neighbouring St. Olave, Southwark. Table 2 shows the effect this has upon the standardised mortality rates. The direct method of standardisation was used and the demographic structure of London in 1851 was used as the standard population. The general ranking of the 36 Districts was not changed a great deal ($r_s = 0.9408$; $z = 5.5658$) although some areas changed their ranks; St. James, Westminster moved from 27 to 17 and Greenwich from 10 to 19. In five areas, the standardised death rate was 10% higher than the crude death rate: St. George Hanover Square, St. James Westminster, and London City had below-average

Table 1. Demographic structure and age/sex-specific death rates in mid nineteenth century London.

	London's age-sex structure; the proportion of the population in each age-sex group		Age-specific death rates, 1847; deaths per ten thousand living.	
	M	F	M	F
Under 5	0.0620	0.0623	816.4	728.1
5 - 9	0.0513	0.0518	100.8	96.1
10 - 14	0.0454	0.0462	44.6	44.7
15 - 19	0.0419	0.0485	69.5	56.0
20 - 24	0.0458	0.0564	89.5	71.7
25 - 29	0.0431	0.0528	108.2	87.7
30 - 34	0.0395	0.0458	116.4	102.5
35 - 39	0.0326	0.0371	157.7	128.4
40 - 44	0.0286	0.0326	183.8	135.5
45 - 49	0.0218	0.0249	254.1	192.1
50 - 54	0.0188	0.0226	267.8	210.4
55 - 59	0.0121	0.0149	453.9	336.6
60 - 64	0.0108	0.0142	532.7	438.4
65 - 69	0.0066	0.0088	862.3	705.0
70 - 74	0.0045	0.0065	1192.7	1003.7
75 - 79	0.0022	0.0035	2014.4	1840.4
80 and over	0.0013	0.0026	2942.5	2705.0

proportions in the younger (high-mortality) age-groups, while Westminster and Whitechapel had below-average proportions of their populations in the older (high-mortality) age-groups. Only Greenwich had a standardised mortality 10% lower than the crude death rate due to its above-average proportion of people in younger and older age-groups. It appears, therefore, that variations in the age-sex structure of these Registration Districts do not badly distort the geography of mortality. Nineteenth-century statisticians came to similar conclusions (Eyler, 1976, pp.353-4). The study of age- and sex-specific death rates are of interest in themselves but are not necessarily crucial for the calculation of general rates of mortality.

Table 2. Crude and standardised death rates; London 1847 (using the age structure of 1851).

Registration District	Total Deaths	Crude Death Rate	Standardised Death Rate
Kensington	2145	178.7	186.4
Chelsea	1365	241.4	225.9
St. George Hanover Sq.	1501	205.0	228.4
Westminster	1804	275.0	332.9
St. Martin-in-the-Fields	704	285.7	309.6
St. James, Westminster	809	222.2	252.4
Marylebone	3961	251.2	260.6
Hampstead	179	149.3	157.9
Pancras	4326	259.1	263.2
Islington	1624	170.4	176.8
Hackney	1128	193.1	187.3
St. Giles	1610	297.0	320.6
Strand	1111	249.9	273.8
Holborn	1436	308.0	326.2
Clerkenwell	1550	239.3	243.0
St. Luke	1325	245.1	247.1
East London	1201	270.5	282.1
West London	1360	472.4	491.4
London City	1136	203.1	232.0
Shoreditch	2792	255.5	255.1
Bethnal Green	2225	246.7	241.2
Whitechapel	2908	364.6	511.3
St. George-in-the-East	1545	320.2	313.5
Stepney	2605	235.2	228.6
Poplar	1033	219.0	207.5
St. Saviour, Southwark	1096	306.7	307.5
St. Olave, Southwark	1176	607.0	620.4
Bermondsey	1300	270.1	261.0
St. George, Southwark	1571	303.1	316.6
Newington	1560	240.7	235.7
Lambeth	3190	229.0	230.0
Wandsworth	873	172.0	165.6
Camberwell	1234	225.7	218.1
Rotherhithe	447	251.1	240.9
Greenwich	2787	280.5	245.8
Lewisham	510	146.4	141.1

The mapping of death rates

This section makes the point that clear, appropriate maps can usefully illustrate analyses of urban social conditions. There is a tendency among medical geographers to champion maps as analytical tools in the study of disease aetiology also. Here it is suggested that their contribution is a modest one and that they were not crucial evidence in nineteenth-century debates about the causes of cholera.

Maps became associated with the study of disease aetiology in the late-eighteenth-century. Initially in surveys of yellow fever (cf. Stevenson, 1965; Shannon, 1981) and later in works on cholera (cf. Gilbert, 1958; Jarcho, 1970), maps were drawn to accompany the text. This concern with cartography was prompted by the exotic origins of these epidemic diseases and early maps recorded their transcontinental tracks. Dot maps of cases in cities initially portrayed the diseases' progressive extension in these places. These cartographic techniques were reinforced by a traditional concern with the topography of healthiness and the result was a concern with the site of disease which contributed to the environmental approach of most nineteenth-century students of epidemics.

These maps showed that there were healthy and unhealthy parts of cities, but on the question of disease transmission they were ambiguous, allowing John Snow to present cartographic evidence of the clustering of cholera deaths in support of his theory that the disease was not personally contagious and was waterborne (cf. Snow, 1936) yet permitting Robert Baker to produce similar maps in support of Edwin Chadwick's view that, while cholera was not contagious, it was caused by contaminated air rather than impure water (GBPP 1842 xxvi (Lords). Medical historians have shown that Snow's evidence was not conclusive and that it was subject to criticisms at the time it was presented (Pelling, 1978, pp.203-50; Brown, 1961, 1964). Modern epidemiologists do not accept that interpersonal transmission was decisively ruled out by Snow's work (Feachem, 1976; 1982, pp.2-13) which must be viewed in its immediate context and not looked at retrospectively in the light of the eventual rise of germ theory. The geographical aspect of his work must be assessed alongside the contemporary medical debates of which it formed a part and the wider social context of medical knowledge which established both the demand for and the forms of presentation of these debates (Ackernecht, 1948; Cooter, 1982).

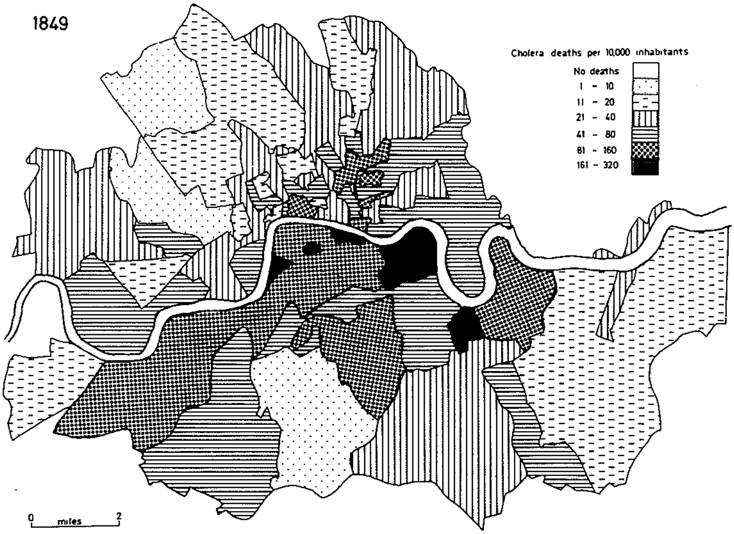
Even if geographers have perhaps overrated its contribution to the development of medical knowledge, the geography of disease incidence is an important component of the study of urban social conditions and maps can usefully supplement studies of living conditions in large cities. There is no single way of mapping a set of statistics which will answer all purposes. Frequently, maps are a compromise between flexibility and comprehensiveness. Absolute values may be represented by proportional symbols or by numbers of some standard symbol such as dots. The latter is quite effective where relatively few locations are to be mapped and where the range of values is not very great. Proportional symbols may succeed in cases where the other type of map would appear cluttered. Ratio values such as population density or rate of mortality may be portrayed on choropleth maps. In this case, individual units with similar ratio values are collected into surfaces of one shading. Consequently, this method is not appropriate for presenting absolute values (an obvious point, but one which is missed by Shannon & Cromley, 1980).

Evans (1977) reports that most people can cope with seven or eight classes of shading and that any number between four and ten can be effective. Having settled upon the number of breaks to be imposed upon the data, the question arises of how they are to be placed. Evans argues against eyeballing for discontinuities in the frequency distribution of the values of the variable to be mapped and, if only one distribution is to be mapped, it is possible to follow his guidelines fairly mechanically. Where two or more distributions are to be compared, the researcher has to decide whether to standardise the class intervals or to set them separately for each map. If the absolute levels need to be compared (eg. to show whether cholera is more severe in this year than in that), then, the same class divisions must be used for all maps. Conversely, if the intention is to analyse differences in the patterning of mortalities on each map, then, classes must be set individually for each map but using consistent guidelines. In producing cholera mortality maps of the 135 London subdistricts for the epidemics of 1849, 1854 and 1866, a frequency distribution for the total data set (405 individual values) of mortalities was produced. The distribution (Figure 3) was too skewed for any transformation to normality to be meaningful so the procedures for J-shaped distributions were followed and a geometrical progression of mortalities was constructed to give a reasonable frequency in each class (Figure 2).

The statistical analysis of maps and spatial diffusion

Geographers frequently use the spatial distribution of disease to remark about the factors favouring its extension. There are two sets of issues involved in these attempts: the technicalities of the efforts to support these remarks statistically and the limitations that the sources impose on what remarks are supportable. The first includes both areal correlation and diffusion studies. The second raises questions about the format of the records and their reliability. This section comments on both these issues before moving to a detailed consideration of the second, and more intractable, set of issues.

The description of maps is an important part of any geography of disease. One may be concerned to relate the spatial pattern of mortality to other aspects of social geography or to factors which might be relevant in accounting for disease transmission. Components of any description may be restated as



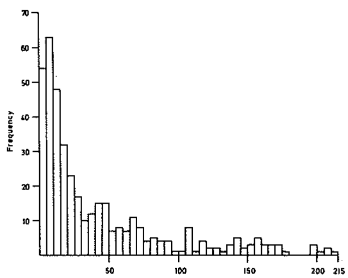


Figure 2. Cholera mortality in the London Registration Subdistricts, October 1st, 1848, to November 24th, 1849.

Figure 3. The distribution of the cholera mortalities of the London Registration Subdistricts in the three epidemics of 1848-9, 1853-4 and 1866.

hypotheses and their reliability assessed in a variety of ways, perhaps involving inferential statistics. One problem of comparison is that tests which are possible with interval data generally involve estimating the variability of a population of which the maps are but one sample (cf. Haggett, Cliff & Frey, 1977, pp.353-77; Cliff & Ord, 1981). This can only be estimated on the assumption that the variability of the sample is a reasonable guide to the variability of the whole population. The relationship between these variabilities may be assessed in terms of the size of the sample; a larger sample, other things being equal, will exhibit a greater range of the population variability than a smaller sample. In geography, there are many circumstances under which other things might not, in fact, be equal. In particular, the variability of areas on a map may be reduced by the blending influence of proximity. This results in an unreliable (under-)estimate of the population variance; the observations in the sample are not independent. For many purposes, it is sufficient to convert the interval data to an ordinal scale (i.e., rank the areas) and use statistical tests which, though less powerful, are more robust (Siegel, 1956).

The geographical study of disease also involves investigating the temporal/spatial aspects of diffusion (eg. Cliff, Haggett, Ord, Versey, 1981). Temporal analysis of epidemics effectively dates from Farr's work on cholera (cf. Bailey, 1975; Fine, 1979) and spatial analysis from the map studies discussed above. Cliff and Ord illustrate that the geography of the 1849 London cholera mortality may be related to the water supply (Cliff & Ord, 1981, pp.1-5). They suggest that the build-up and concentration of mortality may be examined by measures of spatial autocorrelation (indicating the degree of spatial clustering of high mortalities) and through a linear regression model separating spread and *in situ* effects on successive levels of mortality. These are clearly useful summary measures for describing spatial patterns and facilitate comparisons of different epidemics. However, the choice of techniques and the scale at which they are applied must also be guided by an appreciation of the accuracy and reliability of the evidence. These considerations will relate to attempts to harmonise the scale of analysis with the processes being studied. The remainder of this essay considers the London 1849 cholera epidemic as a detailed case study.

THE CHOLERA EPIDEMIC IN LONDON, 1848-9

Each urban epidemic presents unique problems. In one sense, then, this analysis can provide little more than a checklist of the questions which one might ask in other cases. In particular, the conclusions about the reliability of the cholera registrations must be tempered by the realisation that registration in London may have been more effective than elsewhere (Smith, 1979, p.14). Nevertheless, the prominence of London within national cholera epidemics and the debates over public health reforms hopefully justifies the presentation of these results. The discussion covers seven topics: a review of the importance of civil registration data within the range of sources available for the study of British urban epidemics; a discussion of the reliability of the diagnoses of cholera deaths; an assessment of the distortion introduced by working with the date of registration rather than the date of death; a treatment of the inaccuracies introduced by the burial of certain persons in places other than where they died; a survey of the possibilities of relating patterns of disease to the distribution of social groups within the city; a consideration of the circumstances of the cholera deaths as indicated in the returns is presented since this places the claims made by contemporaries about the causes of cholera into context; and, finally, this contextual reading of contemporary statements about the aetiology of cholera is elaborated in a discussion of the social construction of the 'cholera crises'.

Some sources for the study of British urban epidemics

The recording of deaths and their causes has only been a legal requirement in England and Wales since 1874 (Forbes, 1976, p.398). Before the mid-nineteenth century, we must rely on parish registers (as does Woods, 1982a, pp.87-102). Their survival is patchy and the cause of death is generally absent or inadequate (but see: Finlay, 1981b; Hollingsworth & Hollingsworth, 1971). For a handful of towns and from time to time, they may be supplemented with bills of mortality. The London bills are thought to date from 1519 though a continuous, regular weekly series was not published until about 1630 (cf. Sutherland, 1970, 1972). Their initial purpose was to monitor the bubonic plague in the City, but from about 1630 they record other causes of death too. Since the bills contain statistics tabulated by parish, they can form the basis of a spatially-sensitive analysis of London epidemics. Early analyses of these records (eg. Graunt, 1659; Petty, 1683) recognised many shortcomings of which the most important, apart from inaccuracy in the way the information was collected (Forbes, 1974), is the lack of population estimates. The bills were regularly extended to include the parishes over which the metropolis was spreading (Pinkus, 1975). They ceased in 1858 but had been inadequate well before this. Institutional deaths and especially deaths in prisons, were frequently the subject of Coroner's inquests. Until 1839 none of the London coroners were medically-qualified, yet their tasks included the investigation of the causes of accidental, suspicious and many institutional deaths (Forbes, 1978). Coroners' records provide a small sample of all deaths but they include that part of the population which was least mobile and highly vulnerable to epidemic disease.

The most suitable records for describing the medical geography of epidemic mortality date from the centralised collection of vital statistics and the establishment of civil registration in 1836 (cf. Cullen, 1974). Yet, paradoxically, Benson & Wall (1981, p.14) claim that 'current research on the historical demography of England comes to a virtual stop in 1837 which was the year of the setting up of the Civil Registers'. Even if this is an exaggeration, they draw attention to the inaccessibility of civil registers for researchers (see correspondence in *The Times*, April 1983, and *Local Population Studies* continuously). Although local registrars recorded the aspects of mortality which interest us (date of death, occupation of deceased, address of deceased, cause of death), the annual and other reports published by the Registrar General provide summary tabulations for Registration Districts only (in 1849 there were 623 in England and Wales) and researchers are not given ready access to the original civil registers.

Some edited extracts from the registrations were quoted in contemporary issues of *The Times* and in publications such as those of William Farr (assistant to the Registrar General and responsible for much of the published work of his office) on cholera (cf. Eyler, 1973; Lewes, 1983). These open a window on the process of registration. In June 1856, the British Library received a volume entitled 'Return by the Registrar General of Deaths from Cholera and from Diarrhoea registered in London the 10th and 11th days of September (-13th October), 1849' (General Register Office, 1849) which records the details of returns from the 135 Registration Subdistricts of London from the 10th of September to the 13th of October, 1849. The returns are listed by Subdistrict for each of six working days of the week and appear to be largely unedited. This document gives us a unique opportunity of examining the production of a set of medical statistics similar to many that historical geographers must work with in studying epidemics and it is heavily drawn upon in the discussion which follows.

Diagnosis of death

Historical data relating to disease mortality are only as adequate as the diagnoses of cause of death on which they are based. These data must be assessed with reference to the character of the disease being studied, the ambiguity of its symptoms and the contemporary social and medical context (eg. Woods, 1978, pp.39-40). Before the general acceptance of the germ theory of disease towards the end of the nineteenth century, death certificates are only, at best, an indication of the mode of death and, in the absence of detailed case notes, not a satisfactory guide to the cause of death.

Cholera statistics provide a special and interesting example of these problems. The national concern about the epidemic must have alerted medical practitioners to the possibility of encountering cases of this disease. Moreover, cholera is associated with symptoms, particularly profuse diarrhoea, common to a narrow range of diseases. Thus there are good medical grounds for believing that cholera deaths will not be attributed to anything other than a diarrhoeal mode of death. Within these classes of deaths, many varieties of diarrhoeal disease were distinguished in the returns. Farr reduced these to three categories: cholera, diarrhoea, and other diseases involving diarrhoea as a symptom. Writing of the 1849 statistics, Farr recorded that "all the cases in which the term 'cholera' or 'choleraic diarrhoea' occurred, were referred to cholera; about 300 cases, in which diarrhoea was evidently a symptom of consumption, or some other disease, were struck out; the residue of the cases was classed under diarrhoea" (General Register Office, 1852, p.xi). There are medical and non-medical difficulties attendant upon this strategy. The medical questions are more straightforward. There are two medical issues: deaths attributed to more than one cause, and the relations between 'cholera' and 'diarrhoea' deaths.

Many deaths are blamed on more than one disease. Many of these multiple diagnoses piled up symptoms which could properly be associated with cholera itself such as 'lethargic liver', and some references to fever were so unspecific as to be meaningless but others clearly were either complicating or subsequent independent maladies. Farr was clearly attempting to encompass all cases in which cholera was a major contributing factor within the statistics of cholera mortality.

Since the document records that 'the epiphets "Asiatic", "malignant", &c., though often used in the returns are omitted in this list', it is not possible to analyse the full range of cholera attributions employed. However, some variations did slip through and one reads of "cholera algida", "choleraic diarrhoea", "diarrhoea cholerica", "malignant diarrhoea" and "English cholera". This last epiphet is interesting. In most years, some cholera deaths were registered. The three years before the 1848-9 epidemic returned a total of 388 cholera deaths in London, while in the years 1850-52, 502 were returned. The provision of ground rules for identifying epidemics must start from the obvious point that in 1848 there were 652 deaths and in 1849, 14 137. During epidemic years the total of 'cholera' deaths did not start from scratch. Under the title 'cholera', registrars included an endemic and an epidemic disease. To contemporaries, there was a continuum from diarrhoea through English cholera to Asiatic (or malignant) cholera. Certainly, there was a broad progression of symptons but it is likely that English cholera, since it had been identified before the early nineteenth-century pandemic, was a different disease from Asiatic cholera and was a generic term for severe dehydrating diarrhoeal diseases. Farr certainly recognised the different character of the two sets of diseases. He remarked on the dependence of diarrhoea and English cholera (or summer diarrhoea) on the temperature and that, in London during 1848: 'The temperature was declining: yet the mortality increased rapidly in October, and 65 persons died from cholera in the first week of November. The cases were severe and rapidly fatal. It was evidently the epidemic cholera - the Asiatic cholera. To everyone accustomed to observe popular disease the difference in the two forms was striking' (General Register Office, 1852, pp.xi-xii). Farr believed the length of the attack to be a significant diagnostic principle: more than half the cases of Asiatic cholera terminated in less than a day; half the cases of summer cholera did not terminate in three days; and half the cases of diarrhoea lasted more than six days (*ibid.*, 1852, p.xvi).

It is likely, *on medical grounds*, that the division of diarrhoeal deaths in London in 1849 into 3899 diarrhoea fatalities and 14 137 cholera deaths will include some deaths from summer diarrhoea in the cholera total and probably very few cholera deaths in the diarrhoea total. In any case, the dramatic increase in diarrhoeal-related diseases between October 1848 and October 1849 means that unless other such diseases are capable of turning epidemic, for which there is no evidence from the period before the first Asiatic cholera epidemic, most of this abnormal mortality must be due to Asiatic cholera. In other words, while cholera accounts for a small proportion of diarrhoeal diseases in contemporary Third World countries (cf. Mosley, Bart, Sommer, 1972) and while contemporary epidemiologists will only accept diagnoses based upon bacterial identification, it appears improbable that more than one diarrhoeal disease could be epidemic on such a large scale at the same time.

Why did Farr not follow his suggestion and distinguish between English cholera (summer diarrhoea) and Asiatic cholera? He probably did not trust the bases on which the epiphets were used. On medical grounds, there might be more or less clear criteria (such as duration and severity of attack) for the division but there were social pressures on medical persons to be conservative in identifying Asiatic cholera, and English cholera was often a compromise diagnosis. The geographer of epidemics would do well to be on guard against such under-reporting. Farr's strategy at least accommodates some of these problems. Newspaper and other historical accounts could be used to supplement the medical statistics available but, in the case of cholera, there are grounds for believing that the diagnoses are meaningful and, therefore, worthy of further attention.

Date of death

The table appended to Grainger's report on the London cholera epidemic of 1849 (GBPP 1850 xxi) details the numbers of cholera deaths *registered* each week during the epidemic; not the number of cholera deaths *occurring* each week. The interval between death and registration will introduce lags of variable length which might compromise any study of the diffusion of this disease which relied upon these data. The delay between death and registration depended upon how the registrar was informed of individual deaths. The sample of registrars' returns analysed here permit an investigation of these lags since they enable the date of registration and the date of death to be determined.

The most common way of registering deaths was for an informant to visit the registrar and register the death. Sometimes, this was a relative of the deceased and usually the medical attendant would supply a certificate which was taken to the registrar. This appears to have been quite a satisfactory method although some problems were mentioned in the returns. In St. Giles, the registrar complained that 'the medical attendant, Mr. Walne of Guildford Street, in both cases declined furnishing any regular certificate of the cause but merely wrote them on separate bits of paper, without his signature'.

There are several examples of the registrars themselves discovering deaths. Occasionally, deaths came to light by chance, as when the registrar of Southwark reported the death of a woman after having 'discovered this circumstance from the daughter of the deceased who applied yesterday to have the death of her son registered'.

Table 3. The time that elapsed between cholera deaths and their registration for the five Divisions of London; 10 September to 13 October, 1849

		0 days	1 day	2 days	3 days	4 days	5 days	6 days	1 week-1 month	greater than 1 month
Northern:	cases	40	46	44	21	9	4	3	11	3
"	" (%)	(22)	(25)	(24)	(12)	(5)	(2)	(2)	(6)	(2)
"	Inquests (%)	(0)	(0)	(0)	(0)	(11)	(0)	(0)	(46)	(100)
Western:	cases	61	112	87	46	17	8	2	22	1
"	" (%)	(17)	(31)	(21)	(13)	(5)	(2)	(1)	(7)	(0)
"	Inquests (%)	(0)	(0)	(0)	(2)	(0)	(0)	(0)	(50)	(100)
Central:	cases	58	99	105	41	22	10	10	17	10
"	" (%)	(16)	(27)	(28)	(11)	(6)	(3)	(3)	(5)	(3)
"	Inquests (%)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(18)	(100)
Eastern:	cases	87	197	158	105	47	28	11	12	5
"	" (%)	(11)	(36)	(29)	(19)	(9)	(5)	(2)	(2)	(1)
"	Inquests (%)	(0)	(0)	(3)	(1)	(2)	(7)	(0)	(33)	(80)
Southern:	cases	186	445	404	249	126	48	18	84	15
"	" (%)	(12)	(29)	(26)	(16)	(8)	(3)	(1)	(5)	(1)
"	Inquests (%)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(6)	(100)
London:	cases	430	899	798	462	221	98	44	147	33
"	" (%)	(14)	(29)	(25)	(15)	(7)	(3)	(1)	(5)	(1)
"	Inquests (%)	(0)	(0)	(1)	(1)	(1)	(2)	(0)	(18)	(97)

The cause of the most serious delays was Coroners' Inquests. Table 3 shows that 96% of all deaths registered after a delay greater than 30 days were registered by Coroners. The majority of inquests related either to the earliest deaths in an area or to deaths in public institutions. When they were aware of a pending inquest, registrars refrained from reporting deaths. Occasionally, the registrar would be unaware that an inquest was taking place and might simply report the deaths of which they had heard. Farr was very critical of these legal diagnoses and commented that: 'The causes of death registered as the result of a solemn, juridical investigation, are the most unintelligible in the register; as it is impossible to attach a specific idea to "Natural Death", to "Visitation of God", and to several other phrases in use in coroner's courts' (General Register Office, 1839, p.107/p.75/). Given the delays and the possibility of non-detection, it is fortunate that the majority of all registered deaths were recorded from a medical certificate. It is particularly reassuring that 94% of all deaths were registered within one week, 68% in less than three days (see Table 3). This reliability is underlined by the close association of the weekly totals of 'registered' (from GBPP 1850 xxi App.B) and 'actually occurring' (from General Register Office, 1852, pp.106-7) deaths shown in Figure 4.

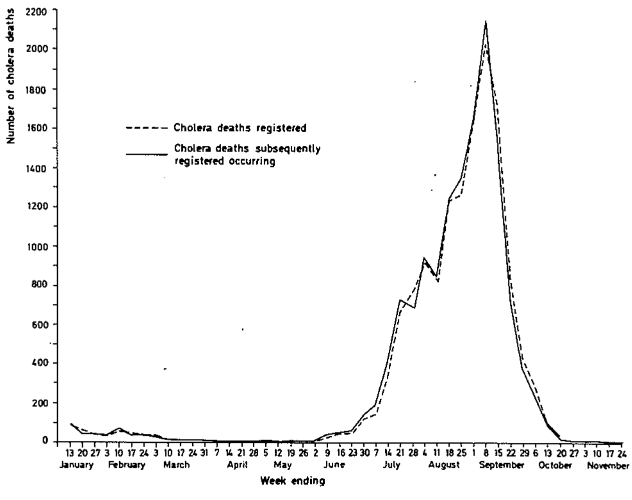


Figure 4. The weekly numbers of cholera deaths and the number of cholera deaths actually registered each week, 1849.

13 937 registered cholera deaths occurred in 1849 and 14 061 deaths were registered during the year; the 'gain' from 1848 being 124 greater than the 'loss' to 1850. From Figure 4, it can be seen that both curves peak in September. The time-lag between death and registration spreads some of the deaths from the peak week into subsequent weeks and the September peak is slightly underestimated by the record of registered deaths. There is also a general under-registration of deaths during the weeks comprising the rising limb of the curve and an over-recording of those making up the falling limb: the six weeks ending September 8 were all under-registered while the next seven weeks were all over-registered. The largest absolute under-registration is in the week ending September 8 and the largest absolute over-registration is in the week ending September 15. On the whole, however, there is an encouraging correspondence between the time-series of the dates of deaths and the dates of their registration.

Place of death

One attraction of London for the medical geographer is the fine mesh for which statistics are available. This may make it possible to relate the healthiness of an area, as indicated by the mortality of the inhabitants, to socio-economic characteristics at a fairly sensitive scale. It certainly allows detailed descriptions of the spatial pattern of mortality and the spread of epidemic diseases. There are, however, two problems with this matrix: the very fine grid gives us insignificantly small weekly returns for many areas; and deaths in institutions introduce spatial biases since some areas had more institutions than others.

Figure 5 portrays the effect that small numbers of deaths may have upon the reliability of the curve of mortality. The cholera deaths for London as a whole are plotted for each of the sixty weeks ending November 24, 1849. The totals of deaths in consecutive weeks were compared with the null hypothesis that there was no change from one week to the next. On this graph, 29 out of the 59 pairs of weeks did not show a significant change in the number of deaths as indicated by a χ^2 value corresponding to the 95% level of significance. The same indicator was then used for every pair of weeks for every subdistrict of London. 56% of these did not have any pair of weeks which showed a significant cahnge in the number of cholera deaths from one week to the next over this period. In other words, one would have a 95% chance of being correct in suggesting that over half the areas of London do not show a significant departure from a randomly fluctuating pattern of cholera deaths during these sixty weeks. Clearly, then, it is not appropriate to pursue an analysis of all the subdistricts using the finest space-time mesh available.

Contemporary observers were conscious of the problems of institutional deaths. They were aware that the movement of sick

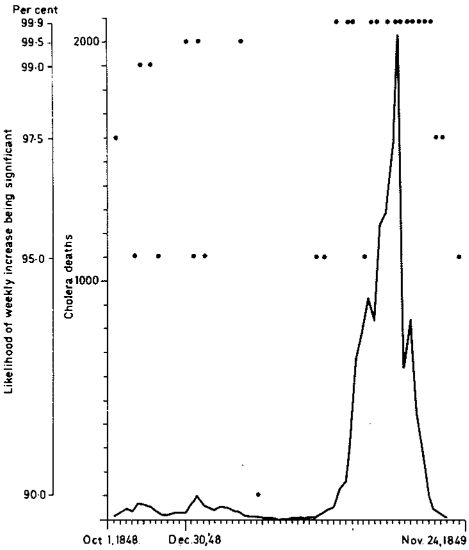


Figure 5. The significance of the weekly changes in the numbers of cholera deaths registered; London, October 1st, 1848, to November 24th, 1849.

people between areas as they searched for help could introduce biases in the mortality data towards areas where such help was available. People did not always die where they contracted a disease which renders the geography of death a less reliable indicator of the pattern of unhealthiness (cf. Woods, 1978, p.49).

The table appended to Grainger's report on the London cholera epidemic of 1849 (GBPP 1850 xxi) shows that almost half the subdistricts of London had institutions. From the detailed returns of 3350 cholera deaths discussed above, it is possible to investigate the effects of this spatial bias which produces a greater number of deaths in areas with institutions than would otherwise have been the case. In this five week sample, deaths occurred in seventy institutions (Table 4): the majority of these were workhouses or hospitals. These deaths represented 18% of all the deaths registered in London during this period; the proportion (see Table 5) being greatest in North London (28%) and lowest in the southern districts (12%). Only 37% of these institutional deaths were inmates. More importantly, of the deaths ensuing from cases commencing *outside* these institutions, about one in eight took place within them. This is a surprisingly high figure and underlines the scale on which private and public relief was provided for cholera victims in 1849. Once again, the deaths registered from the northern

Table 4. Institutional deaths distinguished by type of institution

Type of institution	Number of instits.	Instit. deaths	Inmates	Local transfers	Other transfers
Workhouses	33	288	117	66	105
Hospitals	29	242	39	90	113
Lunatic asylums	3	43	43	0	0
Prisons	5	16	16	0	0
TOTAL	70	589	215	156	218

Table 5. Institutional deaths and inter-Subdistrict transfers

Division of London	Deaths 1849	Deaths in sample	Instit. deaths	Inmates	Local transfers	Other transfers
Western	1223	364	78	27	29	22
Northern	956	265	73	17	17	39
Central	1724	394	81	12	21	48
Eastern	3097	743	174	79	24	71
Southern	7137	1583	183	80	65	38
TOTAL	14137	3350	589	215	156	218

districts included the highest proportion of such transfers within their total (21%). These transfers may be divided into local transfers, where the movement of people from residence to institution did not entail the crossing of a Subdistrict boundary, and others where Subdistrict boundaries were crossed.

There are three reasons why such moves occurred. Firstly, many parishes had their Poor Law workhouse in another parish; either because their parish was heavily built-up or because parishes had been grouped into poor law unions with a shared workhouse. Secondly, some parishes subscribed to hospitals outside their parish, to which they sent pauper patients. Thirdly, a few individuals were hospitalised where they happened to be visiting when they fell ill. There is, then, a bias in the returns toward areas with institutional health care and a specific bias against those areas where the local authorities vigorously sought such health care for their charges beyond their boundaries.

By calculating the net effect of these flows on the total numbers of deaths registered in each subdistrict and by re-allocating these transfers to the Subdistricts from which they

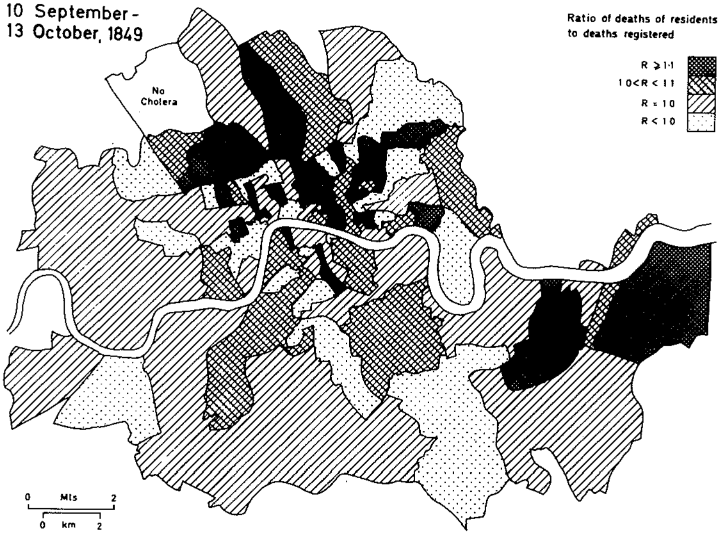


Figure 6. The effect of inter-Subdistrict transfers on the death rates of the Registration Subdistricts of London: 10th September to 13th October, 1849.

came, it is possible to offer some suggestions about the gap between the deaths registered in an area and the deaths resulting from cases contracted in that area. Of the 135 Subdistricts, 49 showed no net gap. However, in 33 areas, the number of residents who died of cholera differed by at least 20% from the number of deaths registered there. Figure 6 presents a map of this ratio. There is a centre-periphery pattern north of the Thames with central parishes sending patients to outlying Subdistricts.

William Farr was aware of the problems posed by these transfers and he commented that: 'The workhouse of the district of St. Luke is in Shoreditch, the workhouse of the Strand is in St. Pancras, the workhouses of the City of London district are in Camberwell and Stepney. In calculating the mortality of the respective districts, the deaths and population of these outlying workhouses were taken from those districts in which they happen to be situated, and placed in the districts to which the inmates belong' (General Register Office, 1848, p.160/pp.5-8/). Clearly the aim was to apportion the blame for these deaths where the responsibility for the financial support of these paupers lay. Farr makes no attempt to discuss the role of workhouses in hospitalising sick paupers during an epidemic, yet, the sample analysed here shows that, for these five weeks of the 1849 cholera epidemic, only 41% of the cholera deaths in workhouses were those of inmates and that 61% of patients moving to a workhouse for treatment crossed a Subdistrict boundary. Table 5 presents my alternative to Farr's scheme, and distinguishes cases contracted within the workhouse and those which commenced elsewhere.

Farr's analysis of the effect of hospitals on subdistrict mortality data is quite different and, while it recognises the problem of transfers, it resolves the issue at a very generalised scale. Farr says: 'In deducing the mortality of the several London districts, the population and the deaths in the hospitals was subtracted from the population and deaths of the respective districts in which the hospitals happened to be situated' (*loc. cit.*). The hospital deaths and hospital populations were then redistributed among the London districts in proportion to the deaths and populations of these districts (net of the hospitals). This amounts to ignoring hospitals altogether and does not reflect the complexity and concentrations of the actual transfers so that, while in the case of workhouses, Farr distributes too many deaths (ie. inmates as well as transfers), in this case, the deaths are distributed to too many places.

In his report on the 1849 epidemic, Farr presents 'corrected' and 'uncorrected' rates of mortality for each subdistrict. From the above, it will be apparent that these corrections are less than perfect. There are 127 Subdistricts for which it is possible to compare Farr's corrections with the registered deaths and the corrected number of deaths of residents. The rate of mortality as registered and the rate of mortality among residents may be calculated from our five week sample. A rate of mortality corrected according to Farr's suggestions may be impossible to determine for this short period since we do not know the population of each workhouse during this time. However, a surrogate 'corrected' rate of mortality may be computed by inflating the registered rate of mortality for each Subdistrict by the ratio of 'corrected' to 'uncorrected' mortality given by Farr for each Subdistrict during 1849 as a whole. This gives us three series of mortality rates in all and Figure 7 gives the Spearman's rank correlation coefficients of

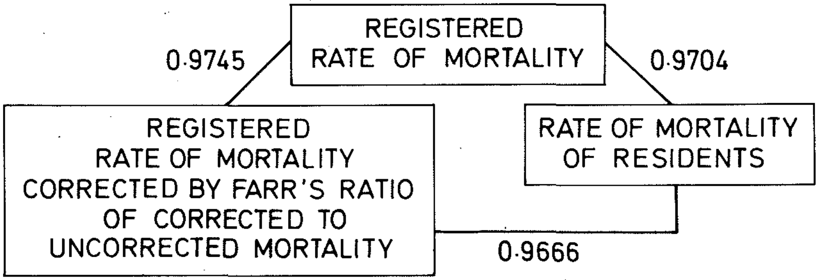


Figure 7. An assessment of the reliability of Farr's set of corrections for the cholera mortalities of the London Registration Subdistricts, 1849.

Table 6. A comparison of two alternative sets of corrections

D = (Farr's proportionate change) - (proportionate change residential deaths - registered deaths)

	D ⩾ 20%	20 > D > 0	D = 0	0 > D > -20%	D ⩽ -20%
Western	2	5	6	4	2
Northern	4	5	3	4	3
Central	7	0	6	4	9
Eastern	3	9	3	8	3
Southern	2	11	10	13	1
London	18	30	28	33	18

the three sets of paired correlations. Given the range of rates of mortality in comparison to the scale of transfers, it is not surprising that the overall ranking of the 127 areas should be so similar and it is the changes of detail which are most interesting. Farr's corrections suggest that 57 areas show no gap between corrected and uncorrected deaths and that 26 areas show a change of 26% or more. Again, this is similar to the scale of adjustments detailed above (Figure 6). However, when one examines the differences between Farr's corrections and those of Figure 6 for each Subdistrict, some interesting points emerge. Table 6 shows that in 36 Subdistricts, the proportionate corrections differ by 20% or more. These differences are most serious in central districts where for 16 out of 26 Subdistricts there is a discrepancy of 20% or more between the two sets of corrections.

These institutions make the spatial distribution of registered deaths an imperfect guide to the map of disease contraction. Contemporaries were aware of this problem, but they often viewed it from a financial perspective and did not distinguish between deaths following the contraction of the disease within an institution and deaths resulting from sick patients transferred to hospitals and workhouses for treatment. The net effects of these transfers do not alter significantly the overall rank ordering of many London Subdistricts, but they can alter a Subdistrict's standing with respect to its neighbours. It is precisely this that the more sophisticated geographical models rely upon.

The suitability of the statistics published with the Parliamentary Report on the 1849 epidemic for refined spatial modelling must be doubtful. If the model is to be comparable with the scale of the processes involved, one would not want to group too many areas together. Cliff and Ord work with 34 Districts rather than the 135 Subdistricts available and their attempts to 'determine whether the epidemic was dominated by the *in situ* rise and fall of death rates ... or by a spatial diffusion process' (Cliff & Ord, 1981, p.31) collapse since they concede that 'indeed, the *in situ* growth may be interpreted as the local spread (within the recording unit) which is likely to predominate when the overall numbers of new cases are low and the disease occurs in isolated pockets' (*ibid.* p.33). They do not give any reasons for ignoring this local spread even when the overall numbers of new cases are high. If one moves to the opposite pole and amalgamates several weeks, then one will miss actual spread altogether. Furthermore, the problem of institutional deaths poses serious questions of spatial bias. Any attempt to cope with such biases by employing general weightings will run up against the problem that, as the focus of the disease shifts, it will be necessary to continually readjust the weightings given to various areas in an arbitrary manner. There are real difficulties, then, in claiming that it is possible to get at 'the underlying processes shaping the geographical patterns' (*loc. cit.*) through this type of statistical evidence.

Occupation of the deceased

This body of statistics is, therefore, far from straightforward and a series of considerations must be borne in mind when using them to reconstruct the space-time patterns of the cholera epidemic of 1849. However, this leaves the question of interpretation unbroached. The spatial pattern of cholera mortality results from the interaction of three sets of factors: the geography of sanitary conditions, the distribution of differentially-susceptible social groups and the spatial effects of proximity and diffusion. In many ways, the most difficult task for the geographer is to disentangle the operation of the first two sets of factors. Yet if no attempt is made, then, spatial correlations between mortality and either social or environmental factors are unreliable.

The first requirement is data on cholera mortality by class as well as by area (cf. McDowall, 1983). This is difficult to meet. There is no consensus about the meaning of class and if we define class in a way which might have some direct bearing on the sanitary situation of the groups concerned then one is entering a dangerous circularity in which it is inevitable that class and disease incidence will be related. Another constraint on a class-specific analysis of cholera mortality is the contemporary categorisation of both victims and of the population as a whole. There is little point devising a framework of study which is inoperable with the available data. There are only two alternatives available to the researcher: either one proceeds from occupational groups or one works with status groups. In deciding which avenue to go down, one must consider the spatial scale at which breakdowns of both sets of categories are given in both the cholera returns and in the published volumes of the decennial censuses. It is essential to marry the data on the victims with that on the population at risk. The choice of approach must also be guided by the philosophies behind the two sets of categorisations. The occupational classifications are, by and large, based on distinguishing groups who work with the same materials and thus they include under one heading all employees, from manager to labourer, within each branch of industry. Status distinctions in the contemporary statistics are much coarser but their categories of 'gentry', 'tradesmen' and 'mechanics' were meaningful to contemporaries and were thought to indicate the differences in life-style that one would like to set against environmental controls on disease. It is thus with class in the sense of status group that this analysis primarily concerns itself. It will become obvious that distinctions between class and environmental factors are very difficult to make at the scale for which data is available.

Two sets of data on class-specific deaths have been published for the 1849 London epidemic. Firstly, there is a return prepared for the *Report of the General Board of Health on the Cholera of 1848 and 1849* by Mr.H.C.Edwards (GBPP 1850 xxi, Appendix B; Appendices 2 & 3). This shows 'the absolute deaths in the metropolis, as they occurred in [the five divisions of London - West, North, Central, East and South] districts, and among the three well-marked classes of gentry, tradesmen and mechanics, during the 60 weeks ending Nov.24, 1849' (*Ibid.* App.B. p.20). Figure 8 presents the basic distribution it gives. Secondly, 'in the Report of the Registrar General for

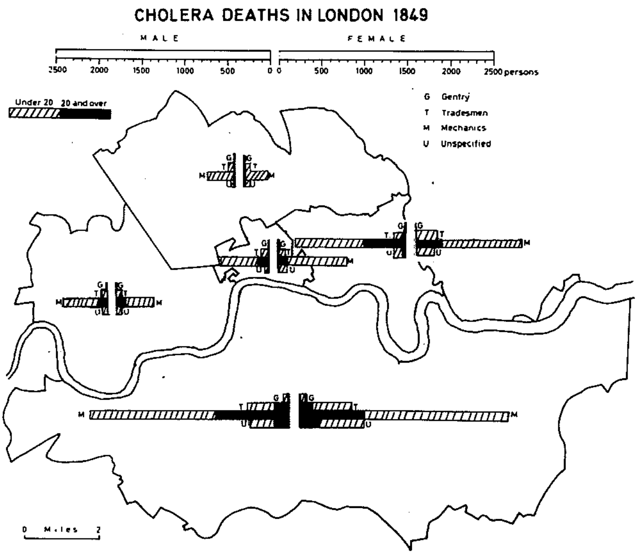


Figure 8. The cholera deaths in the three social groups in the five Divisions of London.

the week ending December 22, 1849, Dr. [William] Guy has given a very interesting account of the professions or occupations of 4312 men of the age of 15 and upwards, who were destroyed by cholera' (*Ibid.* pp.21-2). This Return is reprinted as Appendix No.4 to the above Appendix B. Dr. Guy lists occupations under the same heads of gentry, tradesmen and mechanics. Assuming Guy and Edwards to have employed similar classifications, a reasonable assumption since Edwards had Guy's work available to him for guidance, it is possible to use the tables on London occupations from the 1851 census (GBPP 1852-3 lxxxviii) to estimate the population at risk in each of these three groups for London as a whole and the gentry population at risk in each division of London.

There are several difficulties in using the census material in this way. Firstly, there is a problem in distinguishing tradesmen from mechanics. For many occupations, Guy lists the masters of the branch of manufacture as tradesmen and allocates their employees to the mechanics. The return of 'Employers with number of men' (*Ibid.* pp.28-9) in the printed census is inadequate. It was particularly difficult to define masters in sweated trades where subcontracting was common. Within any branch of industry there might be considerable spatial variation in the organisation of the trade, between the 'respectable' West End and 'sweated' East End of London, making comparisons difficult. Furthermore, this Census tabulation of the number of Employers in various branches of industry only gives a listing for London as a whole and does not distinguish its Divisions. Consequently, it is only possible to look at class-specific mortality rates for London as a whole. Table 7 gives the results for males in the three groups. 'Others' in the 'Population' column refers to those occupational groups it was not possible to allocate on the basis of Guy's history. These made up 34.5% of the male population. 'Others' in the 'Cholera Deaths' column refers to deaths listed as 'Others by Edwards, comprising 11.2% of the male deaths, and there is no necessary relation between the two groups. Even so, the broad picture is clear. The gentry experienced a lower mortality from cholera than tradesmen or mechanics. The differences between the deaths in each group and the deaths one would expect if they were distributed in proportion to their relative populations are significant (χ = 61.8, df = 2, α = 0.001).

A second problem in calculating the size of the groups in the 1851 census to which the labels 'gentry', 'tradesmen' and 'mechanics' might refer results from the failure of the published census to analyse families as a whole. This makes it difficult to determine the social class of many women and children. Three-quarters (76.7%) of the males under 20 are listed as 'Scholar' (28.3%) or 'Son, grandson, brother, nephew (not otherwise returned)' (48.4%). It is impossible to allocate these to any social group and they, therefore, inflate the 'others' category of the 'Population' in Table 7 accounting for 95.1% of the unassigned group. Since the participation rate in the workforce varies considerably between the three social

Table 7. The rate of cholera mortality among males in the three social groups; London, 1849

Social Group	Population 1851	Cholera Deaths 1848-9	Mortality per 10 000 living 1851
Gentry	34 923 (4.8%)	168 (2.7%)	48.1
Tradesmen	118 261 (16.3%)	989 (16.0%)	83.6
Mechanics	571 145 (78.9%)	5 026 (81.3%)	88.0
Total Allocated	724 329 (100.0%)	5 183 (100.0%)	
Others	382 229	774	
Total Population	1 106 558	6 957	62.9

Table 8. The rate of cholera mortality among males over 19 in the three social groups; London, 1848-9

Social Group	Population 1851	Cholera Deaths 1848-9	Mortality per 10 000 living 1851
Gentry	33 829 (5.4%)	157 (3.8%)	46.4
Tradesmen	108 886 (17.4%)	726 (17.4%)	66.7
Mechanics	482 366 (77.2%)	3 288 (78.8%)	68.2
Total Allocated	625 081 (100.0%)	4 171 (100.0%)	
Others	7 464	521	
Total Population	632 545	4 692	74.2

Table 9. The rate of cholera mortality among females over 19 in the three social groups; London, 1848-9

Social Group	Cholera Deaths 1848-9	Cholera Deaths among the over-19 age group	Population aged over 19 allocated as for males	Mortality per 10 000 living 1851
Gentry	161 (2.5%)	140 (2.9%)	40 518 (5.4%)	34.6
Tradesmen	1 000 (15.5%)	807 (16.8%)	131 242 (17.4%)	61.5
Mechanics	5 306 (82.0%)	3 850 (80.3%)	581 404 (77.2%)	66.2
Total Allocated	6 467 (100.0%)	4 797 (100.0%)	753 164 (100.0%)	
Others	1 166	920	9 254	
Total Population	7 633	5 717	762 418	75.0

groups, this unassigned group renders the size of the allocated population in each group unreliable. This casts doubt on the calculated rates of mortality because in Edwards' return the deaths of children are allocated to their parents' social group. The only way to alleviate this problem is to exclude males under 20 from the analysis and assume that all masters are over 19 years of age. The resulting rates of mortality are given in Table 8. The results are broadly similar and again differences between the three groups are significant (χ = 21.4776, df = 2, α = 0.001), although the gap between the tradesmen and mechanics on one hand and gentry on the other has narrowed. This is largely because the proportion of deaths occurring among the under 20s was lower for the gentry (6.5%) than for tradesmen (26.6%) or mechanics (34.6%). The significance of this is not clear since one can only guess at possible collusion between doctors and wealthy clients to return infants' deaths as diarrhoea associated with teething, or something similar, as opposed to cholera.

The difficulties in classifying females are more intractable. 41.5% of the women over 19 are returned as 'Wife (of no specified occupation)'. There seems little prospect of extracting meaningful information from the occupational classification of females. Therefore, on the assumption that the sex ratio is similar across the three social groups, females over 19 years of age were allocated in the same proportion as the males. As with the males, the proportion of deaths not included by restricting the analysis to people aged 20 or more varies across the groups although in this case, the gentry (13.0% of all female-gentry cholera deaths occurred among females aged less than 20) are not as different from the tradesmen (19.3%) and mechanics (27.4%) as they were in the case of males (6.5%, 26.6%, 34.6% respectively). Table 9 presents the results and, as above, it shows a significant difference between observed cholera deaths in each group and those that would be expected if there was a uniform rate of mortality (χ = 60.8, df = 2, α = 0.001). The 7633 female deaths represent a rate of mortality (60.8 per 10 000) similar to that of the males (62.9). The 1166 'Others' deaths included in this total comprise a larger proportion (15.3%) than for 'undescribed' male deaths (11.1%). Consequently, one cannot place too much stress on the lower absolute mortalities in the three social groups for women (34.6, 61.5 and 66.2 per ten thousand as against 46.7, 66.7 and 68.2 per ten thousand, respectively) although it is also noticeable that a slightly higher proportion of the specified female cholera deaths (80.3%) are returned as 'mechanics' than among males (78.8%).

Given the two sets of problems which arise in using the published census in this way, only broad conclusions may be offered at this stage. Firstly, males and females were attacked to a similar degree. Secondly, the gentry suffered less than the other groups. Thirdly, tradesmen and mechanics were similarly afflicted at a rate which was between 50 and 100% greater than that of the gentry. The published census volumes do not give a spatial disaggregation of 'Masters and Men' so that it is not possible to give any indication of the size of the tradesmen or mechanics groups in the five divisions of London. The first two conclusions, however, may indeed by examined geographically from these sources.

The overall similarity between the mortality of the two sexes concealed interesting variations based on age and area. Tables 10 and 11 show age-specific cholera mortality rates for the five divisions of London. Mortality clearly varied with age, and the chi-square statistics calculated to test the null hypothesis that the deaths were distributed among the age groups on the basis of a uniform mortality are massively significant for London as a whole and for each division. Mortality levels of the different ages varied consistently across the divisions. The 60 and over age group had the highest mortality among both sexes in all areas and the 45-59 age group, showed the second highest mortality. The lowest mortality occurred in the 5-14 age group in some areas and in the 15-29 age group in others. For each age group, there was a consistent spatial pattern of mortality. For females, the ranking was identical for all age groups (Southern, Eastern, Central, Western, Northern) while among males, Central had higher mortalities than the Western division for those aged 30 and over and their positions were reversed for the under 30s. Tables 10 and 11 also show that the disparity between the areas varied for each age group; the division with the greatest female mortality (Southern) deviated from the London average to the greatest extent (2.14 times) in the

Table 10. Age-specific cholera mortality rates (deaths per 10 000 living) for males in the five divisions of London; 1848-9

	0-4	5-14	15-29	30-44	45-59	60 & over	Total
West	42.6 (0.56)	23.7 (0.65)	20.0 (0.57)	36.1 (0.54)	59.6 (0.60)	115.6 (0.63)	37.3 (0.69)
North	23.8 (0.32)	11.3 (0.31)	9.6 (0.27)	21.1 (0.32)	40.7 (0.41)	67.8 (0.37)	21.0 (0.33)
Central	41.6 (0.55)	22.4 (0.62)	17.8 (0.50)	47.6 (0.71)	65.7 (0.67)	138.7 (0.75)	40.0 (0.64)
East	69.5 (0.92)	36.1 (0.99)	42.1 (1.19)	81.9 (0.22)	118.9 (1.20)	209.2 (1.14)	69.7 (1.11)
South	155.2 (2.07)	68.7 (1.89)	71.5 (2.03)	122.7 (1.83)	176.8 (1.79)	302.5 (1.65)	118.4 (1.88)
London	75.2	36.4	35.3	66.9	98.7	183.8	62.9

(The figures in brackets give the ratio of the age-specific cholera mortality in each division to that in London as a whole).

Table 11. Age-specific cholera mortality rates (deaths per 10 000 living) for females in the five divisions of London; 1848-9

	0-4	5-14	15-29	30-44	45-59	60 & over	Total
West	38.2 (0.61)	17.6 (0.57)	11.0 (0.42)	29.5 (0.43)	54.8 (0.53)	103.3 (0.53)	30.3 (0.50)
North	14.1 (0.23)	7.9 (0.25)	7.5 (0.28)	18.3 (0.27)	32.8 (0.32)	79.4 (0.41)	18.7 (0.31)
Central	42.5 (0.68)	19.8 (0.64)	21.7 (0.82)	58.4 (0.85)	82.2 (0.79)	161.7 (0.83)	48.2 (0.79)
East	49.2 (0.79)	28.9 (0.93)	31.6 (1.19)	81.0 (1.18)	103.6 (1.00)	205.6 (1.06)	63.0 (1.04)
South	133.8 (2.14)	63.4 (2.04)	54.5 (2.06)	132.9 (1.93)	210.4 (2.03)	351.7 (1.81)	121.7 (2.00)
London	62.5	31.1	26.5	68.7	103.6	194.4	60.8

(The figures in brackets give the ratio of the age-specific cholera mortality in each division to that in London as a whole).

0-4 age group and least (1.81 times) in the 60 and over age group, and the division with the least mortality (Northern) showed the same pattern (0.23 and 0.41 respectively). Only the Western females did not follow this pattern of displaying greatest deviation from the mean in the 0-4 age group. For males, the 0-4 age group mortality in each area characteristically had a great divergence from the London average but the pattern was not as consistent as among females and the Eastern males showed no pattern at all.

This brief examination of the interaction of age and area suggests that while males and females in the three social groups may have been attacked to a similar degree, there were wide divergences in the experiences of the different ages with the very young and the old suffering most. This pattern was consistent across space although the general level of mortality in each division was different and the high mortality in the South is associated with an especially high mortality among the under-fives.

The generally lower mortality of the gentry also incorporated interesting geographical patterns. Table 12 presents the results from an examination of the pattern of gentry mortality among males aged 20 and over. This is the only age group for which there is an occupational listing at a registration district level. Table 13 presents the mortality levels of female gentry over 19 years of age. As above, the female gentry population is determined by assuming that it forms the same proportion of females in each division as the male gentry is of the total males in the several divisions.

The geographical variation in mortality was marked. While, in each division, the gentry had a lower mortality than the rest of the population, the gentry in the Eastern and Southern divisions suffered greater cholera mortality (62 and 110 deaths per 10 000 for males, 57 and 97 deaths per 10 000 for females) than the non-gentry in the Western and Northern divisions (44 and 26 deaths per 10 000 for males; 37 and 25 deaths per 10 000 for females). Male gentry aged 20 and over in the Southern division were 4.6 times as likely to die of cholera as the same group in the Northern division and among female gentry the ratio was 8.1. The ratios are comparable to the spread in the mortality of the population as a whole. The differences between male and female gentry mortality are proportionately greatest in the areas of light mortality (Western, Northern and Central divisions) while the greatest proportionate disparity between gentry mortality and other mortality occurs in the Central division (24 and 51 cholera deaths per 10 000, respectively). In other words, male and female gentry mortality are closest in areas of high mortality and closest to overall mortality in the areas of highest (Eastern, Southern) and lowest (Northern) mortality. The geographical influence seems to be greatest at the extreme of the spatial pattern and the social-group divergence greatest in the median areas.

Table 12. The mortality from cholera among the male gentry (aged 20 and over) in the five divisions of London; 1848-9

AREA:	Western	Northern	Central	Eastern	Southern	London
Gentry:						
Population	9 174	9 497	5 361	2 420	7 377	33 829
Cholera Deaths	25	23	13	15	81	157
Mortality (per 10 000)	27	24	24	62	110	46
Others:						
Population	92 881	115 047	108 023	127 262	156 457	599 670
Cholera Deaths	413	302	546	1 120	2 154	4 535
Mortality (per 10 000)	44	26	51	88	138	76
Total:						
Population	102 055	124 544	113 384	129 682	163 834	633 499
Cholera Deaths	438	325	559	1 135	2 235	4 692
Mortality (per 10 000)	43	26	49	88	136	74

Table 13. The mortality from cholera among female gentry (aged 20 and over) in the five divisions of London; 1948-9

AREA:	Western	Northern	Central	Eastern	Southern	London
Gentry:						
Population	12 013	13 004	5 874	2 561	8 644	40 713
Cholera Deaths	15	16	10	15	84	140
Mortality (per 10 000)	12	12	17	57	97	34
Others:						
Population	121 624	157 530	118 352	139 394	183 332	721 705
Cholera Deaths	452	395	760	1 179	2 791	5 577
Mortality (per 10 000)	37	25	64	85	152	77
Total:						
Population	133 637	170 534	124 226	142 045	191 976	762 418
Cholera Deaths	467	411	770	1 194	1 875	5 717
Mortality (per 10 000)	35	24	62	84	150	75

It is not possible to replicate the above analysis for Tradesmen and Mechanics but from the returns available for 10th of September to 13th of October, 1849, some geographical evidence about certain occupations may be offered. From the sample of over 3000 cholera deaths, only seven large and unambiguous occupational groupings could be defined which were also specified in the published 1851 census. These comprised about 10% (330) of the total sample. The analysis proceeds at the level of the Division although in this case it would be possible to construct estimates of the population at risk and to provide counts of the victims in each group for a finer spatial mesh. However, this was not pursued since the numbers of cholera deaths were not large enough and some amalgamation of the Divisions for certain occupational groups was necessary. Table 14 shows the results of this exercise.

Males aged 20 and over given as 'Clerk', 'Commercial Clerk' or 'Mercantile Clerk' in the sample were taken to correspond to the census label 'Commercial Clerk'. 'Gentleman' and 'Male, Independent' in the sample were placed with 'Gentleman' and 'Independent Male' in the census. 'Irish Labourer' and 'Labourer' in the sample have been placed with 'Labourer (branch undefined)' from the census. 'Mariner', 'Master Mariner', 'Mate', 'Sailor', 'Seaman' and 'Second Mate', from the sample were put with 'Seaman RN', 'Seaman' and 'Others connected with sea navigation' in the Census. Under the heading 'Servant', are 'Housemaid' and 'Spinster Servant' from the sample and 'Domestic Servant (General)' (both male and female) and 'Housemaid' from the Census. 'Boot and Shoe maker', 'Boot Closer', 'Boot Maker', 'Journeyman Boot Maker', 'Cordwainer', 'Journeyman Cordwainer', 'Journeyman Shoemaker', 'Master Shoemaker' and 'Shoemaker' all correspond to the single census category 'Shoemaker'. Similarly, 'Tailor', 'Master Tailor', 'Journeyman Tailor' and 'Working Tailor' have all been associated with the single census category 'Tailor'.

As a check on the adequacy of these definitions and the reliability of this sample, Table 15 shows the total mortality for males aged 15 and over in these occupations (abstracted from Guy's occupational listing). The ranking is very close, only Seamen and Labourers swap ranks between the two listings. The most surprising thing about Table 14, is that Gentlemen have the greatest mortality in London as a whole (101 per 10 000). Only in the Western division is this position challenged and the small number of seamen deaths involved (2) in their very high mortality (66 per 10 000) undermine the significance of this exception. Guy's listing shows that the 135 gentlemen deaths in 1848-9 made up over half the total gentry deaths (260) and from the census the 3146 gentlemen in 1851 (see Table 15) made up only 9% of the gentry group aged over 15 years of age (35 087). Yet Guy also suggests that these 135 deaths represent a mortality of 1 in 200 (calculating, he claimed, on the basis of the 1841 census) which would put the number of gentlemen living at about 27 000, an order of magnitude greater than the total given in 1851 census. Clearly, in the 1851 census, a lot of people who might have been termed 'Gentlemen' by others were given a more specific occupational label. Consequently, the class-specific mortalities for 'Gentlemen' are unreliable and the distinction between gentlemen and other gentry must be treated with caution.

Fortunately, the other group open to this difficulty (Labourers) seems more reliably specified. Guy gives 756 deaths which he claims is 1 in 65. This would give 49 140 labourers and, from the 1851 census, Table 15 gives an estimate of 49 325 which is reassuringly close. The only other groups for which such a direct comparison can be made are tailors and shoemakers. Again, the two sets of estimates are very close. For tailors, an estimate of 20 918 can be derived from Guy and the 1851 census gives 22 072, while for shoemakers, the figures are 24 522 and 26 639 respectively.

Another distortion in the data must be noticed. It is difficult to interpret residential data relating to seamen and this problem is compounded in the present case by the way health care for sailors was organised. Hulks were set up as hospital ships and, ultimately, a large number of sailors' deaths were returned to the Southern division where the hulks were stationed. Consequently, while the inference that seamen (33 deaths per 10 000) and labourers (31 deaths per 10 000) were similarly afflicted might be reliable, the suggestion that the divergence between the mortality of seamen in the Eastern division (23 per 10 000) and the Southern division (66 per 10 000) might be related to environmental conditions would not be. For the above reasons, gentlemen and seamen are omitted from this discussion of the interaction of area and class.

Table 15 presents chi-square values for the different occupations to indicate how differently deaths were distributed from those that would have followed from there being no geographical variation in mortality. The small numbers of expected deaths in some divisions for many occupations meant that some spatial grouping was required and this is indicated. The Servants showed the weakest geographical variation ($\chi^2 = 3.22$, df = 4, $0.30<\alpha<0.50$) and the Tailors showed the second weakest ($\chi^2 = 4.75$, df = 1, $0.02<\alpha<0.05$). In all other cases, the χ^2 values are significant at the 0.02 level. The weakest variation is also associated with the lowest mortality. The general exemption of servants makes it all the more sad that they were viewed as carriers of disease by many gentry and their visits to relatives were often restricted during the epidemic. Furthermore, this lack of geographical influence on the mortality of servants is underlined by their being the only group not to have their highest mortality in the Southern division. Labourers, unlike other groups, suffered their second highest mortality in the Western division (29 deaths per 10 000) but the general ranking of divisions for each group was consistent. Similarly, Labourers were the highest ranking in all areas except the Eastern division where Shoemakers (22 deaths per 10 000) had a slightly higher mortality than them (21 deaths per 10 000).

Table 14. The rate of cholera mortality among seven occupational groups (aged 20 and over); London, September 10th to October 13th, 1849

AREA:	Western	Northern	Central	Eastern	Southern	LONDON
Clerk (M):						
Cholera deaths	1	0	3	3	12	19
Population	1 560	3 240	2 389	1 636	3 485	12 310
Mortality	6	0	13	18	34	15
Gentleman (M):						
Cholera deaths	5	3	3	0	20	31
Population	1 008	729	508	245	572	3 072
Mortality	50	41	59	0	350	101
Labourer (M):						
Cholera deaths	18	15	14	24	64	135
Population	6 312	6 843	6 169	11 365	13 124	48 813
Mortality	29	22	23	21	49	31
Seaman (M):						
Cholera deaths	2	1	0	24	27	54
Population	301	509	828	10 643	4 061	16 342
Mortality	66	20	0	23	66	33
Servant (M,F):						
Cholera deaths	9	9	3	7	12	40
Population	32 940	30 630	15 339	8 196	20 889	107 994
Mortality	3	3	2	9	6	4
Shoemaker (M):						
Cholera deaths	1	0	5	14	14	34
Population	3 793	4 855	5 482	6 435	6 074	26 639
Mortality	3	0	9	22	23	14
Tailor (M):						
Cholera deaths	3	2	2	4	6	17
Population	4 340	4 175	5 148	3 484	3 010	202 517
Mortality	7	5	4	11	10	8
CV	68.6	40.1	52.9	25.4	40.7	52.7

(see text for explanation CV row)

Table 15. Cholera mortality in seven occupational groups, 1848-9

	X^2	Areas	Male deaths aged 15 & over 1848-9	Population Males aged 15 & over 1851	Cholera Mortality (deaths per 10 000)	CV
Clerk	15.09	WN,CE,S	100	15 940	63	37.1
Gentleman	39.74	W,N,CE,S	135	3 146	430	-
Labourer	20.94	W,N,C,E,S	756	49 325	153	36.1
Seaman	20.03	WNC,E,S	299*	21 430*	140	-
Servant	3.22	W,N,CE,S	-	-	-	48.4
Shoemaker	18.77	W,N,C,E,S	159	29 916	53	28.2
Tailor	4.75	WNC,ES	86	22 072	39	53.3

* Includes Greenwich Pensioners.

(See text for explanation of CV, X^2 and Areas columns)

These data cover a shorter period than the whole epidemic so that the absolute levels of mortality may not be directly compared with those for the gentry during the whole epidemic. However, the relative geographical variability of the two sets of data may be examined. The Coefficient of Variation is the indicator used here ($CV = (\sigma/\bar{X}) \times 100$; where $\bar{X}$ is the weighted mean mortality and σ is the weighted standard deviation of the component mortalities). Table 14 gives the results for the five divisions and Table 15 gives the results for five occupational groups; the coefficient of variation of the male gentry over 19 was 55.3%. On the whole, the groups with the highest mortality (Labourers, Clerks, Shoemakers) had the lowest variation ($r_S = 0.7$, $n = 5$, $z = 1.4$, $\alpha = 0.0808$, one-tailed test). The variation of gentry mortality across the five divisions also has this pattern since their total mortality (46 per 10 000) was similar to that of the Tailors (39 per 10 000; Table 15) as was their variation (55.3% and 53.3% respectively). The variability of the mortalities in each area (see Table 14) bear out the tentative conclusions drawn from the discussion of gentry mortality: the variation of mortalities is least in the divisions with the highest (Eastern, Southern) and lowest (Northern) general mortality.

The following conclusions may be offered about the interaction of class and area in the explanation of the geography of the cholera epidemic of 1849 in London. Within each class, males and females appear to have suffered to a similar extent although there were significant variations within each sex based on age. The young and the old were particularly prone to cholera and the age-specific mortalities all showed similar patterns with the influence of area being especially strong among the under fives. The geographical effect was particularly evident among those groups which experienced highest mortality from cholera and was weakest for relatively exempt groups. The different groups diverged least in the areas of highest and lowest mortality. It was at the extremes that the geographical part of the class/area interaction was most powerful. Nevertheless, there were marked and consistent differences between the level of mortality of different groups with the general exemption of the gentry being evident. This finding is difficult to interpret without small-scale studies on social segregation in different parts of London but perhaps the gentry were fairly segregated while tradesmen and mechanics lived in closer proximity sharing the same filthy courts and impure water and that these similar sanitary conditions had more effect than differences of income. It appears that, while class had an effect on cholera mortality, there was a strong, independent geographical control and that the geography of cholera mortality did not simply mirror the distribution of differentially-susceptible social groups.

Circumstances of death

In addition to systematic details on cause of death, date of death, place of death and the profession or occupation of the deceased, the registrars and medical attendants were encouraged to note any other relevant circumstances. Such materials cannot be standardised and are primarily of use in respect of the use made of them by advocates of public health reform.

The returns were a rich source of illustrative material for people criticising existing sanitary arrangements. For example, a Lambeth registrar described a case from 'a locality' which 'ought to be immediately seen to'. The registrar recorded that 'the poor deceased was laying upon what had once been a bedstead, with only coarse rugs to cover her, and such was the poverty and destitution, that the husband had not a halfpenny to purchase a candle, which, from the darkness of the place, was necessary to enable me to see the patient'. An Islington return described one area thus: 'Elder Place consists of six or seven houses with no back windows; the one privy, one dusthole, one gully hole, for all the houses, are all situated within five feet of the door of number two where the death occurred. The bin was full to the brim. Water comes in at the common cock three times a week, for all the houses'.

Poor drainage was frequently complained of, for example, in a return from Shoreditch, the registrar gave an account of Chatham Gardens, a place which had 'upwards of 60 houses, or rather cottages ... forming 2 rows. Nothing but surface drainage, and the place is surrounded by cesspools which are seldom, if ever, emptied'. From many areas, there were reports that 'all waste water is thrown into the street' and that sewerage was ineffective. The registrars also recorded that they had complained of these conditions to the appropriate authorities but often without success.

Alongside these environmental conditions, the registrars considered a host of other factors to be important in explaining the extension of cholera. Many mentioned dietary infelicities including the consumption of cucumbers in Clerkenwell and, in the Strand, cholera was the price paid by a boy for 'having eaten freely of whelks'. Others suggested that women in confinement had a lower resistance to the disease. Many registrars reported cases in which they suspected contagious transmission of cholera to have been important. Apart from attending upon the sick, the most common suspected mechanism was the washing of the clothes of cholera victims.

Table 16: The circumstances of cholera deaths, 10th September to 13th October, 1849

	CIRCUMSTANCES OF DEATH		
AREA	Cholera	Premonitory Diarrhoea	Contagious Transmission
Northern	265	48	20
Western	357	49	28
Central	481	46	27
Eastern	589	57	47
Southern	1580	140	72
London	3272	340	194

Table 16 has been calculated from these returns and in about 6% of the cases the registrar set forth grounds on which one might suggest that contagious transmission took place. The figures also record that in 10% of the cases, registrars made a note that the cholera attack had been preceeded by premonitory diarrhoea. Yet the strategy of the General Board of Health was based on the belief, held by Edwin Chadwick, that cholera was never contagious and was always preceded by the premonitory diarrhoea. The registrations rarely put forward any moral factors which might have been contributing causes of death. Intemperance was mentioned in less than 1% of the cases discussed while only three prostitutes are found in the whole lists yet it was taken as axiomatic that excessive drinking and poor morals were associated with high mortality. The basic assumptions of the General Board of Health are not borne out by these returns and, in the range of predisposing factors considered and in the inclusion of contagious transmission the tone of the returns is closer to the theory of contingent contagionism (Pelling, 1978, pp.18-25, 295-310), of which William Farr's own work is one example (Eyler, 1979, pp.97-108), than to the sanitarians' theory of anticontagionism.

The General Board of Health based its strategy on the assumption that cholera was never contagious and was always preceded by premonitory diarrhoea. They advocated and, at times, imposed house-to-house visitation on districts in the hope that this would uncover cases of premonitory diarrhoea which could be successfully treated before they passed into the far less tractable choleraic condition. Many registrars praised house-to-house visitation. The other part of the General Board of Health's strategy aimed at removing what it saw as the source of cholera: decomposing organic matter was to be carted or flushed away. Many registrars expressed support for general cleaning. However, others were worried that, in disturbing long-standing accumulations, the General Board of Health ran the risk of stirring up further 'exhalations'.

Examination of the details of these returns and the comments of registrars about the circumstances of particular deaths, can highlight the extent to which they could only provide ambiguous support for particular theories of disease. Cullen has said, of a report by Farr on violent deaths, that 'what is striking about all this is not so much its humanity as how little the tediously collected and collated statistics were required. The real function of the General Register Office was to be another Government sponsored pulpit for reforming ideas' (Cullen, 1975, p.38). While this is less true of Farr's studies of cholera, it is clear that the returns were incapable of adequately grounding categorical statements about the nature of cholera. The claim of Farr that they could, must be seen in the context of the statistical movement's championing of statistical objectivity. In the medical profession, this constituted an attack on the right of the established bodies (The Royal College of Physicians and the Royal College of Surgeons) to legislate on medical questions by virtue of their authority rather than their research. A familiarity with the process whereby facts were produced is an essential part of understanding how they were cited because it makes the strategies the facts were plugged into more explicit. In this case, the returns highlight how far the General Board of Health had to distort evidence in order to maintain that their analysis of the nature of cholera and their attempts to cope with the epidemic received support from the experience of the 1849 London epidemic.

The social construction of the 'cholera crises'

Having commented on the ways the detailed registrations throw light on how contemporaries constructed their own accounts of cholera mortality as much out of their ideological preconceptions as from the basic facts, it is important to push these remarks further and consider the whole issue of the construction of historical 'events'. Historians and sociologists have been alerted by Michel Foucault to the intersection of power and knowledge in the construction and deployment of concepts (this is developed in ways relevant to this paper in Armstrong, 1983). One can accept that concepts have material groundings in ways which incorporate defensible statements about the real world and that the empirical regularities the concepts claim to explain exist independently of those concepts, while also recognising that the significance of particular concepts is primarily a social creation.

In isolating the cholera epidemics as events, one is clearly following contemporary practice. In consequence, one should ask what meaning such a mark of distinction conveyed in the mid-nineteenth-century. It is certainly not the case that these epidemics were of great demographic moment. Set alongside the more frequent fevers, endemic tuberculosis and pneumonia-diarrhoea, their impact was slight. Yet contemporaries did not wait until the count was in before they assigned significance. One is driven to the conclusion that it was the anticipation rather than the experience of cholera which gave it such a high profile. This anticipation was fuelled from two sources which related to the question of urban political disorder. First, there was the social disruption evident during cholera epidemics in Russian cities. The dramatic mortality there and the consequent widely reported working-class agitation put the British middle classes on their mettle. Secondly, this anticipation was reinforced by the eastern origins of this disease. The political apparatus reactivated the discussions and terror associated with the plagues of the fourteenth to seventeenth centuries. What the authorities saw was not a steep rise and then fall in the monthly rate of diarrhoeal mortality but a new plague and a possible breakdown in law and order within the cities. The anticipation of this collapse called forth the crisis mentality from which the political significance of the cholera epidemics stemmed.

However, a different set of considerations animated the meaning that the epidemics held for the public health movement. On one hand, widespread recognition of a crisis with a medical root elevated the medical profession to a position from which it could dispense eagerly awaited advice. The epidemics, therefore, became one opportunity in the long struggle for medical professionalisation and, in reinforcing the use of the professional bodies as a distillation of the wishes and wisdom of medical practitioners, the medical profession stressed status over experimental science. On the other hand, the broader public health movement, while anxious to point to the removable environmental deficiencies which favoured the extension of cholera did not want to use cholera mortality as a simple barometer of sanitary conditions since the latter could and did exist without the former. Furthermore, in capitalising on the cholera crises, they ran the risk of encouraging complacency once the crisis had been seen to pass. For the public health movement, the aim was to exploit the crisis as an opportunity while trying to direct attention to predisposing causes or the slow accumulation of epidemic conditions.

These comments could be extended to a consideration of the meaning a cholera crisis held for other groups in society. In each case, it would be possible to document divergences. This raises two problems for the researcher: first, what set of meanings have been bequeathed to us as the historical account from which our work proceeds and, secondly, were these events ever really there? These enquiries underline the need to pursue the ideological identification of *significant* events. In other words, in returning to contemporary accounts one needs to construct some sort of grid of alternative readings of events so that the relations between power and knowledge implicit in the sources are made explicit. This topic is vital to any assessment, other than a purely demographic one, of the effects of the cholera epidemics and of their association with public health reform. Yet, in another sense, these 'crises' generated a lot of demographic material which historical geographers may use to place some sort of bounds on contemporary surveys of sanitary conditions. In parish registers one sometimes finds cholera deaths distinguished in ways which directly recall the treatment of plague victims. In the parliamentary papers there is a wealth of material, at a variety of scales, which places cholera victims in a broader social and environmental framework. For once one is convinced that the appelation 'Asiatic Cholera' identifies a mode of death quite out of the ordinary then a medical geography of the patterns of that mortality becomes a valuable part of the study of the nineteenth-century urban environment, just as a study of the reactions of contemporaries highlights the political and ideological landscape. In pursuing this medical geography one is taking advantage of the materials thrown up by the 'crisis', but one is using them in ways that contemporaries frequently did not and, when one considers the Victorians' frequently cavalier attitude to the details of these statistics in presenting their analyses, one is led to conclude that the medical geographer is using the data in ways that contemporaries never intended to. This increases the value of a systematic approach to the materials since the bias in their construction was never meant to produce a preponderance of evidence in any one direction, simply a rich source of illustrations, however atypical. The type of analysis undertaken by historical and medical geographers starting from systematic bodies of data does not inevitably reproduce the ideology and expectations of those who commissioned and collated the materials. Analyses which are sensitive to technical and conceptual issues raised by the 'discipline of historical context' can make a valuable contribution to historical knowledge.

CONCLUSION

This paper has illustrated the problems encountered in the use of historical statistics by medical geographers. It has documented and measured some of the biases in the registration data available for the 1849 London cholera epidemic. These issues are not confined to this particular example and it is hoped that the tables may be of use to geographers working on similar topics in other British cities as an indication of the scale of the biases they might encounter. Although, from this survey, the data appear quite robust in aggregate, the issues raised here become more telling as the scale of analysis shifts from Registration Districts (eg. Woods, 1982b; cf. Lawton, 1982) to Subdistricts. The conclusion of the discussion on the influence of geography on mortality was that much fruitful work may be done on the spatial aspects of urban epidemics but that the relevant environmental factors will probably be related to small-scale social segregation and local sanitary conditions as much as to the large-scale control exerted by topography and water supply. This work will need to take cognisance of the technical and contextual issues relating to sources that this paper has begun to examine. The careful examination and preparation of sources is a necessary prelude to their manipulation in subsequent analysis unless, of course, the aim is to illustrate a technique rather than to answer substantive questions.

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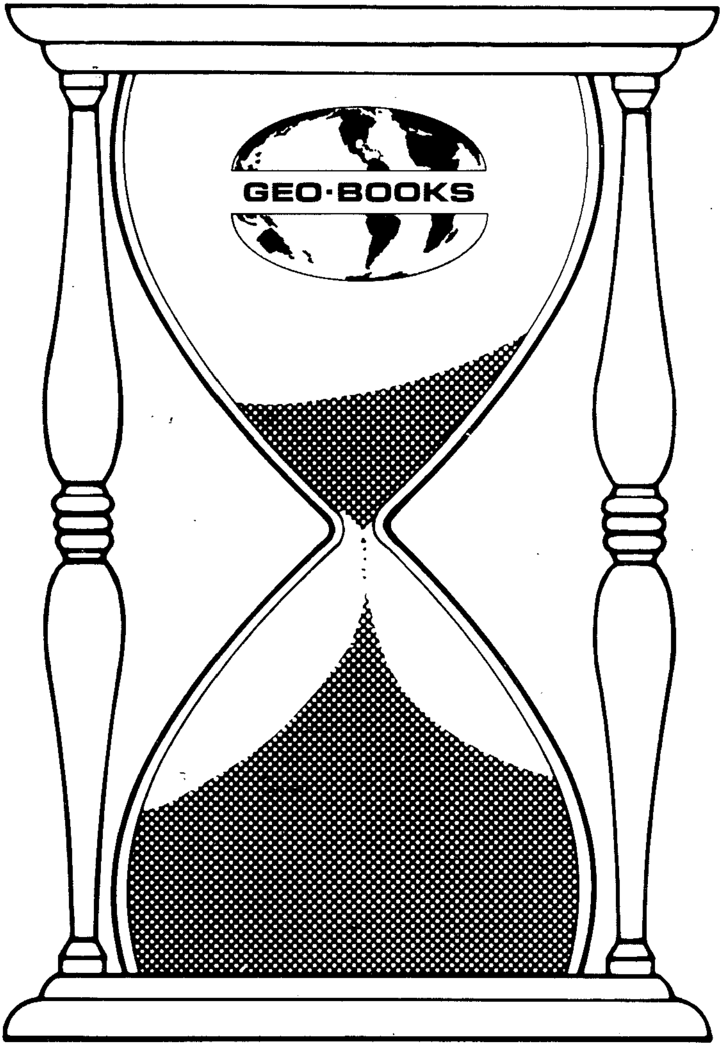

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