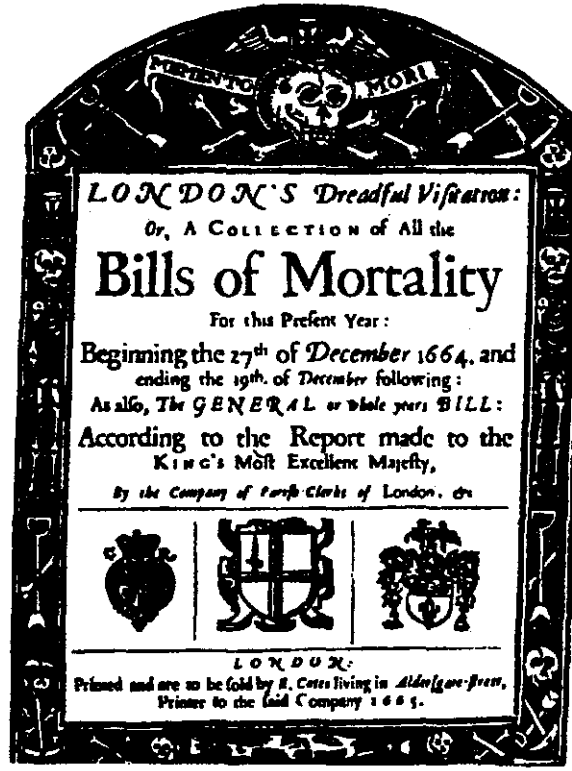
LONDON'S DREADED VISITATION

The Social Geography of the Great Plague in 1665

J. A. I. Champion


LONDON'S Dreadful Visitation:
Or, A Collection of All the
Bills of Mortality
For this Present Year:
Beginning the 27th of December 1664. and
ending the 19th. of December following:
As also, The GENERAL or Whole years BILL:
According to the Report made to the
King's Most Excellent Majesty,
By the Company of Parish-Clerks of London, &c
LONDON:
Printed and are to be sold by E. Cotes living in Aldersgate-street,
Printer to the said Company 1665.

Number 31
HISTORICAL GEOGRAPHY
RESEARCH SERIES

September 1995

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No. 31

LONDON'S DREADED VISITATION

THE SOCIAL GEOGRAPHY OF THE GREAT PLAGUE IN 1665

'The City of Confusion is broken down,
every house is shut up.' *Isaiah 24: 10–12*

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ISBN 1 870074 13 0

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Preface and Acknowledgements

This work derives from a project conceived by Drs John Henderson and Derek Keene comparing the epidemic experiences of Florence and London in the seventeenth century. The project was based at the Centre for Metropolitan History (CMH) under their supervision, and was funded by both the ESRC (Reference No. R000231192) and the Wellcome Trust (Ref: 019204). Many thanks are due to both of those individuals and institutions. The work began in the late 1980s: thanks to the persistent support of the director of the CMH, Derek Keene, and its administrator, Olwen Myhill, it has finally come to fruition. CMH has supplied much of the technical assistance that has provided the means for displaying and analysing the data presented here: in particular, thanks should be given to Craig Spence, sometime colleague at CMH, who created the base maps of the metropolis. Grateful acknowledgement should also be made for the many bibliographical references supplied by Heather Creaton and Tony Trowles.

The ideas that frame the presentation of the databases compiled from hearth tax assessments, burial records and other sundry seventeenth-century materials, were presented in a number of places: the Institute of Historical Research, Cambridge University (the Early Modern Seminar and the Wellcome Unit), and Southampton University. Many thanks to all of those who offered comments, advice and criticism. Of particular importance in forming my own understanding of the relationship between disease and society in the seventeenth century were my many enjoyable conversations and discussions with Graham Twigg who is always willing to share either his own biological knowledge, or the latest results of his own analyses of early modern epidemiology. I am also grateful to Paul Slack who, very early on in the life of the project, gave careful advice and general encouragement: important matters for any historian who has to work in the shadow of his *Impact of the Plague*, which throughout the time I have spent researching, inputting and writing, has served as a model of clarity and exposition. Thanks also to Michael Power who gave the project his working notes and analyses of the Hearth Taxes of the 1660s: they were indispensable. Gratitude also to Paul Laxton, who graciously gave the project access to a machine-readable version of the *Bills of Mortality* for 1665, which saved a great deal of time and effort.

I would also like to thank the archivists and librarians at the Corporation of London Record Office, the Greater London Record Office, Guildhall Library, East Sussex Record Office, the Public Record Office, and the City of Westminster Archives Centre for their prompt and expert assistance. Debt is also owed to the Cambridge Group for the Study of Population for providing data relating to St James Clerkenwell compiled by the late Amanda Copley.

Manifold thanks should also be given to Olwen Myhill, without whom this project would probably have ground to a halt. Her sharp eye for contradiction and

dedication to accuracy, combined with an expertise in the manipulation of various software programs has meant that the text is presented in a professional and elegant manner.

Finally, I would like to thank Derek Keene for all his industry and expertise. When I first arrived in the basement of 34 Tavistock Square (the original address of CMH) I had little awareness of the complexities of topography, jurisdiction and infrastructure of early modern London: Hearth Taxes, Burial registers and Churchwardens' accounts were simply sources. Working with Derek has changed my understanding, not only of the history of London but, more generally, of the way history can be written and explored. I am very grateful for all Derek's contributions to the final product: in particular, his advice and rigour in ensuring that the data is presented in a cogent and consistent manner. If this slim volume has anything to contribute to our understanding of disease in the crisis of 1665 then the credit should be traced back to the enthusiasm and dedication of Derek Keene and the culture of CMH.

Justin Champion
London
July, 1995

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List of Abbreviations

BL	British Library
CCDR	Crisis Crude Death Ratio
CDR	Crude Death Ratio
CLRO	Corporation of London Record Office
CMH	Centre for Metropolitan History
CMR	Crisis Mortality Ratio
CSPD	Calendar of State Papers Domestic
DHH	Deaths per Household
EcHR	*Economic History Review*
GL	Guildhall Library, London
GLRO	Greater London Records Office
hh	household
MHH	Mean number of hearths per household
PPNR	Plague/Non-Plague Ratio
PRO	Public Records Office
TRHS	*Transactions of the Royal Historical Society*
U.P.	University Press

GLOSSARY

Bills of Mortality Database — The database compiled from the weekly *Bills of Mortality*, 1655-1665.

Clustering — The occurence of more than one deaths within a household.

Crisis Crude Death Ratio (CCDR) — A means of determining the deviation of death rates in the epidemic from normal patterns of death. Calculated by division of the number of deaths per 1000 in 1665 (CDR) by the mean figure for the decade before the epidemic (1655–64). So CCDR=CDR 1665/CDR 1655–64.

Crude Death Rate (CDR) — The number of deaths per 1000 inhabitants derived from analysis of Harding (1990) and the *Bills of Mortality.*

Crisis Mortality Ratio (CMR) — Following Wrigley and Schofield (1981), and Slack (1985) this is a means of determining the deviation of *epidemic mortality* (E) from normal patterns of deaths. It is calculated here by dividing the figure for deaths in 1665 by the mean annual figure (M) for the decade before the epidemic (1655–1664). So CMR=E/M. While there is debate about the nature of 'crisis', the CMR, is used throughout this text as a means of distinguishing the deviation from the *endemic* experience.

DHH — Deaths per household. Calculated in two different ways. (1) the expected DHH derived by division of the total number of deaths in a location by the total number of households. or (2) the observed DHH, derived from the linked Parish Database, and identifying the precise number of deaths attributed to specific housholds.

Endemic	Used descriptively to denote the normal, background experience of death, or more precisely (eg. when calculating or discussing CMRs) to refer to the mean aggregates of deaths for the decade before the epidemic (1655–1664).
Epidemic	The period of crisis mortality defined by substantial increases in CMRs. It is taken to refer to both the number of deaths and the process of increased mortality.
Household	A family unit including domestic servants and other dependent residents (lodgers, inmates, etc). A house might contain several households.
Intramural, Extramural, Outlying, Westminster	Terms identifying general areas within the metropolitan location. The parishes included within each area are taken from Bills of Mortality: see Appendix I.
Metropolitan	Defines the geographical area covered by the *Bills of Mortality*.
MHH	The mean number of hearths per household. A rough indicator of social and economic status calculated from the Hearth Tax returns of the 1660s.
Mortality	A term used to describe the patterns of all deaths in specific locations or at specific times.
Parish Database	The database compiled from parish Burial Registers, Hearth Tax returns and other parish assessments. The linked Parish database contains those burials which have been linked to households recorded in the taxation assessments.
Plague	Employed throughout this work in a nominalist rather than a medical sense: 'plague' is the disease or cause of death which contemporaries identified by that term.

Residue deaths — The total of all deaths in the Bills of Mortality other than those attributed to 'plague'.

Seasonality — The distinctive pattern of mortality in relation to the time or season of the year as calculated from either the *Bills of Mortality* database or the Parish database.

I

INTRODUCTION

On 15 February 1666 the gathering of Middlesex Justices of the Peace at Hicks Hall was 'numerous' — in marked contrast to the abortive quarter sessions summoned in July, October, and December 1665 which were either hastily adjourned (*instanter adjornata*) because of the threat of the plague, or did not proceed because of lack of attendance. The Earl of Craven, Sir John Keeling, and Sir Orlando Bridgeman met with thirty-three other magistrates to reflect upon the success of the civic and parish administration in containing the dangers of the great epidemic. As the sessions rolls commented, the magistrates 'by this full court' made a 'most remarkable Order' diagnosing the origins of the disease and laying out a prescription for remedying the problems. There were 'manifold mischiefs and inconveniences' but fundamentally the magistrates suggested that the greatest danger to the health of London and its environs lay in the 'receaving harbouring and placeing of inmates and undersitters in houses and cellars, and by erecting of new buildings, and by divideing and parcelling out the said buildings and other houses into severall petty tenements and habitacions, and pestering and filling the same with inmates and poore indigent and idle and loose persons'. The problem of poverty and homelessness caused by this unlicensed expansion of residence endangered the city, whether in time of health or sickness. The resolution of this social problem was simple. All illegal inmates were to be evicted, 'that there may be noe more families then one abiding in the said houses'. In order that 'this most insufferable annoyance to the publique be thoroughly reformed' the Justices of the Peace should use 'their utmost care and dilligence' by meeting once or twice a week to execute speedily the order. If undersitters were not removed, or if new buildings were not taken down, then the owners of the illegal properties might either be indicted before the sessions of peace, or be made liable for 'all charges and expenses' for the relief of the poor, even if the 'said landlord or owner dwell out of the parish'.[1]

The point of describing this magisterial response at length is to stress the social or material factors that were considered by contemporaries as significant contexts for the spread of disease in Restoration London and Westminster. The magistrates' order was concerned more with issues of social status — note the language describing undersitters, 'idle', 'loose' and 'indigent' — and with issues of social space, rather than with medical factors. A cursory survey of sessions records for Middlesex and Surrey suggest this concern with the connection between

[1] *Middlesex Sessions Rolls* vol. 3, 373–4.

the built environment and disease was more than mere magisterial ideology: presentations for illegal building or subdivision of existing houses were a frequent matter. Those prosecuted, for example, in Surrey included fledgling property developers like William Angell who built new cottages without the stipulated measure of land or William Hall, haberdasher, who divided one dwelling house into four separate tenements, but also poorer people like the Lambeth waterman, Christopher Morgan, who kept inmates in his own house or William Leggatt, trunkmaker, who did the same 'to the great danger of infecting the neighbours with plague and other contagious diseases'.[2]

This stress on the connection between the development of the material infrastructure of urban life and the increased incidence of disease was also a theme stressed by John Graunt in his *Natural and Political Observations.* As he wrote, his overall brief was to consider 'whether a city, as it becomes more popular, doth not, for that very cause, become more unhealthful'. The progress of disease in general, and plague specifically, was promoted by the ever increasing density of the urban and suburban population. 'Turning great houses into tenements, and building upon a few gardens' meant that 'our parishes are now grown madly disproportionable'.[3]

This study, then, intends to take these concerns — social status and social space — as starting points for an examination of the epidemiological history of the 'Great Plague' of 1665 in London. The reader might be forgiven for inquiring why yet another historical study of urban disease is necessary, given the high quality of existing research undertaken by Slack, Schofield and, most recently, Landers. Following the precedent of Kearns' earlier work *Urban epidemics and historical geography* (1985) this study has both empirical and methodological ambitions. The historical aim of the project was to explore some of the suggestions made by current historiography about the causal relationship between poverty and disease and further to address the specific point made by Paul Slack about the relationship between the civic responses to epidemic crises and their impact upon the patterns of death that obtained within urban environments. The methodological angle should suggest that historical investigations of the nexus between disease and society need to shed many of the biomedical paradigms that are embedded within current discourses.

This investigation, as indicated in the opening paragraphs, approaches the question of the relationships between patterns of death (seasonal, sexual and spatial) and social structures in Restoration London and Westminster by eschewing biomedical theory and concentrating instead upon the material structures of urban life. That is to follow the recent example proposed by John Landers, who insists that historical epidemiology should be concerned not simply with the pathogenic

[2] *Surrey Quarter Sessions 1663–1666*, 230, 232, 248; *Surrey Quarter Sessions 1666–1668*, 67, 69.
[3] Graunt (1676), 393–4.

quality of particular diseases nor with the structure of biological ecologies, but should adopt a more holistic approach to the dynamic interplay between social and economic structure, between people and location, and between social policy and popular behaviour. As Landers writes in explanation of his more advanced understanding of the concept of an epidemiological regime, it should be understood, 'not as a loosely related collection of vital rates, but as an unbounded network of relationships between the demography of human populations and the structures of their social, economic and political life, as well as their biology and ecology'.[4] Landers has characterised this approach to the history of mortality as a 'structural' one in the sense that his investigation wishes to embed the patterns of change in mortality over the eighteenth century, not in context with rising or falling indices of standards of living, nor with the mutations in virility of autonomous pathogens, but with 'variations in the spatial structure of a population and its economic and social life'.[5]

Landers' work, by developing a model epidemiological regime, sets out to investigate the dynamic and trajectories of the experience of death and mortality in the eighteenth-century metropolis. The concern of this study by comparison is parochial: the examination of one particular crisis in 1665 in a selection of London parishes. Although much narrower in focus, the concern to explore the structural dimensions of mortality in 1665 owes much to the approach projected by Landers' work. By exploring the spatial, social and sexual patterns of death in 1665 the intention has been to show how the experience of illness and death was configured by the nature of urban patterns of work, residence and economic opportunity (amongst others). Landers' research dealt in a very sophisticated manner with issues of nutrition, variations in pathogenic immunity and exposure of immigrant and resident populations to disease. This work will restrict its focus to deal with particular social and environmental themes present in one crisis. Indeed, by exploring the spatial and social variables of the patterns of disease and death, it hopes to suggest that one of the crucial determinants in driving the patterns of the epidemic was a process that tied or released marginal and affluent populations to specific localities and households. This process, as the argument will suggest, was bound in with the very structure of work and livelihood in Restoration London and Westminster.

[4] Landers (1993), 3.
[5] Ibid, 35.

II

Sources and Methods

'Bodies Corrupted or Persons Wanting Necessaries'

On 12 September 1665, at the height of the plague epidemic, John Tillison wrote to William Sancroft, Dean of St Paul's then resident at Tunbridge Wells, continuing a correspondence that had started when the Dean left London in early June. In earlier letters Tillison had asked calmly for advice and financial support for the Dean's parishioners suffering under the burdens of disease and poverty, especially those 'sick and poore' of St Giles Cripplegate (one of the Dean's peculiars) who were likely to be 'famished within dores the P[ar]ish not being able to relieve their necessities'.[1] By August his letters were taking a more desperate tone as he described the chaos:

> What ey: would not weep to see soe many habitacions uninhabited? ye poore sick not visited? ye hungry not fed? ye graves not satisfyed? Death stares us continually in ye face in every infected person yt passeth by us, in every coffin wch is dayly & and hourely carried along ye streets: ye bell never cease to put us in minde of our mortality.

According to Tillison's account the epidemic was getting worse rather than better: as the physicians commented the disease was 'more favourable in ye begininge of ye contagion: now more fierce and violent'. Symptoms had altered: 'one week ye general distempers are blotches and biles; ye next week as clear skind as may be but death spares neither'. Importantly Tillison commented that it 'raigned most heretofore in Alleys &c: now it domineers in the open streets. Ye poorer sort was most afflicted, now ye richer beare a share'.[2]

The cause and progress of the disease was, as one contemporary put it, 'inscrutable'.[3] Writing after the abatement of the epidemic, Simon Patrick confessed himself confused, 'after all my Inquiries & Observations, I can learne little, But that it seises upon people strangely, & and handles them variously. Some are affected in one manner, & and some another, & some are smitten that stir not half so much abroad as I'.[4] The disease hit all 'it infecteth not only those which are weak, and infirm in body, and full of ill humours, but also those which are young, strong, and healthful, and of the best temperature; and that sometimes

[1] Nicholson (1919), 146.
[2] Ibid, 146–7.
[3] Ibid, 159.
[4] Ibid, 164.

sooner than others'.[5] Henry Oldenburg was more confident in his analysis: writing to his colleague and fellow member of the Royal Society, Robert Hooke, in late August he commented, 'the sickness grows still hotter here, though I find by all my own, and other men's observations, that very few of those houses whose inhabitants live orderly and comfortably, and have by nature healthy constitutions, (you must take all these together), are infested'. For Oldenburg, as indeed for many modern historians of disease, the connection between economic and social status and the incidence of plague was clear: as he continued in his letter,

> and I can say (God be praysed for it) that as yet not one of my acquaintances, except and under-postman, who lived closely and nastily, and has all sorts of people coming to his house with letters, is dead: so that, generally, they are bodies corrupted and persons wanting necessaries and comfortable relief, that suffer most by this contagion.[6]

The supposition of a causal connection between poverty and disease is a central theme of both seventeenth-century writers and modern historiography. Using Oldenburg's phrases, there was a link between an 'orderly and comfortable life' and security from the plague, and conversely the coincidence of a 'close and nasty existence' with a susceptibility to the pest. Although contemporaries often debated the precise nature of the 'cause', some emphasising the moral rather than material elements of bodily corruption, they agreed that the plague hit the 'poore' hardest. So, Thomas Vincent, the nonconformist author of *God's Terrible Voice in the City* (1665), insisting that the visitation was a divine scourge for the 'filthiness of flesh and spirit' in the metropolis drew a strict connection between poverty, moral corruption and just punishment. Although there had been 'outward neatness' in London, for all the washing, rubbing and scouring there remained an 'inward sluttishness, they who have had clean houses, and clean garments, and clean faces and hands, have had foul hearts'. He explained, 'when you were so rotten and corrupt, and defiled inwardly, you should have boils, and blains, and running sores outwardly'. An anonymous author, eschewing the moral tone of the providentialist account, appealed instead to a Galenistic account of bodily humours, affections and constitutions. Contrary to Vincent's insistence on sin, the author of *Shutting Up Infected Houses* (1665) stressed the material dirtiness of poverty that attracted corrupt miasma: 'close chambers nastily kept' conspired with the 'poor peoples own ordure' to kill or poison them. A vicious cycle of infection and re-infection haunted the poor: 'their sweat is cast by them upon their clothes, and evaporates upon the house round them'.[7]

[5] Vincent (1722), 12.

[6] *Correspondence of Henry Oldenburg*, vol. 11, 479.

[7] Vincent (1722), 124, 177. Anon (1665), 11. Interestingly the author included a list of 75 cases where the 'cause' of death had been examined. Nearly 40 per cent of these aetiologies were attributed to food consumption: 'by eating a cucumber', 'by radishes', 'by a gooseberry fool', 'by eating quinces', 'by a dishe of eeles', 'by an immoderate eating of cavears, and anchoves'.

Identifying the exact clinical nature of the epidemic of 1665 has both bemused and bewildered historical research since the nineteenth century. Contemporary medics, writers like William Boghurst, Nathaniel Hodges, and George Thompson, made speculative attempts to understand the aetiology of the illness. Anatomical dissection, chemical therapy and empirical advice were all turned to the 'pursuit of Therapeutical Truth'.[8] Seventeenth-century debate focused upon a central question. As Boghurst put it, was the disease 'an *sit morbus totius substantiae* [that is] whether the Pestilence is *morbus intemperieri*, a disease which proceeded from the excesse of some manifest quality as heat, moisture, or from some venomous quality, occult or unknowne to us'?[9] There was great discussion about 'prognosticks' that considered both environmental, social and individual causes: 'few swallows were seen in the years 1664 and 1665', too much pork was eaten, or people married too often, were just a few of the 'hidden' causes that contemporaries referred to. One thing is certain, although rival medical discourses (Galenistic and Helmontian) insisted that they had diagnosed the plague correctly, ultimately they remained in 'cimmerian darkness'.[10] Modern historians claim to have escaped this obscurity.

Since the turn of the twentieth century when the biological 'cause' of the 'plague' was clinically 'discovered' historians have been confident that they can understand the epidemiological motors of 'plague' in the early modern period.[11] The story of the 'conquest of the plague' is a classic of whiggish scientific narrative. The 'pioneer' phase of plague research started in 1894 when the bacillus *Yersinia pestis* was isolated, and reached a climax in 1908 when the role of the flea as carrier of the bacillus was accepted. The 'bionomics' of the flea became the focus of scientific investigation. Although there is still much debate within the medical community about the precise epidemiological components of a plague epidemic the general argument about the transmission of infection from rodent to human populations by flea vectors has been adopted wholesale by historians.[12]

[8] Thompson (1666), 2. See also Boghurst (ed 1870). A useful bibliography of sources for the 1665 epidemic can be found in Guildhall Library (1965).

[9] Boghurst (ed 1870), 9.

[10] Ibid, 20–25; Thompson (1666), 2. For an account of the different and rival medical discourses of the 1660s, see Cook (1986), esp. 133–183. For a specific discussion of how these practitioners used the epidemic of 1665 as a testing ground for the authority of their therapies, see Thomas (1953).

[11] See Hawthorn (1993), 39–80.

[12] Much of the medical debate focuses upon identifying which flea is the most effective transmitter of the bacilli. The main candidates are *X.Cheopis* (the rat flea) or *Pulex Irritans* (a human parasite). Interestingly the medical research that supports these different explanations was undertaken in different parts of the world: the *X.Cheopis* did most of its work in India and Australia, while the advocates of *Pulex Irritans* worked mainly in French North Africa. The Anglophone and Francophone aspects of medical research has been reflected in the different national historiographies: English historians stress the rat flea vector while French writers insist upon the inter-human parasite. See Biraben (1977). See also Ranger and Slack (1992).

The anachronistic logic of this argument should now be challenged. Much of the historical writing adopts a simple backward projection. Medical research from the late nineteenth century has shown that the presence of the flea *X. Cheopis* is a firm index of 'plague'. As the most widely-read populariser of medical theory on plague epidemics commented, '*X. Cheopis,* then, exists and breeds in London, even under the unfavourable conditions of today. Undoubtedly it must have been far more abundant on the vast colonies of black rats which shared with man the warm dwelling rooms and kitchens of seventeenth-century London'. This type of authoritative statement has become embedded in much of the historical writing on the Great Plague. For example, Appleby wrote confidently, 'In sixteenth and seventeenth century England, rats lived in close proximity to humans, in the thatched roofs of their cottages or the plaster walls or earth floors of their houses'.[13] These sorts of assumptions are, however, based upon little more than informed speculation.

The historical logic of arguing that since modern accounts of the epidemiology of the plague identifies the rat-flea-human mode of transmission as causal then early modern 'plague' must share the same agency is clearly problematic. It has also obscured social and environmental aspects of historical research into the epidemics of the early modern period. Before moving on it is worth pausing to consider the evidence for the role of rats and fleas as mediums for the spread of disease. One contemporary cited Athanasius Kircher's Roman experiments to argue that 'minute insects' in the air caused the illness. William Boghurst similarly noted that 'in the summer before the plague in 1664 there was such a multitude of flies that they lived the insides of houses, and if any threads or stringes did hang down in any place, it was presently thick set with flyes like a rope of onions'. The year after the epidemic 'very few flies, frogs and such like appeared'.[14] Writing after the epidemic, one Dr Hervey commented, that 'it was the opinion of some in 1665, that infection might be discovered by the partys breathing upon a piece of glass, where, the breath condensing, there might be seen by a microscope, living creatures of strange, monstrous, and frightful shapes like dragons, snakes, serpents, etc.'.[15] Obviously many of these observations were mere speculation but even these have some historical value. It is clear from these texts and many others that contemporaries of the Great Plague were aware of their environment. They observed the changes in the material circumstances of their lives whether it be the vagaries of the climate or of changing circumstances in the world of the flora and fauna. Surprisingly, given that, according to the rat-flea theory, in order for fleas

[13] See Hirst (1953), 339–40. Appleby (1980), 163. For citations of Hirst see Slack (1985), 7–17 and footnote 13 (345).

[14] See 'An Account of the first Rise, Progress, Symptoms and Cure of the Plague being the substance of a letter from Dr Hodges to a person of quality' 15–16 in *A Collection of Very Scarce Pieces Relating to the last Plague in the Year 1665* (1721). Boghurst (ed 1870), 26, 98.

[15] See *The City Rembrancer*, vol 1, section III, 129.

to transfer from rat to human first the rat population must suffer an epizootic, there are few (if any) references to an increased number of rat carcasses either in printed works or in private diaries. Seventeenth-century Londoners were familiar with the life cycle and habits of the rodent. Professional ratkillers and even householders used arsenic and 'ratsbane' to exterminate the pests.[16]

Secondly, as modern zoologists have pointed out, the 'bionomics' of the fleas are very complex.[17] The crucial determinants in the growth of a flea population are temperature and humidity: outside of certain very circumscribed parameters the flea population cannot breed rapidly enough to sustain the epidemic patterns of infection. From most of the surviving accounts the climate in England between 1664 and 1665 does not seem suitable to have provided the environmental infrastructure of an infected flea population.

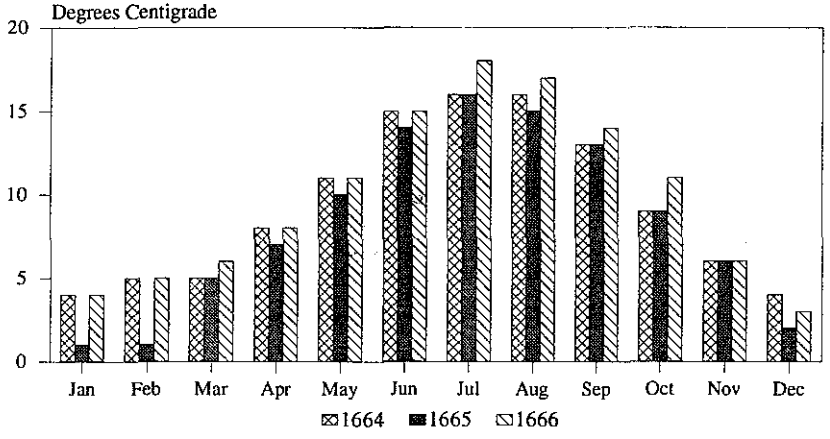


FIG. 1. Temperatures in central England, 1664–6.
Source: Manley (1974). Monthly means for air temperature.

Research on mean air temperatures suggests that the winter months of 1664-65 were severe (see Fig. 1). Spring and early summer of 1665 were similarly below average temperatures. Further information on the type of weather experienced in 1665 can be gleaned from less precise sources like astrological accounts and diaries.[18] John Goad's *Astrometeorologica or Aphorisms and Discourses of the Bodies Coelestial* (1686) gives a detailed description of the weather throughout the year. In early March he commented on the bitter cold and frosts not normally 'known in March'. Rain, wind, 'fog, cold', 'furious tempests

[16] Boghurst (ed 1870) (at 55) commented that 'the rat killers will have a sweeping trade next year, the arsenick and ratsbane being all spent, and the cats killed'. The fashion for 'arsenical amulets' as prophylactics was rife in 1665.
[17] See Twigg (1984).
[18] See Manley (1974), 393. See also Baker (1932), 423. See Thomas (1984).

of wind and rain' are common entries for 1665. *The Intelligencer* commented that it was so cold in early September that it 'made a quick riddance of such bodies as were before tainted'.[19] Clearly too much emphasis ought not to be placed upon air temperature and individual observation given that the environments inside households would have been heated and perhaps have provided a more commodious habitat for infected flea populations, but on the other hand the climate in 1665 does not seem to have been very different from earlier and later years and so in terms of the rat-flea theory could not have determined the nature of the epidemic.[20]

Much modern historiography has, using the biomedical model of *pestis yersina*, drawn a simple link between the supposed agency of transmission and the 'impact' of the disease amongst the poorer urban communities. As a historical model this 'impact' theory is static rather than dynamic. Recent historical approaches to the related theme of the 'impact' of war on society have stressed that we ought not to 'persist in thinking of war on one side, and society on the other'. For Marwick it is historically short-sighted to treat war and society as two distinct variables 'with the first "impacting" on the second, and producing "consequences" '.[21] This study of epidemics and society in early modern London similarly intends to stress the idea of social continuity. In this sense the method adopted here is to explore the social, political and economic infrastructure of the crisis period not to understand the pure 'biomedical' dynamics of 'plague', but to, as George Rosen neatly put it, understand the 'biosocial context'. The nature of the 'plague' in this understanding, then, has as much to do with the components of early modern urban society as with the epidemic life of an alien bacillus.[22] While there has been much recent excellent work examining the 'impact' of plague on Tudor and Stuart society, in particular the magisterial study by Paul Slack, there has been no single investigation that focuses upon the last great epidemic outbreak in London of 1665 since William Bell's work in the early twentieth century.[23] Research undertaken at the Centre for Metropolitan History into the social geography of the epidemic of 1665 can go some way to answering some of the questions about the social and epidemiological processes that related poverty and disease in the outbreak.

It was a common assumption of the period that disease afflicted the poor disproportionately to the better off. Echoing early modern diagnosis historians have argued, in insisting that the major cause of death was the 'Plague', that the epidemic

[19] Goad (1686), passim. *The Intelligencer*, 876.

[20] Without wishing to be frivolous it seems that a short history of the flea bite might be useful to counter the zoological appreciation of the insect. One common assumption is that the flea only attacked the poor. Interestingly most of the very few references to fleas survive in the literary accounts of the upper orders, Donne's *The Flea* being the most obvious: see Gardner (1972).

[21] See Marwick (1991), 16–18.

[22] See Rosen (1974).

[23] Slack (1985). See Bell (1911 and 1954).

took away only the poor. Recently Jonathan Barry has voiced doubts about such a causal connection: as he comments 'was it poverty as such, or bad housing and sanitation, or the inability to flee town that left the poor increasingly vulnerable?'.[24] The assumption that poverty and disease ought to be causally related is one of the prime consequences of the static 'impact' model of understanding disease and society. It will be the brief of this monograph to re-examine some of the assumptions both of contemporaries of the Great Plague and modern historians. In particular, the intention is to test the commonplace assumptions about the relationship between poverty and disease in the Restoration crisis by posing a series of questions about precisely who did die and, importantly, where they died, and the relationship between those spatial patterns of mortality and the victims' social and economic status. Pursuing a line of enquiry that lays emphasis upon the 'biosocial context' will also involve some consideration of whether the civic response or management of the epidemic had any effect upon the pattern of deaths.

Sources for the Study of Wealth, Disease and Illness in 1665

Mapping the topography of the epidemic in 1665 was a central technique for illuminating the epidemiological dimensions of the disease and its dialectic with the material and social environment of Restoration London (see Fig. 2 for the parishes of the metropolis). Using a number of different sources and computer-assisted historical techniques it was possible to reconstruct the social geography of the epidemic of 1665 both at a metropolitan level and in a more local context. Following the research of historians, like Paul Slack and Michael Power, on the social and economic topography of Restoration London, distinct but convergent types of sources were examined to build up a comprehensive picture of the impact of the epidemic on the different parochial social structures.[25] The most important body of sources used were the various tax assessments, in particular the Hearth and Militia Taxes, and the locally collected Poor Rates. These assessments of the 1660s are useful because they give (in theory) a detailed nominal listing of residential heads of household, as well as a measure of the relative wealth of those householders. By using the assessments in a series of consecutive years and comparing the lists of residents, it is possible to reconstruct details of the social and economic structure of particular parishes.[26] So, for example, the Hearth Taxes of 1662, 1664, and 1666, much opposed

[24] Barry (1990), 'Introduction', 17.

[25] See Beier and Finlay (1982).

[26] M Power has led the way in using the Hearth Taxes (1662–88) to uncover the dimensions of social and economic life in London and its suburbs. C A F. Meekings' writings on the institutional and bureaucratic history of the collection and administration of the Hearth Tax is a much under-used resource: see in particular his 'Introduction' to the *Surrey Hearth Tax of 1664* (Surrey Record Society, VII, 1940). For a general analysis of the importance of the Hearth Taxes as historical records see Alldridge (1984), Unwin (1985), and Marshall (1936). See also Schurer and Arkell (1992).

on their introduction as a despotic imposition, gave the local constable (as agent of the State) the power of entry into each household to determine the number of fire hearths or industrial stoves each owned.[27] Importantly, although there was some confusion between 1662 and 1664, the listings were meant to include both those who were exempt (by poverty or disability) and those chargeable. Such listings in theory, then, covered the social range, from the wealthiest householder to almost the most marginal alms person or elderly widow.

Comparing such information about the minimum number of householders with contemporary maps of London parishes allowed detailed plotting of the social topography of parts of Restoration London. It was possible to examine not only the richest and poorest parts of the Cities of London and Westminster and their suburbs, but also the wealthiest and most poverty-ridden of those individual parishes.[28] The numerical data derived from the Hearth Taxes was central, then, to evaluating the relative wealth and poverty of different households both within and between the parishes studied. As contemporaries commonly assumed, there was a relationship between the number of hearths in a household and its socio-economic standing. Indeed the most recent historical examination of the value of the taxes as accurate assessments of poverty and wealth has echoed contemporary assumptions and argued that the hearth taxes can be used as a 'real if rough' standard of socio-economic measurement.[29]

Information about those who died, when they died and what they died of, for the whole metropolitan area, can be gleaned from the *Bills of Mortality* and for the various parish studies from surviving manuscripts of the parish clerks' burial registers.[30] A third

[27] For the rubric of the Hearth Tax Act, see Arkell (1992), Appendix, 55–64.

[28] For a good introduction to maps of London, see Glanville (1972). The indispensable listing of existing maps is Darlington and Howgego (1964). There are useful facsimiles of Ogilby and Morgan's (1676) survey of the City, William Morgan's *London Survey'd* (1682), and Rocque's later work. For a more detailed discussion of the quality of the maps, see R Hyde's introductions to the seventeenth-century maps; also Spiers (1908). The project used the surviving maps of the City of 1676 [Ogilby and Morgan] and 1682 (including Southwark and Westminster) by Morden and Lea, and were supplemented by the more detailed accounts found in John Strype's 1720 edition of Stowe's *Survey of London*. The digitised map of parish boundaries was based upon the 1886 Ordinance Survey copies cross-referenced with the above. Many thanks to The Department of Geography, Royal Holloway College, University of London, and Craig Spence of the Centre for Metropolitan History for expert help on all 'mapping' aspects of the project. The software used was a combination of Isis (digitising), PC Mapics and a drawing package. Data was imported from dBase IV and AseasyAs spreadsheets.

[29] See Husbands (1986), 159.

[30] For a general account of the *Bills of Mortality*, see Graunt (1676), and Walford (1878); discussions of how the *Bills* were created can be found in Christie (1893). Dr Paul Laxton is preparing a complete edition of the surviving *Bills* for publication on microfilm. For a more specific account of the role of women in compiling the *Bills*, see Forbes (1974). For those studying disease in London most of the surviving registers for the metropolitan area can be consulted in the Guildhall Library. *The Handlist of Parish Registers Part One* is an essential source. *Part Two* covers parishes outside the City. For an interesting discussion of the relationship between the registers and the printed sources, see Sutherland (1970).

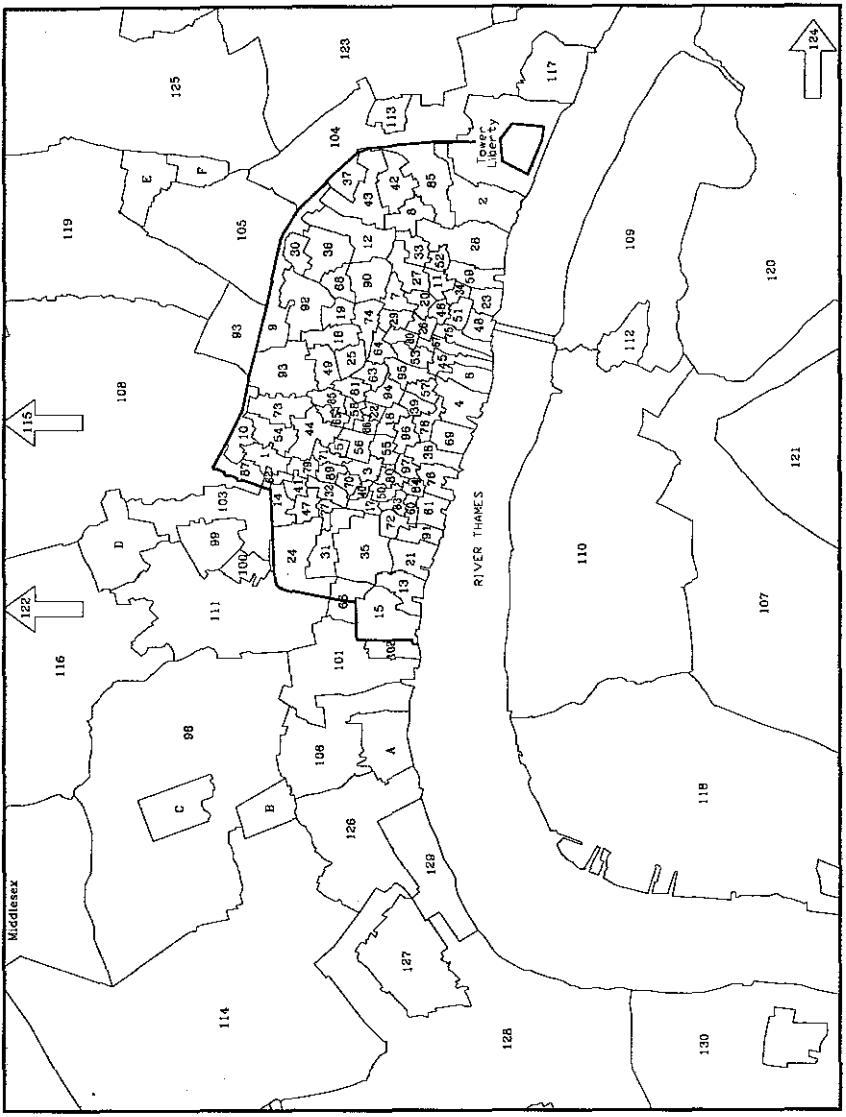


FIG. 2. The metropolitan parishes, 1665

1 St Alban Wood Street
2 All Hallows Barking
3 All Hallows Bread Street
4 All Hallows the Great
5 All Hallows Honey Lane
6 All Hallows the Less
7 All Hallows Lombard Street
8 All Hallows Staining
9 All Hallows on the Wall
10 St Alphage
11 St Andrew Hubbard
12 St Andrew Undershaft
13 St Andrew by the Wardrobe
14 St Anne Aldersgate
15 St Anne Blackfriars
16 St Antholin
17 St Augustine by St Paul's
18 St Bartholomew Exchange
19 St Benet Fink
20 St Benet Gracechurch
21 St Benet Paul's Wharf
22 St Benet Sherehog
23 St Botolph Billingsgate
24 Christ Church Newgate Street
25 St Christopher
26 St Clement Eastcheap
27 St Dionis Backchurch
28 St Dunstan in the East
29 St Edmund Lombard Street
30 St Ethelburga
31 St Faith
32 St Fosters (St Vedast)
33 St Gabriel Fenchurch
34 St George Botolph Lane
35 St Gregory by St Paul's
36 St Helen
37 St James Duke's Place
38 St James Garlickhithe
39 St John the Baptist (Walbrook)
40 St John the Evangelist
41 St John Zachary
42 St Katharine Coleman
43 St Katharine Cree
44 St Lawrence Jewry
45 St Lawrence Pountney
46 St Leonard Eastcheap
47 St Leonard Foster Lane
48 St Magnus
49 St Margaret Lothbury
50 St Margaret Moses
51 St Margaret New Fish Street
52 St Margaret Pattens
53 St Mary Abchurch
54 St Mary Aldermanbury
55 St Mary Aldermary
56 St Mary le Bow
57 St Mary Bothaw
58 St Mary Colechurch
59 St Mary at Hill
60 St Mary Mounthaw
61 St Mary Somerset
62 St Mary Staining
63 St Mary Woolchurch
64 St Mary Woolnoth
65 St Martin Ironmonger Lane
66 St Martin Ludgate
67 St Martin Orgar
68 St Martin Outwich
69 St Martin Vintry
70 St Matthew Friday Street
71 St Mary Magdalen Milk Street
72 St Mary Magdalen Old Fish Street
73 St Michael Bassishaw
74 St Michael Cornhill
75 St Michael Crooked Lane
76 St Michael Queenhithe
77 St Michael le Querne
78 St Michael Paternoster Royal
79 St Michael Wood Street
80 St Mildred Bread Street
81 St Mildred Poultry
82 St Nicholas Acon
83 St Nicholas Cole Abbey
84 St Nicholas Olave
85 St Olave Hart Street
86 St Olave Old Jewry
87 St Olave Silver Street
88 St Pancras Soper Lane
89 St Peter Westcheap
90 St Peter Cornhill
91 St Peter Paul's Wharf
92 St Peter the Poor
93 St Stephen Coleman Street
94 St Stephen Walbrook
95 St Swithin
96 St Thomas the Apostle
97 Holy Trinity (the Less)
98 St Andrew Holborn
99 St Bartholomew the Great
100 St Bartholomew the Less
101 St Bride
102 Bridewell
103 St Botolph Aldersgate
104 St Botolph Aldgate
105 St Botolph Bishopsgate
106 St Dunstan in the West
107 St George Southwark
108 St Giles Cripplegate
109 St Olave Southwark
110 St Saviour Southwark
111 St Sepulchre
112 St Thomas Southwark
113 Holy Trinity Minories
114 St Giles in the Fields
115 Hackney Parish
116 St James Clerkenwell
117 St Katharine by the Tower
118 Lambeth Parish
119 St Leonard Shoreditch
120 St Magdalen Bermondsey
121 St Mary Islington
122 St Mary Newington
123 St Mary Whitechapel
124 Rotherhithe Parish
125 Stepney Parish
126 St Clement Danes
127 St Paul Covent Garden
128 St Martin in the Fields
129 St Mary Savoy
130 St Margaret Westminster

Extra-parochial Precincts:

A Temple
B Lincoln's Inn
C Grey's Inn
D Charterhouse
E Liberty of Norton Folgate
F Old Artillery Ground

group of material, consisting of the records of the parish management of the epidemic can be used to illuminate the processes of social administration related to social structure and mortality. Using the relational capacity of dBase IV it was possible to 'link' all these types of material to examine the specific social, economic and sexual patterns of death in the Plague epidemic of 1665.[31]

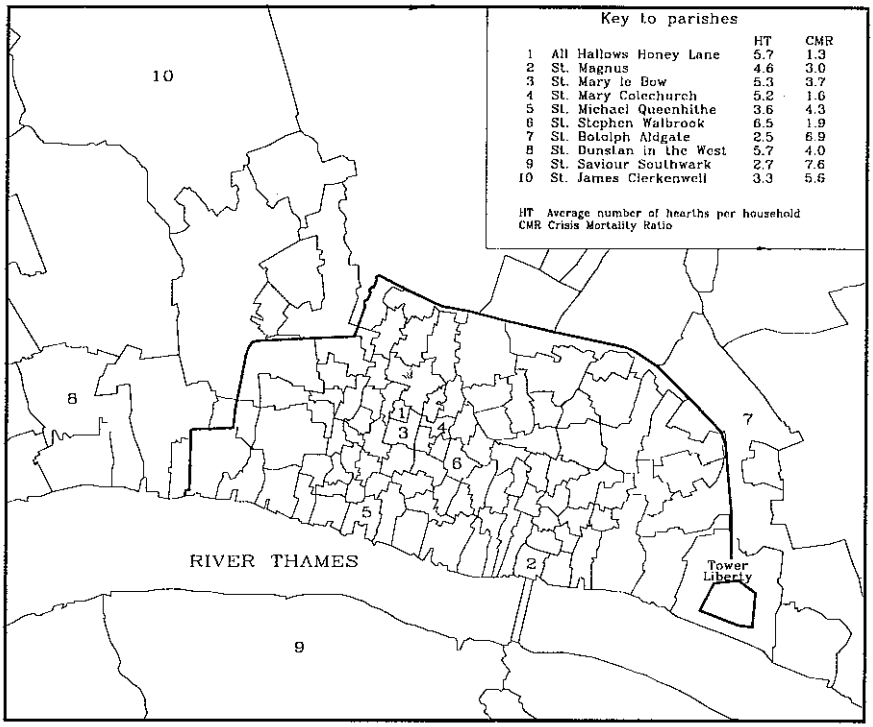


FIG. 3. The sample parishes

THE PARISH STUDIES

Adopting this computer-assisted investigation meant that it was possible to explore the related themes of poverty, gender and disease, both at the metropolitan and the parish level. The objective was to explore correlations between environment and disease that were manifested in the city-wide study in the more detailed context of a full range of local areas. Selecting representative parishes to investigate in more depth was crucial to the success of the project. The criteria for choice of

[31] A detailed account of the computer method employed in the research project can be found in Champion (1993a).

parishes was defined not only by socio-economic, geographic and topographical considerations but also by the quality of surviving sources. The ten parishes selected for the main focus of investigation covered the various variables of location, wealth and economic activity present in Restoration London.[32] As well as representing a range of wealthy and poor parishes, the selected areas, as Fig. 3 illustrates, also provide a sample of the different geographical and topographical environments in the metropolis including both east and west, central and extra-mural, and north and south of the Thames.

TABLE 1
Hearths per household in the ten sample parishes, 1666

Parish	Mean	Percentage of households with given no. of hearths:						
		1	2	3	4	5	6	Over 6
Intramural:								
All Hallows Honey Lane	5.7	3	0	9	12	21	27	27
St Magnus	4.6	9	11	16	17	18	13	16
St Mary le Bow	5.3	6	8	11	18	14	22	32
St Mary Colechurch	5.2	11	8	15	13	18	19	16
St Michael Queenhithe	3.6	24	13	20	7	15	10	11
St Stephen Walbrook	6.5	0	6	9	19	15	12	40
Extramural:								
St Botolph Aldgate	2.5	27	33	24	5	4	4	3
St Dunstan in the West	5.7	11	8	7	14	12	11	38
St Saviour Southwark	2.7	30	34	20	8	4	3	2
Outlying:								
St James Clerkenwell	3.3	40	19	17	7	4	3	10

Source: Parish Database.

The social character of the parishes as defined by the distribution of hearths ranged from large and small wealthy West End and central Cheapside parishes like St Dunstan in the West and All Hallows Honey Lane, where the average number of hearths per household was above 5, to poorer riverside and suburban parishes like St Botolph Aldgate and St Saviour Southwark, where households, on average, only contained between 2 and 3 hearths (see Table 1). Overall the average number of hearths per household of these areas, ranging from a low of 2.5 (St Botolph) to 6.5 (St Stephen Walbrook), gives a very broad measurement of their relative socio-economic status which can be expanded by examining the distribution of households at all hearth values. So, for example, the distribution

[32] Also for general discussion, see for example, Power (1972) and (1986). Many thanks are due to Dr Power for allowing the project to use his copies and manuscript analyses of the Hearth Taxes of Restoration London. For an older account of the development of the City and the suburbs, see Brett-James (1935)

of hearths per households in St Dunstan was very distinct from that of St Magnus, St Mary le Bow or St James Clerkenwell. The tax assessments show that the small, very wealthy, parishes of Cheapside and near by (St Mary le Bow, St Mary Colechurch, St Stephen Walbrook, and All Hallows Honey Lane) contained households that had a correspondingly high number of rooms and hearths: as many as 50 per cent had six or more hearths. This compares with the poorer intramural parishes like St Michael Queenhithe and St Magnus Thames Street, where the average household had between 3 and 4 hearths and correspondingly the distribution of all houses was concentrated in the middling and poorer quality housing. Again this pattern is to be further contrasted with the large extramural and suburban parishes like St Botolph Aldgate, St Saviour Southwark, and St James Clerkenwell, where the low average number of hearths reflected a distribution firmly rooted in small, poor quality households of only one or two hearths. In distinction from the Cheapside parishes, in these areas the vast majority of the households in the sample had only one or two hearths with only a very small percentage having six or more hearths. So, for example, whereas the Cheapside parishes had between 0 and 11 per cent of households with a single hearth and 16–40 per cent valued at seven and above, St Saviour Southwark had 30 per cent at one and only 2.2 per cent at seven and over.

In one very clear way the distributions of the number of hearths per household for each parish also illuminate the socio-economic quality of the topography in each area. The high mean number of hearths per households (MHH) in the Cheapside parishes reflect a pattern of large urban buildings of perhaps three or four storeys constructed to look out on open streets, courtyards, and lanes. Such buildings might include enclosed and paved courtyards, garrets and cellars, as well as warehouses, shops and all the rooms commonly associated with domestic life such as parlours, kitchens, dining rooms, bed-chambers, and privies. As the series of tax assessments from the 1630s to the 1660s suggests, this pattern of substantial housing remained fairly stable throughout the middle decades of the seventeenth century: that is, the physical layout of the streets and housing was not subject to new building, subdivision of properties or infilling with smaller and poorer quality housing. This pattern of topographical uniformity and stability can be contrasted with the other parishes studied.[33]

St Dunstan in the West, although in general a wealthy parish with a mean number of hearths per household of 5.7, did not mirror the case of Cheapside. Although there were many substantial properties like the legal inns, especially around the main thoroughfares of Fleet Street, Chancery and Fetter Lanes, there were also alleys and yards hidden behind the grander buildings that were packed with much smaller and densely constructed households. While the Cheapside topography broadly reflected the material needs of a mercantile and trading

[33] Brown (1986). Keene and Harding (1987).

population, St Dunstan's pattern of accommodation was determined by the legal inns and the position of the parish on one of the main thoroughfares from London to Westminster. Alongside properties like Serjeants', Clifford's and Staple Inns were large taverns, coaching inns and stables as well as, tucked away in places like Whitefriars, Hercules Pillars or Ram Alley, a plethora of cook houses, coffee houses and shops. Although many of the substantial properties, especially along the large roads, had not been the subject of property development, the land behind them had become built up as the populations of the western suburbs increased during the first half of the seventeenth century.

If the topography of St Dunstan in the West was a product of the expansion of the urban population in the early seventeenth century, it was one mediated by the dynamics of wealth and power. Although clearly there were poor parts of the West End, as Power has shown, parishes like St Dunstan are characterised better by the type of housing that the political elites occupied than by the squalid residences of Whitefriars. In contrast, however, the extramural parishes to the north, east and south of the city of London, although they did have some titled families living in their precincts, can be more readily identified as places where the poor congregated in densely populated rents and estates. St Saviour, south of the Thames in Southwark, was a parish contrived on a much bigger scale than the tiny Cheapside parishes, it was even between two and three times larger than St Dunstan in the West. Consisting of over 2,500 households and with a mean number of hearths per household of 2.7, the parish was divided into three distinctive areas: the bustling commercial and trading precinct of Boroughside built around the main road and bridge over the Thames. The adjacent location, known as the Clink, was infamous for its entertainments: bear pits, theatres and night walkers. The third part of the parish, Old Paris Garden, was semi-rural, with ribbon development by the riverside to accommodate those who plied their trade on and across the river, and a network of small cottages where those who worked in the tenter grounds and other small- scale manufacture lived. Unsurprisingly, the different socio-economic character of the areas was manifest in the type of built environment. Boroughside with its mixture of warehouses, manufactories, shops and substantial housing had a mean number of hearths of 4.1, while both the Clink and Old Paris Garden only had households with, on average, 2.3–2.5 hearths, that consisted mainly of small, sometime sub-divided and temporary, cottages.[34]

If St Saviour can be thought of as a parish that combined three quite distinct topographical areas ranging from the semi-rural Old Paris Garden to the built-up

[34] For a detailed discussion of St Saviour Southwark, see Boulton (1987). Evidence for the subdivision of properties and the high number of inmates and lodgers can be found in the many prosecutions for such offences listed in *Surrey Quarter Sessions 1663–1666* volume VII, *passim*. The Minet Library holds many local records relating to the burgeoning property developments undertaken by men like William Angell in Old Paris Garden: see also Darlington (1954), 470–1.

and bustling Boroughside, the large east end extramural parish of St Botolph Aldgate can be characterised as a location of intense but piecemeal suburban development. Initially considered as a fashionable suburb popular for its healthy air, by the 1630s it had become a reservoir for the poor and marginal labouring population achieving a household total of over 2,500 with a mean of 2.5 hearths per household. Extending from the main thoroughfare of Aldgate High Street to the low-lying and Thames-sodden district of East Smithfield, the parish can be characterised by a process of development that, while preserving the substantial buildings fronting main streets, saw the extensive gardens and open land gradually built upon to house the poor and indigent. In contrast with the housing in Cheapside or St Dunstan much of the back street, alley and yard accommodation was temporary and insubstantial. The densely-built rents consisted of older sub-divided properties, converted sheds and single rooms.[35] In combination with the three other parishes—St James Clerkenwell, a semi-rural location to the north of the city and St Magnus and St Michael Queenhithe, two smaller riverside parishes associated with river trade and marketing—the selected areas of study covered the full topographical range of the Restoration metropolis.[36]

The parishes also provide a representative sample of the different civic, socio-economic and occupational patterns within the city. Working London, wealthy London and poor London are all found in the ten parishes. Parishes such as St Dunstan and the central Cheapside locations had effective and well organised structures of civic and ecclesiastical government, while the traditional agencies of civic and economic jurisdiction were less efficient in suburban areas like St Botolph and St Saviour. Places like St Michael Queenhithe and St Magnus provide examples of parishes whose economic life was closely bound up with the river trade and provisioning, the former acting as one of the central warehousing locations for river trade, while the latter saw a concentration of shops and businesses associated with supplying food and goods to the city. In the Cheapside parishes of All Hallows Honey Lane, St Mary le Bow and St Stephen Walbrook a higher quality of mercantile and trading activities existed. Whereas St Michael and St Magnus contained 'porters', 'cheesemongers', 'netsellers', 'haberdashers', 'booksellers' and 'salters', the Cheapside traders were 'druggists', 'merchants', 'silkmen', 'skinners', 'mercers' and 'drapers'. In the larger suburban parishes north, east and south of the city the economic infrastructure was far more diverse. In St Botolph, for example, manufacturing textiles and metalwork competed with a large brewing and distilling industry. Victualling the city and, further towards the Thames in East Smithfield, the maritime concerns meant that there was a high concentration of butchers' shops,

[35] For an excellent discussion of topography and the built environment in the parish, see D. Keene 'The poor and their neighbours: the London Parish of St Botolph outside Aldgate in the sixteenth and seventeenth centuries' (unpublished manuscript, available at CMH).
[36] See Earle (1994).

slaughterhouses, brewshops and tallowchandlers. To service all these activities the parish was also a place of employment for many labourers, carriers, porters and seamen. Similar to St Botolph, but with more emphasis upon providing services and goods for the river trade, St Saviour in Southwark entertained a wide range of occupations and industries. The better off trading and marketing location of Boroughside was packed with mercers, haberdashers, hatbandmakers and grocers who rubbed shoulders with butchers, bakers, cheesemongers and other shopkeepers, while Old Paris Garden and the Clink were where those industries related to shipbuilding, textiles and the carrying trades were located. Ropemakers, sawyers, carpenters, joiners, and sailesmen worked on the riverside, while watermen, lightermen, and fishermen plied their trade on or across the water. Inland, smiths, cutlers and pinmakers worked alongside throwsters, tailors, weavers, whisters, leatherdressers and cordwinders. A fairly similar structure of occupational activities but without the connection with the Thames existed in the northern parish of St James Clerkenwell.[37]

The selected parishes cover many of the variables of material, cultural and economic life in Restoration London. Given that the reason for pursuing the case-studies was to explore the relationship between environment and disease derived from the examination of the *Bills of Mortality* for the whole metropolitan area in a more precise historical manner it was important that the parishes examined accounted for the variations in social, and civic life and geographical location. Not only do the parishes cover the differences between intra and extra mural life, or riverside and suburban existence, they also cover a whole variety of economic activity. Since the project wished to explore the interaction between environment and disease in a dynamic rather than static manner the way different human populations in different social and material cultures interacted, both with each other, and with the distinct parameters of the physical world in their locality, the ten parishes examined provide a sample of those differences.

The Databases

As described above, the historical premise of this investigation was the application of a computer-aided technique of linking 'environmental' and 'mortality' sources to provide a relational database which would allow a series of questions to be posed about the socio-economic and geographical dimensions of the epidemic of 1665. Clearly the value of the enquiry as an historical enterprise rests to a great extent upon the accuracy of the data examined. A great deal of thought and time has been spent by many practitioners addressing the central issues of computer-aided research: here is not the place to engage in the wider issues under debate.[38]

[37] See Parish Database sorted on occupational fields.

[38] See most recently the special issue of *History and Computing* (1992).

It is important, however, to give a brief account of some of the methods adopted and problems encountered during this investigation.

Having employed a defined set of principles for the conversion of data from manuscript and printed sources outlined elsewhere, the contents of the resulting databases are summarised in Table 2.[39] Since the value of any arguments that are proposed in this analysis rest squarely upon the 'accuracy' of material within the databases it is important to attempt some evaluation of the 'success' of this method. The objective of the project was to reconstruct in precise detail the environmental dimensions of the epidemic. The historical ideal was that each death might be attributed to a particular and historically quantifiable location. Technical inconsistencies in the sources (variations in orthography for example) combined with the practical imprecision of early modern procedures for compiling taxation lists and the registration of vital events were problems that no amount of sophisticated methodological refinement could overcome.

Put simply, as Table 2 illustrates, it was not possible in all cases to 'link' every individual recorded in parish burial registers with households described in the taxation assessments. The variations in the success rate of linkage between the different parishes is historically significant. As illustrated, the database as a whole managed to relate some 42 per cent of deaths to specific locations within each parish. As one might expect the accuracy of linkage was more efficient in the smaller more wealthy intramural locations. In such areas the parish officers, clerks, constables and headboroughs, would have had a considerably easier job of monitoring the population of a small intimate locality compared with the much larger districts of suburban parishes where building development and jurisdictional conflicts would have obstructed the accuracy of the process of information gathering. The database constructed from linked sources, then, only allows for historical commentary upon a limited proportion of the population: so in particular the discussion of the relationship between economic wealth and the impact of the disease cannot be regarded as definitive. There was clearly a significant number of deaths that cannot be directly related to specific households within each locality. Indeed one of the conceptual problems with the computer method would suggest that the success rate of linking environmental and mortality sources could determine (in an unhistorical manner) the nature of the epidemiological results derivable from the linked database. That is, that the patterns of connections established between households with particular numbers of hearths and deaths contained in the burial registers was caused by the lack of consistency in these early modern sources, rather than a reflection of a 'real' observable causal relationship between poverty and disease.

In one profound historical sense there is little that can be done to prove the historical reality of the data contrived in the relational databases: they are a modern

[39] See Champion (1993a).

TABLE 2
General features of the sample parish database, 1665–6

Parish	No. of households	No. of burials	Burials per household	Burials linked to households	
				Number	As percentage of all burials
Intramural:					
All Hallows Honey Lane	37	10	0.3	6	60
St Magnus	122	85	0.7	50	59
St Mary le Bow	103	60	0.6	35	58
St Mary Colechurch	54	11	0.2	6	55
St Michael Queenhithe	157	185	1.2	37	20
St Stephen Walbrook	69	33	0.5	30	91
Subtotal	542	384	0.7	164	43
Extramural:					
St Botolph Aldgate	1,799	4,555	2.5	1,860	41
St Dunstan in the West	972	939	1.0	460	49
St Saviour Southwark	2,587	3,215	1.2	1,341	42
Subtotal	5,358	8,709	1.6	3,661	42
Outlying:					
St James Clerkenwell	1,172	1,296	1.1	567	44
Total	7,072	10,389	1.5	4,392	42

Source: Parish Database.

construction that employ early modern sources for objectives other than their original purpose. However, there were a number of procedural tactics adopted that might enable a more positive attitude to the historical probability of this one component of the methodology. For example attention was paid to a careful consideration of the relationship between the social structures described by the different sources: so for example the distribution of households by wealth from the tax assessments was compared with the range of households observed in the linked databases. Similarly with the burial registers it was possible to compare the general seasonality of deaths derived from the mortality sources alone, with the statistics of deaths created in the relational databases. This enabled some crude but essential monitoring of the trustworthiness of the final data.

Although such procedures were important, in another sense it should be stressed that patterns derived from the linked material were only one part of the investigation. Analyses of the socio-economic structure based on the tax assessments before and after the epidemic, and on the numbers of deaths during 1665, were uncontaminated by the potential methodological circularity of the related material. While these early modern sources were obviously converted to machine-readable format they remained historically uncorrupted by the process: no attempt at coding or summarising the original data was made. So, while there

may be historical problems with the precision of early modern procedures for compiling the listings of taxable households or recording deaths in particular parishes, there were no added problems caused by the process of computerisation. Descriptions of the social structures of the various locations and the record of who died and when in these parishes can be treated as historically accurate (within the obvious limits imposed by the sources themselves). It was at this point that the data from the relational databases were of significance in aiding some understanding of how environment and disease interacted. The relational data then ought to be thought of as a working historical tool to facilitate explanation rather than an empirically definitive account of what happened.

One immediate criticism of the method might be that many of those who lived and died in metropolitan locations, because of their marginality as poor inmates, lodgers or transient labourers, simply would have eluded the original sources. There is no doubt that this is true. There are many entries in burial registers that simply record unnamed corpses found dead in the streets or in sheds and stables. Very rarely do the tax listings deposited at the Exchequer give details of inmates and subtenants, although some use has been made of the working documents used by petty constables and headboroughs to list the poor and marginal who do not appear in the final state documents. These marginal and transient populations remain almost inescapably elusive. While it is clear that the majority of the permanent (respectable) poor households did not escape surveillance by tax assessors it might be possible to argue that one simple point can be made from the shortfall in relating deaths to households and that would be that the metropolitan population contained a high proportion of individuals, and perhaps even families, who certainly lived and (possibly) worked in London, more particularly in its suburbs, without encountering the more commonplace state or parochial agencies unless they became identified as a threat to local order and discipline.[40]

[40] See Beier (1985) especially 40–7. See also Slack (1988) and Shoemaker (1991).

III

The Metropolitan Experience

It is an historical commonplace that the Great Plague of 1665 was 'a true morbus pauperum'. That metropolitan London, as one contemporary put it, suffered a 'Dreadful Visitation' is beyond doubt: the literary accounts found in the various collections of letters, journals, newspapers and diaries can be supplemented with more quantitative material like the *Bills of Mortality* and surviving burial registers. Mortality from plague, and other causes combined, swept away as much as a fifth of the population in London, Westminster and their suburbs.[1] Even if we discount the impact of the 'plague', 1665 was a bad year for Londoners. The *Bills of Mortality* conveniently provide evidence that illness and death of all sorts increased during 1665. Characteristically for each parish the *Bills* gave two weekly figures, the first for the total number of deaths attributed to all causes, the second the number passing away due to 'plague': these two series provide much of the data that allows a reconstruction of mortality in the metropolis between 1655 and 1665. Although the *Bills* do provide these two discreet figures (for 'plague' and non-plague casualties) for each parish in the metropolitan area, confidence in the accuracy of the diagnostic apparatus of Restoration London must be cautious. Historians have suggested that the accuracy of the *Bills*, as a record of all burials within any parish, may be compromised because nonconformists and other types of religious dissident deliberately avoided registration of births and deaths under Anglican rubics. To place too much trust upon the precision of the parish examiners' diagnoses of a death as caused by 'plague' would be foolhardy. Indeed this study, although it will make some use of the statistical relationship between plague and non-plague deaths, intends to examine the totality of the epidemic experience of death rather than simply focus on an historically rather poorly defined disease. There are a number of reasons to support this tactic. Primarily, the intention in exploring the social patterns of all deaths in the crisis is calculated to undercut the biomedical approach which has insisted that it can diagnose with (almost) clinical confidence what disease the 'plague' was in 1665. The intention is then to expose all the patterns of death that obtained in the epidemic without being narrowly concerned with the epidemiological behaviour of one particular disease: again the purpose is to stress the social rather than purely medical dynamics that underpinned the crisis. There are also more practical concerns. Concentrating simply upon the 'plague' deaths would obscure the wider dimensions of illness and mortality in the epidemic. As discussion below illustrates there were

[1] For a very useful discussion of the vexed issue of precisely how large the London population was (and indeed what historians have meant by 'London'), see Harding (1990).

clearly other sorts of disease that proliferated in the metropolis in 1665. A further point suggests that concentrating on plague deaths alone would introduce a number of methodological problems. The intention of the study was to relate the data from the *Bills* to parish burial registers. A simple means of overcoming the fact that there was no consistency of recording whether victims died of the plague or not in most burial registers was to compare total numbers of deaths. Similarly, one of the central methods adopted of comparing endemic and epidemic regimes, the crisis mortality ratio, meant that it was necessary to calculate such ratios using total deaths so that some measure of continuity might be established between patterns of death before and during the crisis.

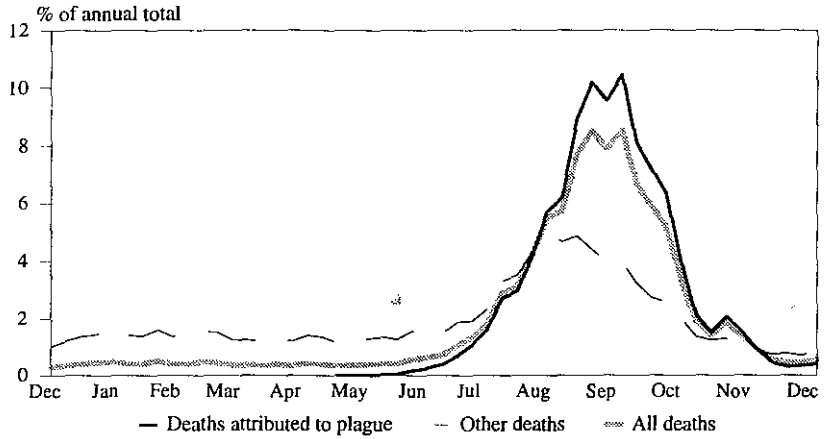


FIG. 4. Seasonality of plague and other deaths for the whole metropolitan area, 1665.
Source: Bills of Mortality, 1665.

A comparison of the seasonality of deaths attributed to plague and those to other causes illustrates some of the obscurity which can be caused by considering only those deaths labelled as 'plague' in the *Bills* (see Fig. 4).[2] As can be seen, the series displaying all deaths and plague deaths, although indicating a difference in the magnitude at the peaks of the crisis, mirror each other in their seasonal dimensions. More significantly, including the series for the residue deaths adds a further perspective to the seasonal pattern of death. As Figs. 5-8 illustrate, there were distinct spatial dimensions to the relationship between plague and non-plague deaths.

The most striking aspect of these variations in spatial patterns is the uniformity of experience of plague and non-plague deaths in the intramural metropolitan parishes compared with the differences of the seasonal series in the other areas. This suggests that there was a constant relationship between the registration of plague and non-

[2] Reference will be made throughout this work to both 'non-plague' and 'residue' deaths: these labels denote all those deaths not classified in the *Bills* as plague deaths. Such deaths were calculated by subtracting the plague figure from the total number of deaths for each parish.

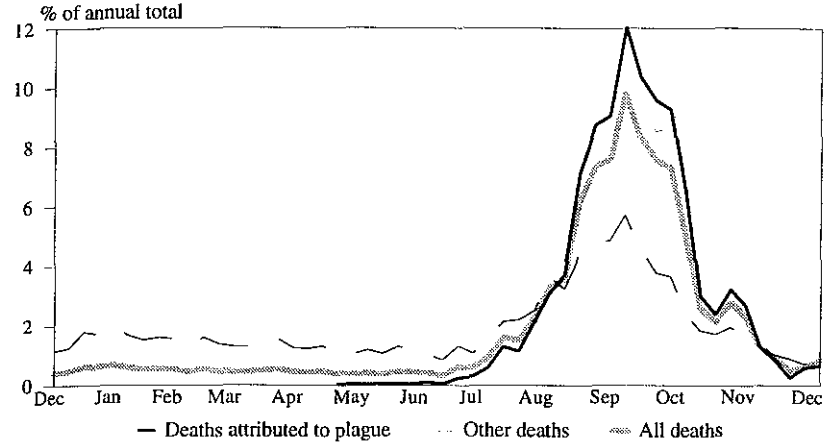


FIG. 5. Seasonality of death in intramural parishes, 1665.

Source: *Bills of Mortality*, 1665.

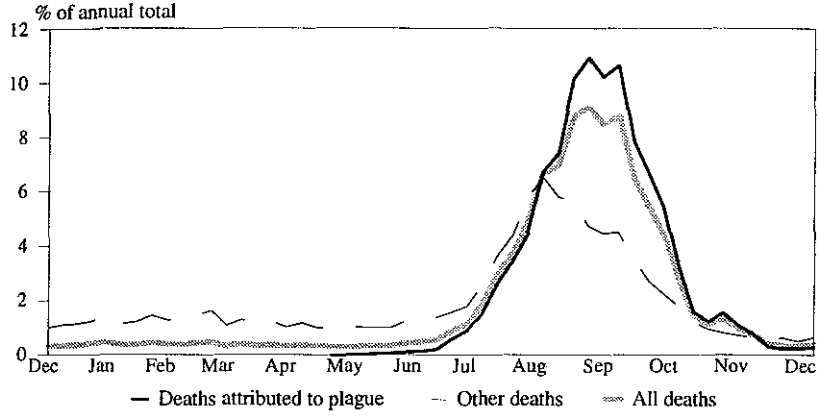


FIG. 6. Seasonality of deaths in extramural parishes, 1665.

Source: *Bills of Mortality*, 1665.

plague deaths within the city walls whereas elsewhere, as the intensity of the epidemic crisis increased, a disproportionate amount of deaths were classified as plague.[3] Whether this difference in the seasonal proportions of plague and non-plague deaths was a reflection of the material, demographic or even biological contexts of the diverse metropolitan locations will be discussed below.

That more than one disease was responsible for the epidemic crisis is suggested by further investigation of this category of residue (or non-plague) deaths. It is possible, week by week (and indeed, if necessary, parish by parish) to calculate (by

[3] For further discussion, see pages 34–7, below.

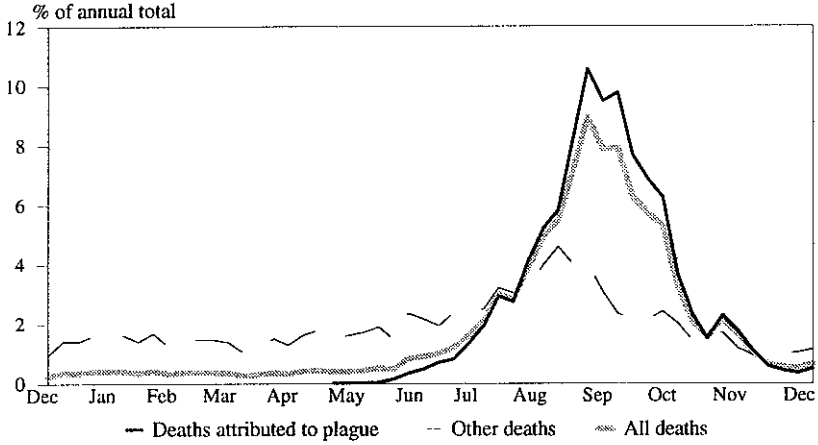


FIG. 7. Seasonality of deaths in outlying parishes, 1665.
Source: Bills of Mortality, 1665.

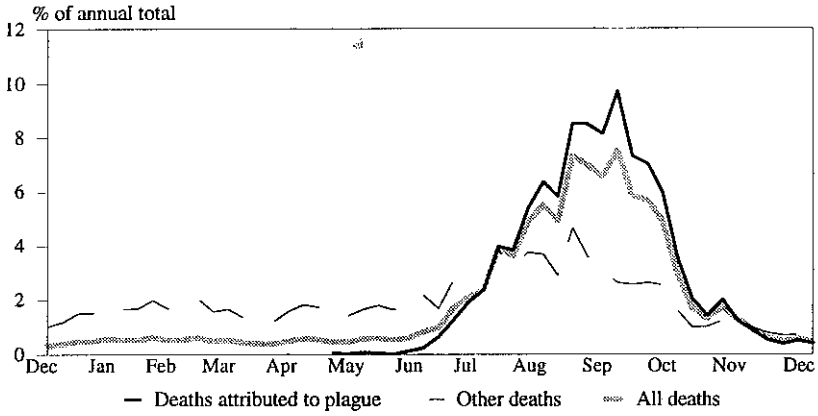


FIG. 8. Seasonality of deaths in Westminster, 1665.
Source: Bills of Mortality, 1665.

subtracting the plague figure from the total sum) the non-epidemic experience of mortality. A commonplace assumption of a biomedical model that suggests the plague was a disease introduced externally to London might be that the 'residue' figure ought to match (fairly closely) the background patterns of mortality. The evidence of the *Bills* contradicts such an assumption. When the 'residue' pattern of death is compared with the average experience (calculated from an analysis of the series of weekly returns for the decade 1655–64) it is clear that non-plague mortality also reached 'crisis' proportions during 1665. Although the general figures for 1665 show that underneath the epidemic crisis there was an increase in mortality by a factor

TABLE 3
Total deaths and crisis mortality ratios, 1665

Area	Total deaths per annum (from annual bills)						Crisis mortality ratios 1665[1]		Crisis mortality ratios (all deaths) 1665[2]
	Endemic (mean of totals for 1655–64)	Epidemic (1665)							
		'Plague' deaths		Other deaths		All deaths	All deaths	Non-plague deaths	
		No.	% of total	No.	% of total				
Intramural	3,302	9,889	65	5,320	35	15,209	4.6	1.6	4.6
Extramural	6,310	28,896	70	12,463	30	41,359	6.6	2.0	6.6
Outlying	4,400	21,419	75	7,134	25	28,553	6.5	1.6	6.6
Westminster	2,590	8,403	69	3,791	31	12,194	4.7	1.5	5.0
Total	16,602	68,605	70	28,710	30	97,315	5.9	1.7	6.0

Source: *Bills of Mortality* Database.

[1] i.e. the epidemic totals divided by the endemic totals (from annual bills).
[2] From the weekly bills: the slight discrepancies with the ratios derived from the annual bills probably arise from variations in the totals introduced by parish clerks when compiling the weekly and annual bills.

of only 1.5 to 2.0 in the different areas of London and its suburbs (see Table 3) if this data is examined week by week it becomes apparent that in early summer between three and seven times as many people were dying as would do usually from non-plague causes. Importantly, if this general CMR figure for residue, or non-plague, deaths is dissected into its spatial components (see Fig. 9) it is apparent that the extramural parishes, as defined in the *Bills of Mortality* (such as St Andrew Holborn, St Botolph Aldgate, St Giles Cripplegate and St Saviour Southwark), suffered a greater mortality much earlier than the other areas, peaking in early August with a figure seven times the endemic amount. Importantly, although not such a pronounced peak, and occurring from late August to late September, the intramural parishes also suffered a non-plague epidemic some four-fold worse than the average experience.

Although it contradicts conventional expectations, it seems then that the epidemic crisis of 1665 was not due to plague alone, nor that this wider deterioration of public health affected the poorer suburban parishes in isolation. That people were dying in greater numbers of things contemporaries did not choose to identify as, or call, 'plague', can also be adduced from other evidence found in the *Bills*. While the front of each weekly return gave the breakdown of plague and non-plague deaths, parish by parish and area by area, the reverse side gave more specific information on the names of diseases that befell the deceased. Even if we allow for both deliberate and accidental 'misdiagnosis' (families were presumably keen not to have the Examiners and Searchers taint their households with 'plague') it seems likely that there were minor epidemics of other diseases. Particularly notable (see Table 4) are those given causes of death which can be associated

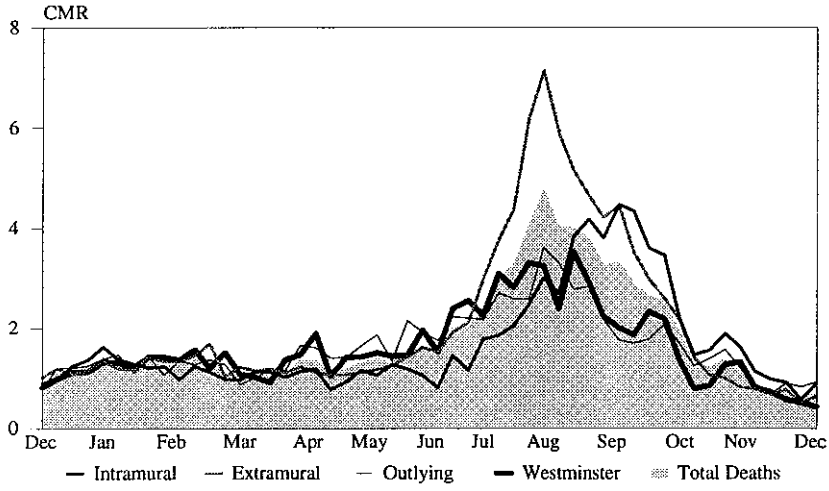


FIG. 9. Crisis mortality ratios for non-plague deaths in 1665.

Source: Bills of Mortality, 1655–65. Figures were calculatd by subtracting plague deaths from total deaths per week to give a 'residue' figure for each week. This figure was then (by week) divided by the endemic total for each week (calculated from the mean figure for the period 1665–64) to give the CMR.

with childhood and with enteric disorders (e.g. 'teeth' and 'surfeit') where the possibility of confusion with, or deliberate masking of, plague seems unlikely.[4]

As the *Bills of Mortality* show, during the course of the year there were increases in deaths attributed to diseases of all sorts: the city faced a disruption in general public health not just a specific problem with one virulent illness. Examining who died and where they died in the local context will enable a more nuanced understanding of the relationship between disease and society in 1665.

When and where the Plague originated between 1664 and 1665 is difficult and probably impossible to pinpoint. Myth and speculation, clouded by the fictional account of Defoe's *Journal of a Plague Year*, is characteristic of the accounts that suggest Holland was the source of the outbreak. Nathaniel Hodges was specific: the disease had been brought from the Levant via Amsterdam in bails of cloth. The *Bills of Mortality* record a couple of incidences of plague deaths in late November–early December which Defoe specifically attributes to two Frenchmen living in Drury Lane. The *Bills* are the best sources for describing the progress of the epidemic: although there is some suspicion that in the spring and early summer of 1665 they were in the words of one contemporary 'managed'. Undoubtedly deaths attributed to plague were hidden under other categories, most notably 'spotted feavers'. Certainly there seemed in the early months of the

[4] See Forbes (1979).

TABLE 4

Crisis mortality ratios for specific diseases, 1655–65 (weeks 30–42)

Disease	Endemic pattern (annual totals for sample years)								Total for	CMR
	1655	1657	1659	1660	1662	1663	1664	Mean	1665	1665
Abortive	22	7	26	31	1	30	2	17	78	4.6
Aged	126	140	152	219	33	205	21	128	571	4.5
Childbed	48	65	63	69	7	46	4	44	347	7.9
Chrisomes	115	195	99	155	24	167	13	110	219	2.0
Consumption	516	652	633	753	95	66	61	482	1615	3.4
Convulsion	152	198	167	275	31	275	33	162	873	5.4
Feaver	157	315	645	616	84	469	43	333	3533	10.6
Flox	283	213	507	98	27	135	19	183	107	0.6
Griping	36	259	94	171	20	254	23	122	643	5.3
Infants	148	187	117	190	29	179	16	124	193	1.6
Rickets	54	76	93	121	13	82	10	64	201	3.1
Rising	35	51	48	76	5	48	3	38	189	5.0
Spotted Feaver	18	20	94	60	3	41	3	34	1551	45.6
Stilborne	80	85	82	81	11	84	4	61	123	2.0
Surfet	12	28	50	55	6	36	4	27	828	30.6
Teeth	220	241	241	241	6	247	19	174	1314	7.6
Wormes	5	14	12	39	3	19	3	14	200	14.3

Source: *Bills of Mortality* Database.

epidemic to be some attempt to cover up the spread of the disease.[5] John Allin, a nonconformist and Helmontian chemist living in Southwark, noted in late April, in a letter to his family at Rye, plague deaths that do not appear in the published records.[6] The semi-official newspaper produced by Lord Arlington's creature Roger L'Estrange, *The Intelligencer*, played down the seriousness of the infection as late as early June by disputing the accuracy of the Parish Clerks' *Bills*. Interestingly however the same newsletter had carried advertisements for plague cures as early as 29 May.[7] Contemporaries were aware that the instruments of public diagnosis were fallible: again Allin wrote to Rye on 26 May, that 'ye Bill

[5] See GLRO Mss 'Plague'. See also Bulstrode Whitelock [May 1666] 'Whitelocke looked upon the Billes of the plague, & found the last year that there had died of the plague in / London, about 100000 persons besides those that were not registered', *Diary of Bulstrode Whitelocke,* 704. Whitelocke seemed more concerned about his 'pyles' during 1665 than the threat of the plague: see ibid, 690.

[6] See the important collection of correspondence between Allin and Philip Frith, Samuel Jeake and others in Rye held at the East Sussex Record Office. Some of the correspondence was published in Cooper (1887).

[7] See *The Intelligencer, Published for Satisfaction and Information of the People* (1665), 371. The advertisement read 'The Sovereign internal Balsam of Thomas See Physitian' sold by Mr Will Flindall at the WhiteHart in Westminster Hall, Mr Eversden, Greyhound in St Pauls Churchyard; Mr Fyge at the Hat and Feather in the Strand and Mr Clark at the entrance to the Royal Exchange.

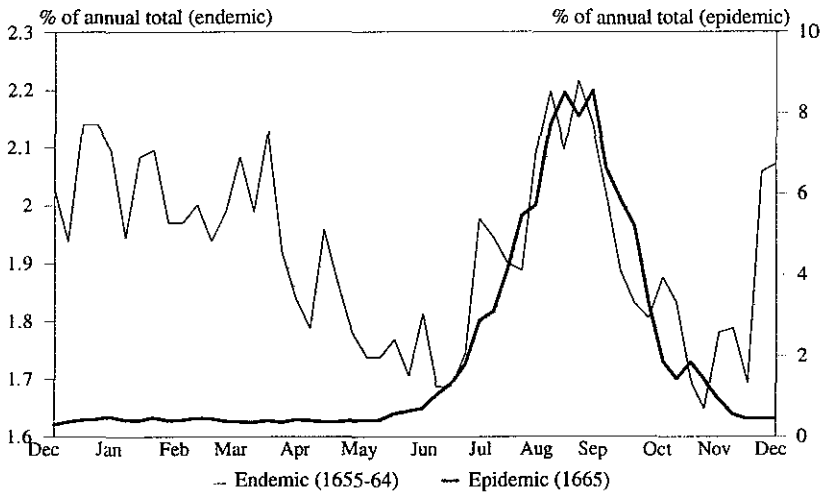


FIG. 10. Seasonality of mortality in the metropolitan area: endemic (1655–64) and epidemic (1665) patterns.

Source: Bills of Mortality. Each weekly figure is expressed as a percentage of the total for the year or decade.

mentioned 3 [Plague Deaths] last weeke, but it is rather to be believed to be treble the number'. By the end of May and mid June the sickness was underway.[8]

Commenting in the early 1680s on the definition of an epidemic, the statistician William Petty argued that 'when 100 per week dy the plague is begun'.[9] By this definition the epidemic in 1665 started about 17 June when the *Bills* registered 112 deaths in one week. The course of the seasonality of death for the whole metropolitan area can be seen in Fig. 10: the last weeks of August and the whole of September was when the crisis was at its height.[10] The worst week was from 19–26 September when 8,297 people died. If this seasonal pattern of mortality is compared with the average or endemic experience of death (calculated from the series from 1655–64) it seems that the 1665 impact greatly exaggerated and extended the usual peak of late summer.[11] The seasonal and spatial patterns of endemic mortality in the metropolitan area (see Figs. 10 and 11) show a standard model of death which peaks in the late summer months of August and September with a trough in the spring months.

[8] See *The Intelligencer*, 408. Whitelocke's Diary records a first mention of the epidemic on 21 May 1665. He was resident at Fawley rather than Fleet Street at the time. See Diary, 693.

[9] See *Petty Papers* (1927) vol 1, 37–40.

[10] Please note unless otherwise specified the y axis of a seasonal figure will be calculated as a percentage of weekly deaths rather than 'real' numbers so that the seasonal patterns of death can be compared across the different areas of the metropolis.

[11] See Wrigley and Schofield (1981), 293–5 for a discussion of the endemic and epidemic seasonality of rural and urban mortality.

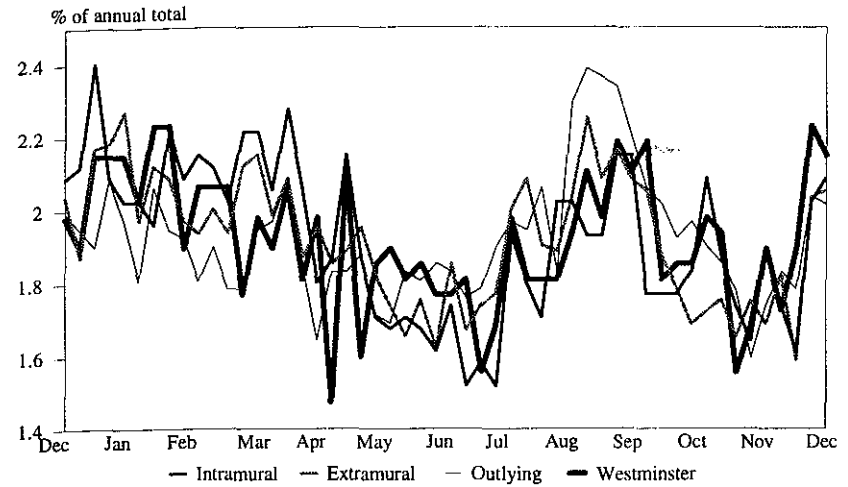


FIG. 11. Seasonality of endemic mortality for each group of parishes, 1655–64.
Source: Bills of Mortality. The parish groups are those used in the Bills. The sum of weekly figures is expressed as a percentage of the total for the decade.

The most distinctive element of the endemic pattern is the evenness of the peaks: the late summer increases are of a similar magnitude to the rise in mortality of the winter months. Again, if the spatial components of this general pattern are examined it seems uncontentious to suggest that although there are clear differences in the numbers of those dying in the different areas that this most likely is simply a reflection of the high number of households resident within those parishes. The seasonality of mortality in each of the four groups of parishes defined by the *Bills*[12] follows broadly the same fluctuations: that is, there are no profound differences between the variations according to the different locations or times of the year, although the intramural and Westminster parishes do seem to peak two or three weeks later in the summer. Perhaps the only two distinctive elements can be seen in the double peak in late august and early September in the extramural parishes and the much more regular or constant rate of mortality in Westminster.

These relatively minor distinctions (see Fig. 12, and compare with Fig. 10) in seasonality and spatial variations were exaggerated in the crisis of 1665. The overall pattern of mortality for the whole metropolis indicates that the endemic peak in late summer was extended from July to October. Underlying this general trend however were quite different local patterns. As Fig. 12 illustrates, the four sectors of the metropolis suffered at different times and with varying rates of

[12] The groups have been defined as follows; intramural ('within the city walls'), extramural (includes some parishes outside the city of London), outlying ('out parishes in Middlesex and Surrey'), and Westminster ('city and liberties of Westminster'). For the detailed composition of the groups, see Appendix I.

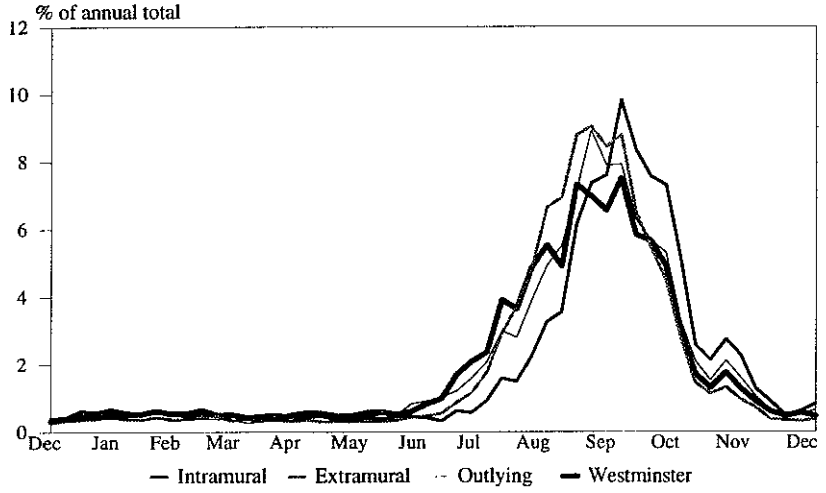


FIG. 12. Seasonality of all deaths by parish groups, 1665.

Source: Bills of Mortality. The weekly figure for each group is expressed as a percentage of yearly total of deaths for that area. The groups are those used in the *Bills*.

severity. The immediate peculiarity is the much later and more emphasised pattern of mortality in the intramural parishes. While all the other areas had their first peaks of mortality in late August, the intramural parishes' high point occurred in mid September. Indeed it seems that all the parishes, apart from those within the city walls, in effect suffered two peaks of mortality during the crisis — in mid August and mid September.[13] The intramural parishes, on the other hand, although clearly suffering an increasingly severe rate of mortality in mid August, followed a different vector. Comparing this pattern of mortality with the figures for rates of death attributed to non-plague mortality clearly suggests that intramural parishes experienced a distinct if related epidemic crisis.

Indeed, one of the general points that can be drawn from a consideration of these descriptions of endemic and epidemic patterns of mortality in the diverse locations would be to suggest that the urban environment, composed as it was of very different social, economic and geographic components, melded together distinct responses to the impact of disease. This is most readily displayed, it might be argued, in the double peak of mortality, evident in both the endemic and epidemic experiences, which seems to have been the result of a distinct urban/suburban seasonal pattern of death. In other words, the evidence of the variations in endemic mortality magnified in the crisis of 1665 suggests that, at one level at least, the nature of the epidemic seems to have been shaped by spatial location: that is simply by living in an inland, riverside or peripheral parish meant that the

[13] See pages 43–4, below, for a more detailed discussion of seasonality.

experience of death would have been different, irrespective of the social or economic status of that area.[14]

There is no doubt that the epidemic crisis of 1665 was severe and hit all parts of the metropolis.[15] In real figures the comparable peak week for an average year saw only 350 deaths compared with over 8,000 in the epidemic: so in 1665 the apparatus of parish administration, the constables, watchers, gravediggers, body bearers, doctors, justices, had to deal with nearly twenty-five times as many corpses as well as all those ill with the disease. No wonder that Vincent commented that the 'Churchyards, now are stufft so full with dead corps that they are in many places swelled two or three foot higher than they were before'. The many surviving churchwardens' accounts note payments to labourers for temporary pits to be dug, soil levelled, lime spread and shovels repaired. At its height the epidemic promoted a fatalistic terror: John Allin is typical in his comments, writing in early September, 'the increasing sicknesse hath now drawn very nigh me, and God knoweth whether I may write any more or no: it is at the next door on both hands of me, and under the same roof ... but I have no place of retiring, neither in the city nor country'. By mid-September Henry Oldenburg suggested to Robert Boyle that the crisis was even worse than that of 1625.[16]

It would be an understatement to say that the crisis was severe: nearly 100,000 people died in the space of the year. Using the *Bills of Mortality* it is possible to explore where and when these people died. As illustrated above using the *Bills*' division of the metropolis into four sectorial areas, it is possible to make some general remarks about the geography of the epidemic. Combining that information with knowledge about the relative wealth and poverty of particular areas and parishes derived from Michael Power's work upon the Hearth Tax will enable a social dimension to be brought to the map of mortality.

One very simple way of illuminating the differentiated impact of the epidemic on the metropolis in a very general manner is to calculate the difference between the proportion of deaths attributed to each sectorial area (as defined by the *Bills*) in an average year and in 1665 (see Table 5). Dealing with the proportional distribution of deaths across the metropolitan area was a useful if ultimately imprecise way of being able to discuss the geography of the epidemic without having to confront the thorny issue of the distribution of households within these areas. Taking the evidence of both total deaths and the figure for plague deaths, the clear implication of the data is that the traditional urban areas identified as the intramural parishes of London and Westminster did not suffer according to the endemic pattern, while the extramural and outlying areas saw an increase in casualties of between seven and nine per cent. This percentage distribution does

[14] For a similar discussion, see Finlay (1981), 103–105.

[15] For a discussion of how bad the 1665 crisis was compared with earlier outbreaks of epidemic disease, see Sutherland (1972).

[16] Cooper (1887), 9; *Correspondence of Henry Oldenburg*, 511.

TABLE 5
Distribution of population and deaths by area, 1655–65

Area	Distribution of population (%)		Distribution of deaths (%)			Difference between 1665 and endemic pattern (%)		CMR (all deaths, 1665)
	*c.*1665	*c.*1700	Endemic pattern	1665				
				All deaths	'Plague' deaths	All deaths	'Plague' deaths	
Intramural	14	13	20	16	14	-4	-6	4.6
Extramural	31	30	38	42	42	+4	+4	6.6
Outlying	35	34	26	29	31	+3	+5	6.6
Westminster	19	22	16	12	12	-4	-4	4.7
Total	99	99	100	99	99	-	-	5.9

Sources: *Bills of Mortality* and, for distribution of population, Harding (1990).

not obviously reflect the total number of deaths but merely the proportion of mortality usually suffered by each area.[17] The differences between the spatial distribution of all deaths and plague deaths in 1665 is particularly interesting: indeed the patterns of shift that are evident when all deaths in 1665 are considered seem to have been exaggerated and perhaps distorted if plague deaths alone are examined. For example, the shortfall of plague deaths occurring in the intramural parishes increased from 4.3 to 5.5 per cent which can be compared with the pronounced increase in incidence of plague deaths in the outlying parishes of London (4.7 per cent). If the proportion of plague deaths to total deaths is calculated, similar results seem to be manifest. Taking the whole metropolitan area, plague deaths accounted for 70.5 per cent of all deaths: the significant deviations from this mean urban experience were evident in the intramural and outlying parish locations. While the extramural and Westminster parishes saw 69–70 per cent of all deaths being categorised as plague, the figure for the parishes within the wall was 65 per cent compared with 75 per cent for the outlying parishes. Indeed if the seasonal dimensions of these annual proportions are explored the spatial distinctiveness of the relationship between plague and non-plague deaths (PNPR) is clear (see Figs. 13–14).

As can be seen in Fig. 13, the mean experience of the whole metropolitan area saw a low point in the PNPR where only about 15 per cent of all deaths recorded were not attributed to plague deaths. Fig. 14 clearly shows that the spatial variation falls into two distinct patterns. First it seems that as other evidence suggests the intramural parishes suffered a different epidemic pattern, avoiding the steep decline in PNPRs in the late summer. However, although as the figure illustrates there are

[17] It might be worth comparing these proportions with the different calculations of population figures for the areas: see Harding (1990).

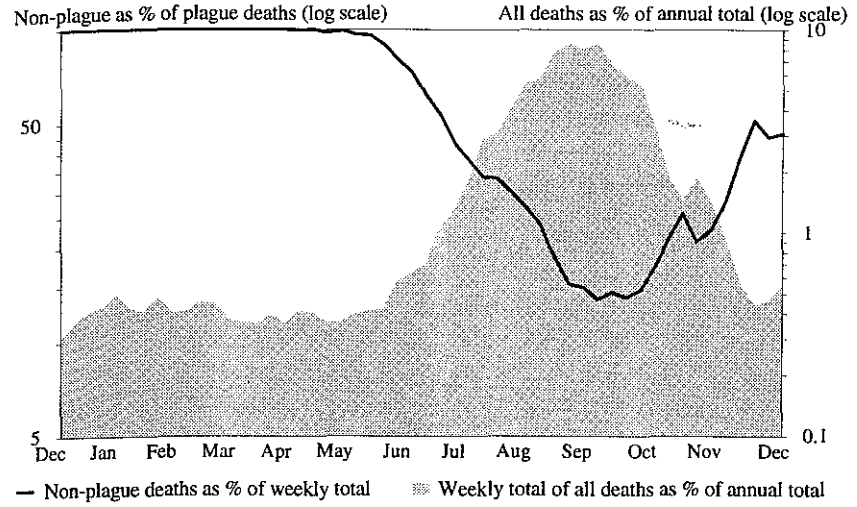


FIG. 13. Non-plague deaths as a proportion of the total for the metropolitan area, 1665.
Source: Bills of Mortality.

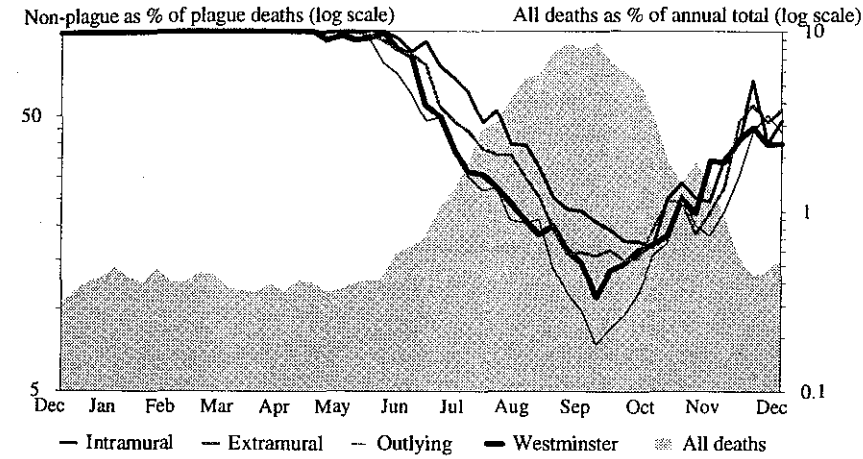
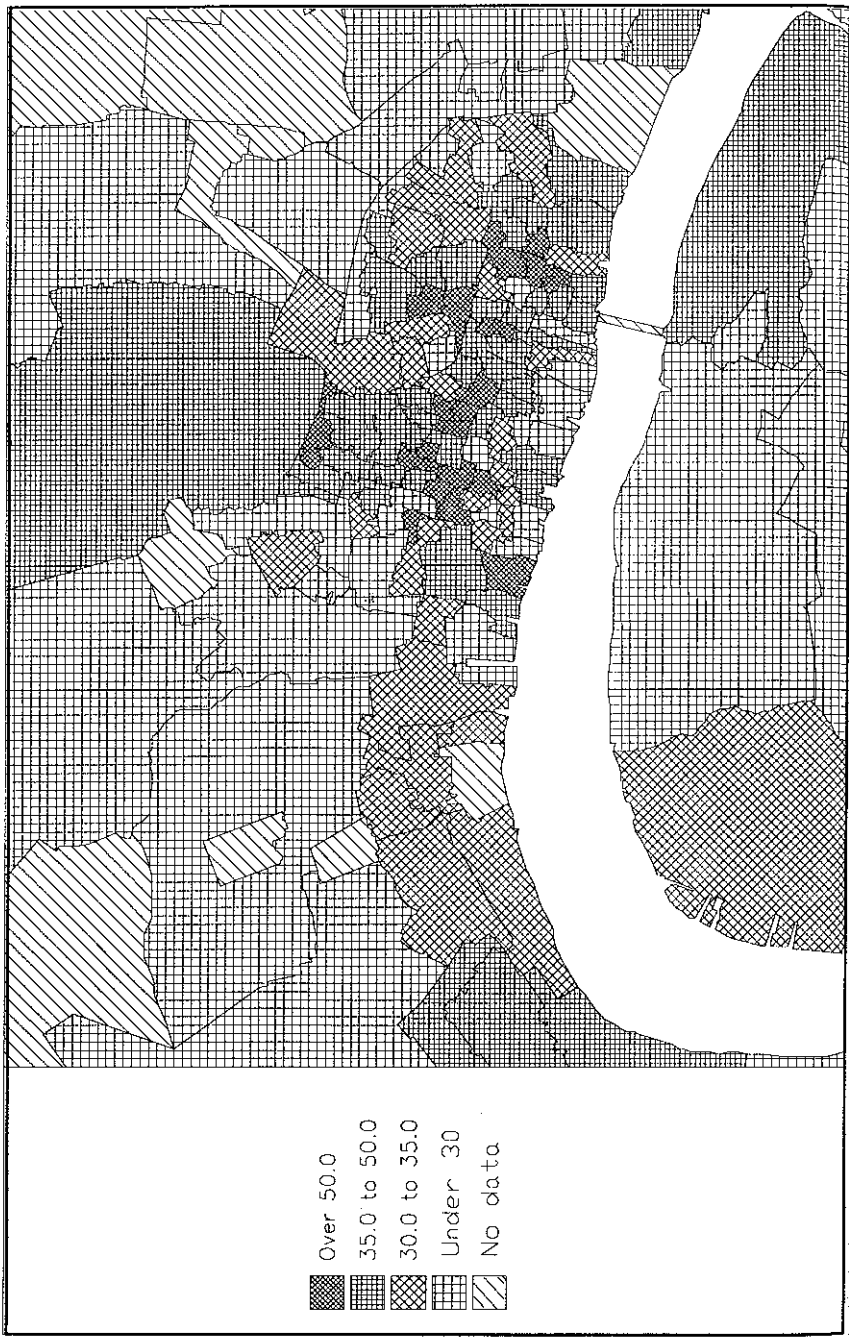


FIG. 14. Non-plague deaths as a proportion of the total for each group of parishes, 1665.
Source: Bills of Mortality.

differences between the seasonality of PNPRs for extramural and intramural parishes, both locations remain above the mean metropolitan experience. The examples of Westminster and the outlying parishes of London diverged from the mean condition. Both locations experienced a much steeper and more severe slump


Over 50.0
35.0 to 50.0
30.0 to 35.0
Under 30
No data

in PNPRs at the peak of the epidemic: the Westminster parishes falling to a low of almost eleven per cent, the distant outlying parishes of Surrey and Middlesex declining to a figure of just above seven per cent. The discrepancy between these two components is intriguing. Mapping the PNPR for each parish (see Fig. 15) again reinforces the diversity of experience across the metropolis. The suggestion seems to be, to put it crudely, that in central London people tended to die of things other than the plague, while west of the city and in the more rural environs plague tended to take away the overwhelming majority of those who died. The evidence may have two implications. First, that in the more populated location within and without the walls of London there lurked other diseases that were triggered by the same biological mechanisms that provoked the 'plague'. In the less dense populations of Westminster and the more rural parishes these diseases may simply have not had the material or biological infrastructure to exist. Second, the discrepancies may be a reflection of the lack of uniformity in compilation of the *Bills of Mortality*. In the more central metropolitan areas the parochial administration may have been more effective in discerning the type of disease casualties died from. Or, on the other hand the parish officials may have been more prone to report the deaths of their neighbours as non-plague, in the more intimate central parishes. In the more rural locations parish officials may have simply recorded all deaths that were clearly not natural as 'plague'. It is difficult to support either of these positions with anything other than anecdotal evidence, but clearly it is important to at least consider the variant possibilities. There seems then, at least at this rather abstract statistical level, to be evidence that suggests the experience of death within and without the city walls was different: the material and demographic environments of the locations may have determined this difference.

Before discussing possible reasons for this shift in the spatial distribution of deaths it is worth briefly considering the overall endemic and epidemic regime of mortality in relation to the proportion of the population resident in the distinct metropolitan areas (see Table 5). Obviously attempting to estimate the resident population figures for London alone, without the added problems of the relative distributions of households within the different parochial districts, is difficult both because of the nature of the historical sources reflecting the complex pattern of immigration and population growth in early modern London, and the imprecision of geographical definition which historians have used when referring to 'London'. This historical picture has been recently bought into sharper focus by Vanessa Harding's survey and comparative assessment of how the surviving demographic material has been used. Although there is still much uncertainty about the precise nature of population figures in the period, Harding's adjusted figures will allow some general picture of the distribution and density of residence in Restoration London. The figures in column 3 of Table 5 must obviously be used with care but, even with such a proviso, illustrate the distribution of residents in the metropolis.

A comparison of the endemic level of mortality with the proportional population shows at least one interesting deviation from commonplace assumptions about the differential impact of urban disease. Although the large extramural parishes do seem to suffer disproportionately to their share of the metropolitan community, the more outlying and semi-rural locations, as well as the Westminster parishes, escaped the expected proportion of mortality. Importantly the only other area to endure a level of mortality above the anticipated percentage was the city within the walls. So it seems as if the prevailing epidemiological regime disadvantaged the locations in close proximity to the city walls and north and south of the river while the more far flung parishes (again both north and south of the river) in Lambeth, Islington, Whitechapel, Stepney and Bermondsey, did not sustain levels of mortality as expected. It seems significant also that the two city areas of London and Westminster experienced different mortality regimes — at least in terms of the endemic models.

As Table 5 illustrates, however, this background structural relationship between the population distributions in these distinct areas and the levels of mortality endured in the previous decade was distorted in 1665. Contrary to the 1655–1664 pattern, in the crisis year both the extramural and the outlying parishes of Middlesex and Surrey increased their share of the total mortality, although interestingly while the extramural parishes as a group now suffered levels of mortality some eleven per cent above the proportion expected according to their share of the population, the outlying parishes still exhibited a shortfall in observed deaths of about six per cent. The crisis also, at this very general level, seems to have brought the epidemiological experience of the intramural parishes and Westminster closer together with both areas reducing their proportionate share of total mortality by about 4 per cent. While London actually experienced the greater reduction it still sustained a level of mortality above its expected proportion, Westminster, on the other hand, avoided its due share by some seven per cent.

Further light can be thrown upon these spatial differences if crude mortality rates are calculated using the aggregate figures from the *Bills* combined with Harding's revised population estimates (see Table 6). Again, as with the above discussion it must be stressed that such figures are probably little more than guess-estimates, but they do provide a setting for further discussion. As historians have shown, the 'normal' (median) mortality rate for early modern England was about 26 deaths per thousand, the vast majority of annual rates falling between 22 and 31.6. This endemic rate was, Finlay has shown, higher for metropolitan London. John Graunt estimated in his *Natural and Political Observations* that between 31.2 and 34.1 deaths per thousand died annually, a figure significantly above the median supplied by Wrigley and Schofield for the whole country. If normal crude mortality rates were high in the metropolis then the epidemic experience saw substantial increases. Finlay's estimates for the crises of 1593, 1603, 1625 and 1636 suggest that CDRs increased to as much as 266 per thousand. Taking the

TABLE 6

Crude death rates (per thousand), endemic and epidemic, 1655–65

Area	Population *c.*1665 (in 000s)	Crude death rates (deaths per 1000 inhabitants)			Ratio of endemic to epidemic rate[2]
		Endemic (1655–64)	Epidemic (1665)		
			All deaths (as recorded)	All deaths (adjusted)[1]	
Intramural	72	46	211	237	5.2
Extramural	160	39	258	258	6.6
Outlying	180	24	159	159	6.5
Westminster	100	25	122	137	5.3
Total	512	32	190	197	6.1

Sources: *Bills of Mortality* and, for population, Harding (1990).

[1] Recorded totals for the intramural area and Westminster inflated by 11 per cent so as to take account of the flight of the wealthy from the metropolis; see below, p. 41, fn. 21.

[2] Adjusted epidemic totals divided by the endemic totals.

metropolitan area as a whole, and deflating the population total to reflect the out-migration of those who left London in June and July, the CCDR was 197.3 compared with an endemic rate of 32.4.[18] Again the most distinct aspect of this data suggests that although the overall CDR for the metropolitan area was just above 30 per thousand, this figure masked two different components reflecting different epidemiological regimes existent in the central metropolitan locations and the more peripheral areas. Surprisingly, as Table 6 illustrates, the highest endemic CDR was in the intramural sector, a figure followed closely by the extramural parishes. The outlying parishes of Middlesex and Surrey and the Westminster parishes had CDRs of between a half and two-thirds of the intramural figure. With a slight variation, this pattern followed through into the epidemic experience of 1665. In terms of peaks of CCDRs, the parishes within and without the city walls were the worst hit, although in this case the extramural suburbs endured an increase both proportionately and in real terms larger than the city within the walls. If the figures are looked at in relative terms it appears, however, although all the areas suffered a massive deterioration of public health, that proportionate to their endemic experience it was the suburban and more peripheral parishes north and south of the river which sustained greater increases compared with the more central areas of the cities of London and Westminster.

These general investigations of the spatially-differentiated impact of the epidemic in 1665 suggests a number of models for how the epidemiological regimes of metropolitan London worked. There seem to be three points that can

[18] See Wrigley and Schofield (1981), 311 and Appendix Table A3.1 (at 528) for annual totals of CDR; Finlay (1981), 88–9,100–5, and Table 6.4 (at 117–18); Sutherland (1972), 309; Slack (1985), 81, 160, 187–8, and on London 148–51.

be made. First, in considering the background pattern of mortality there is a clear distinction between those parishes classified in the *Bills of Mortality* as intramural and extramural, and the peripheral locations. The second point to note is the very different experience between the two cities of London and Westminster: the former characterised by an endemic and epidemic CDR almost twice the size of the latter. The third clear point concerns how the crisis of 1665 distorted the endemic structure of death so that the worst mortality experience shifted geographically from a central sector located north and south of the city of London, to the suburban locations between the city of London and Westminster. So in some sense the two established urban areas of Westminster and London, although they clearly endured mortality of crisis proportions, had a fairly stable reaction to the epidemic, whereas the suburban and Middlesex and Surrey parishes responded in a more violent manner. Indeed, perhaps the single most apparent aspect of Tables 5-6 points to the unique experience of the extramural parishes north and south of the river: this aggregation of communities suffered a worse crisis than any other area.

There are then clear differences indicated at a very general spatial level. Pinpointing such distinction is relatively straightforward while explaining them is more problematic. One tradition of historical demography insists that when dealing with the dynamics of mortality variations, it is only possible to appeal to factors such as pathogenic virulence, climatic disruption or other exogenous quantities which cannot be related to the observable structure of social or economic life. A different approach, and one put forward most cogently and recently by John Landers, suggests that it is important to locate variations in mortality firmly in the structure of everyday life. In this view, then, differences in the dynamics of death are not the result of some autonomous external agency, but are embedded in the material, socio-economic and ecological networks of urban life.[19] Combinations of variations in topography, or in the quality of the built environment, nutrition, migration, housing density, access to water supply, occupational characteristics and social structure, all contributed to the differential impact of disease in the early modern period.

For example, one immediate explanation for the shift in the distribution of mortality and CDR identified in Tables 5–6 might be found in the differences in the household density and the continuity of the populations at risk in these distinct areas. Contemporary accounts suggest that in the wealthier city precincts many of the mercantile and political elites, along with those traders and other businessmen who could afford to, took the opportunity to flee the capital in June and early July. Thomas Rugge commented on 18 July that '1800 families [had] left London and fled into the country in many places'.[20] Evidence of a poor rate assessment compiled in September 1665 for the city of Westminster that listed whether

[19] See Landers (1993), esp. 1–39.

[20] See T Rugge, 'Diurnall' (BL, Add Ms 10,117), folio 143 r.

occupants were resident or not suggests that perhaps as many as 12 per cent of the wealthier households had left the metropolis.[21] Samuel Pepys' *Diary* gives ample evidence of the flight of those who had the economic ability to do so. Between 20 and 22 June, Pepys sent his own mother into the country and commented, watching from the Cross Keys at Cripplegate, 'where I find all the town almost going out of Town, the coaches and waggons being all full of people going into the country'. A week later he noted that Whitehall was 'full of waggons and people ready to go out of town'. Throughout July he kept a careful record of those who upped and left. An interesting insight into the motivations and calculations that faced the middling sort is given by Pepys' discussions with the tallowchandler Joyce in late July. Pepys encouraged Mr Joyce to allow his wife and women folk to leave the city, 'but I could not prevail with him — he urging some simple reasons, but most that of profit, minding the house — and the distance, if either of them should be ill'. Eventually Pepys' persuasions conquered Joyce's worries and his wife was sent to Windsor. But clearly for some, the balance of interests between staying and facing the plague or fleeing and becoming destitute or ruined were careful calculations that were perhaps determined more by economic than medical factors.[22]

[21] See 'A rate for the reliefe of such poor persons and families as are visited of the plague'. Interestingly a note at the end of the assessments implies that the money was never collected. See Westminster database: 11.7% of the total households (1422) were marked as either 'gone' or 'empty'.

[22] See *Diary of Samuel Pepys*, VI 1665, entries for 21 June (133), 22 June (133–4), 23 June (136), 29 June (141–2), 6 July (149), 18 July (162), 29 July (174).

IV

Mapping the Evidence

Mapping the data from the *Bills* means that we can reach a high resolution of understanding how the disease affected the metropolis by exploring its impact on each parish. One method of trying to assess the relative impact of the disease in areas of very different size, wealth, environment and population density is to calculate Crisis Mortality Ratios (CMR) for each sectorial area, and indeed for each parish within those areas, so that direct comparison can be made with endemic patterns. These calculations were made by comparing the average (or endemic) pattern of death for the decade prior to 1665 with the epidemic totals.[1] Taking the year as a whole, London experienced a CMR of 5.9: the city within the walls, in general terms the wealthier area, suffered the lowest rate of 4.6 comparable to the Westminster figure of 4.8, while the poor extramural and outlying parishes had figures that ranged from 6.5 to about 6.6.

Although these general ratios hide great diversity both seasonally and spatially, they point to some general themes of spatial differentiation indicated by the changes in the crude distribution of deaths discussed above. Looking at the experiences of the different areas week by week (see Fig. 16) shows the distinct patterns of impact in the epidemic. Following what might be expected from the CCDRs and sectorial CMRs the seasonality of mortality mirrors the spatial re-orientation from an intramural/extramural: outlying/Westminster endemic model to an intramural/Westminster: extramural/outlying regime. As Fig. 16 illustrates, the extramural and outlying parishes follow a similar trend both experiencing the crisis first in mid June. Significant increases in the CMRs for intramural and Westminster parishes are not apparent until late July and early August, reaching a high point of 22 in early November. The poorer parishes suffered more severe rates, reaching as high as 29, for a period of about thirteen weeks, compared with the intramural parishes that only had extended and severe CMRs for two months. In effect, the intramural parishes and the western locations associated with Westminster, as a whole, experienced a different epidemic from the larger outlying areas: the intramural parishes avoided crisis mortality until much later in the year peaking at a lower rate, whereas the experience of the poorer parishes, especially those outside the city walls, was harder and longer. That the spatial re-orientation suggested above was reflected in seasonal differences is apparent from a comparison of Figs. 11 and 16.

A cursory examination of the relative wealth and poverty of these areas in relation to the seasonality of death illustrates some general relationships between socio-

[1] For a discussion of methods in calculating CMRs, see Slack (1985), 81 and Finlay (1981) 119–23 and for a more sophisticated procedure, see Landers (1993), 102–4.

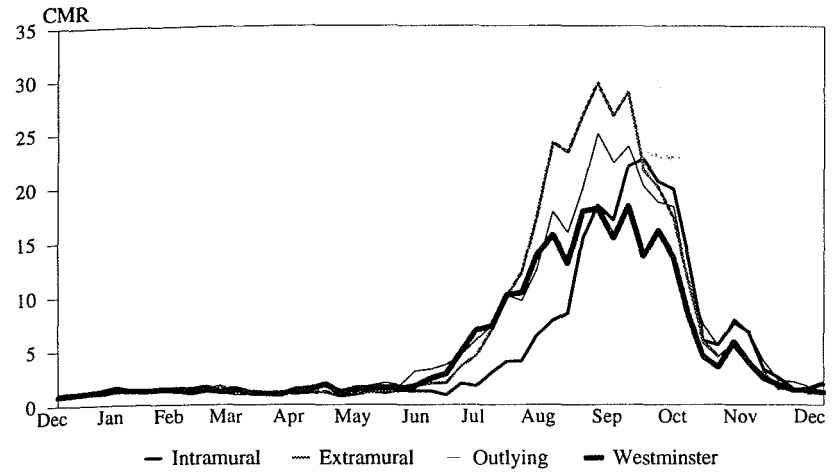


FIG. 16. Weekly crisis mortality ratios for each group of parishes, 1665.

Source: Bills of Mortality, 1655–65. CMRs were calculated by dividing the weekly numbers of all deaths for 1665 by the mean figure for the same week for the period 1655–64.

economic factors and mortality. The cities of London and Westminster, with a mean number of hearths per household of between 4.2 and 5.7, although they had different infrastructures of wealth (the former based on mercantile activities, the latter on political and judicial rather than economic power) shared very similar seasonalities of mortality in a typical non-epidemic year. On average there were between 50 and 65 deaths per week in both areas. This is to be contrasted with the outlying parishes of Middlesex and Surrey. Here the locations straddled both sides of the river and shared a mean number of hearths per household of 2.8. Although the geographical and topographical range of locations was large, encompassing riverside parishes like St Katherine by the Tower (2.3), large north-western areas like St Giles in the Fields (2.9), and semi-rural communities like Lambeth (3.1) and St Mary Bermondsey (2.5), the areas all shared similar socio-economic status. On average between 75 and 100 individuals died per week. If the outlying parishes and intramural sectors can be ascribed some form of socio-economic homogeneity, the last category — 'extramural' — is more problematic given its mixture of wealthy West End, poor East End and Southwark locations. The 'extramural' category thus combined a group of western and north-western parishes like St Dunstan in the West (5.7), St Andrew Holborn (6.3) and St Bartholomew the Great (4.4) with a mean of 5.1 hearths per household[2] (significantly higher than the intramural London figure) with parishes like St Botolph Aldgate (2.5), St Giles Cripplegate (3.0), St Sepulchre (1.7) and St Saviour Southwark (2.8) where the mean was 2.6 hearths. Although there is some geographical logic to this

[2] This figure includes only those where hearth tax records survive: St Andrew Holborn, St Bartholomew the Great, St Bartholomew the Less, St Botolph Aldersgate, St Dunstan in the West, St Bride.

group, given their location in a band around the walled city there are clearly two distinct categories of urban environment submerged under the label 'extramural'. On average between 100 to 130 people died per week in these parishes but the proportion between rich and poor locations was imbalanced with 30.7 succumbing in the former compared with 91.2 in the latter. This imbalance was made more evident during the crisis of 1665 when the share of deaths that the richer parishes accounted for fell from 25.2 percent to 22.0 percent. This differential pattern was emphasised in the CMR for each sub-group: whereas the wealthier parishes saw an increase of mortality by 5.6 (from 30.7 deaths per week to 171.9) the poorer parishes shared a CMR of 6.7 (91.2 deaths per week on average to 610.3). One reason why the 'extramural' parishes may have had such a distinct seasonality, in both endemic and epidemic seasons, is most probably related to this mixture of wealthy and poor locations: the different seasonalities in other areas of London and Westminster suggest that the double peak in the extramural pattern might result from the co-incidence of wealthy and poor suburban epidemiological regimes.

At this general level there is then, as Paul Slack has pointed out for other epidemics and urban communities, a correlation between wealth, poverty and disease. The spatial dimensions of this relationship can be made more precise when the CMR for each individual parish is related to social structure represented by the mean number of hearths per household for that area (see Figs. 17 and 18[3]). The spatial correlation between the two sets of data is close. Examining the figures from the hearth tax illustrates the classic divisions between wealthy central and West End parishes, poorer locations along the river frontage on both sides of the Thames, and northern and eastern parishes adjacent to the city wall (both inside and outside).[4] This social topography can be broadly distinguished in the map of CMRs (Fig. 18) where the wealthy central parishes had low crisis rates. So city parishes such as St Mary Colechurch, All Hallows Bread Street, St Lawrence Jewry, St Matthew Friday Street, and St Mary Le Bow where the mean number of hearths per household (MHH) was between 5 and 7 only had CMRs between 1.5 and 3: that is, substantially below the general pattern. This central area was buffered from the extramural experience by two bands of parishes with increasing CMRs. Immediately proximate to the wealthy areas were parishes to the west, north and east of the city which although they still had high MHH values[5] had higher

[3] For the figures for all parishes covered in the *Bills of Mortality*, see Appendix 1 'The Parishes of Metropolitan London as Described in the *Bills of Mortality* and Attributed Data'.

[4] For a more detailed account of the variations of Restoration social topography, see Power (1972) and (1986).

[5] For the parishes selected a range of 4.7 for St Dunstan in the East to 6.7 for St Helen Bishopsgate. The other parishes in this small selection were St Gregory by St Paul's, St Faiths, St Andrew Cornhill and St Mary at Hill. The MHH for these six parishes was 5.5. For the same selection the CMR range was 3.4 to 5.0 and the average was 4.0.

TABLE 7

Crisis mortality ratios for 1665 and the status of parishes as indicated by mean hearth tax assessment, 1662–6

Parish group according to mean numbers of hearths per household	Number of parishes in group	Mean number of hearths per household in group	Mean crisis mortality ratio for group
Under 3 hearths	11	2.2	6.4
3 to 4.9 hearths	43	4.2	5.2
5 to 6 hearths	40	5.4	3.6
Over 6 hearths	7	6.7	2.9

Source: Appendix I.

CMRs. Enveloping this inner band, but still within the city walls was a further set of locations, still with relatively substantial households (4.2 to 5.0 hearths), but with even higher CMRs (6.4 to 9.1).[6] Beyond the city walls two clear patterns emerge. To the west, the parishes of St Dunstan in the West and St Margaret Westminster, although suffering a definite crisis (CMRs between 3 and 5) shared an epidemiological equivalence with the second inner band of London parishes. To the north, east and south of the city, as the mean number of hearths per household declined so the CMRs increased.

The general pattern indicated by Figs. 17 and 18 suggests that there may have been at least two central components determining the differential impact of the epidemic. Firstly, spatial location, at least at one level, appears to have set certain dimensions to the epidemic. Secondly, in some way this geographical determinant was related to social and economic factors. These relations were complex, however. It is possible to see a definite correlation between suburban poverty and increased mortality — but the evidence of the trichotomy of experiences within the city walls suggests that wealth and location did not operate independently of each other. Evidence derived from comparing MHH with CMRs for the metropolitan area (see Table 7) similarly suggests that there is a strong inverse correlation between the number of hearths per household and the level of crisis mortality, although regression exercises suggest that it is not a particularly strong coefficient of determination (the R^2 figure was 0.31).[7] Other mapping procedures and regression analysis allows the introduction of other variables such as crude population and household density to be explored over the whole metropolitan area. Projecting the endemic and epidemic distributions of mortality by acreage reinforces some of the points made above. The immediate feature to pick out of such a comparison (see Figs. 19–20) is the essential continuity of the epidemiological processes that hit the same set of city, extramural and outlying

[6] This second aggregation of parishes is composed of St Anne Aldersgate, St Olave Silver Street, St Alphage, St Ethelburga, St James Dukes Place.

[7] Note that these statistical procedures were done on a database that only included the 100 parishes for which complete aggregate data exists. For those excluded, see Appendix I.

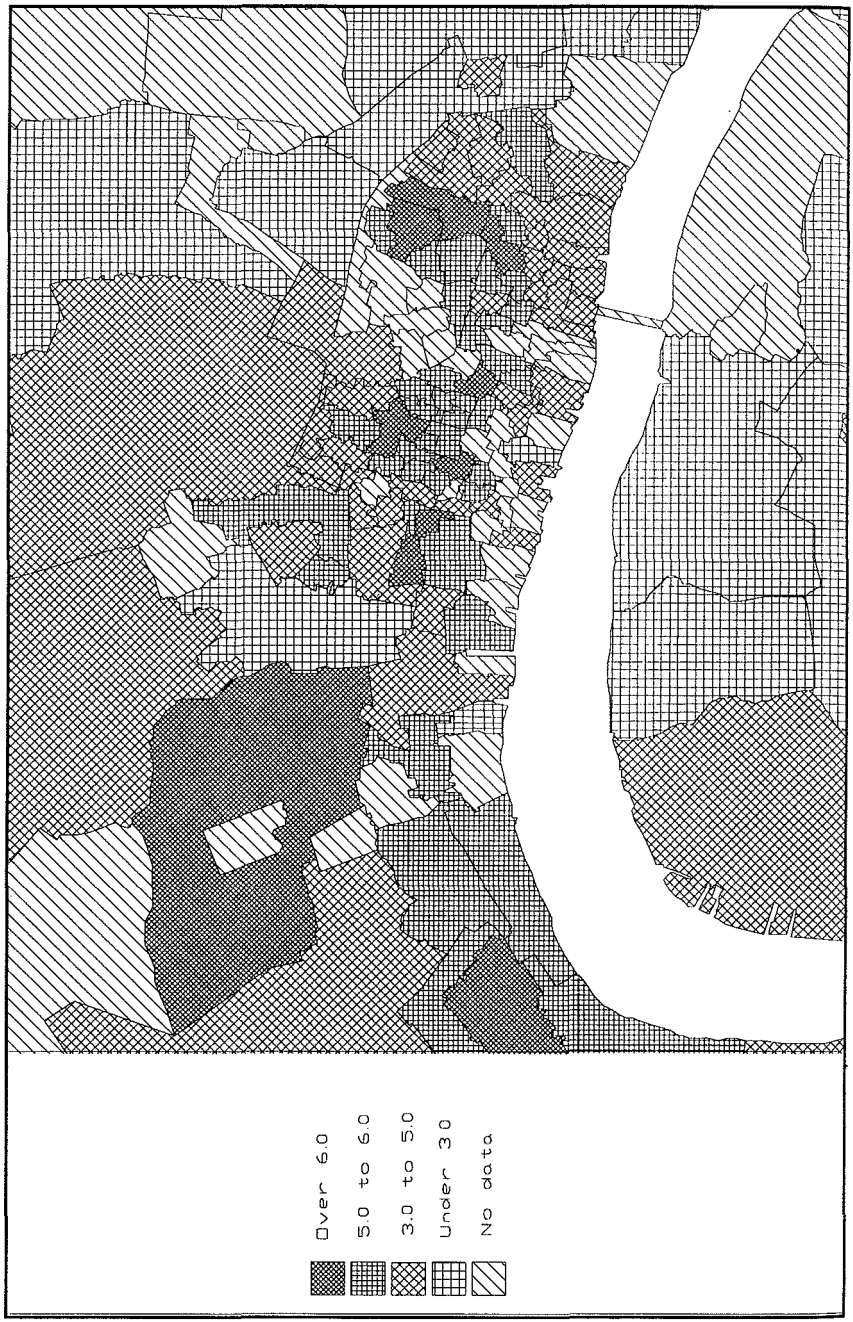
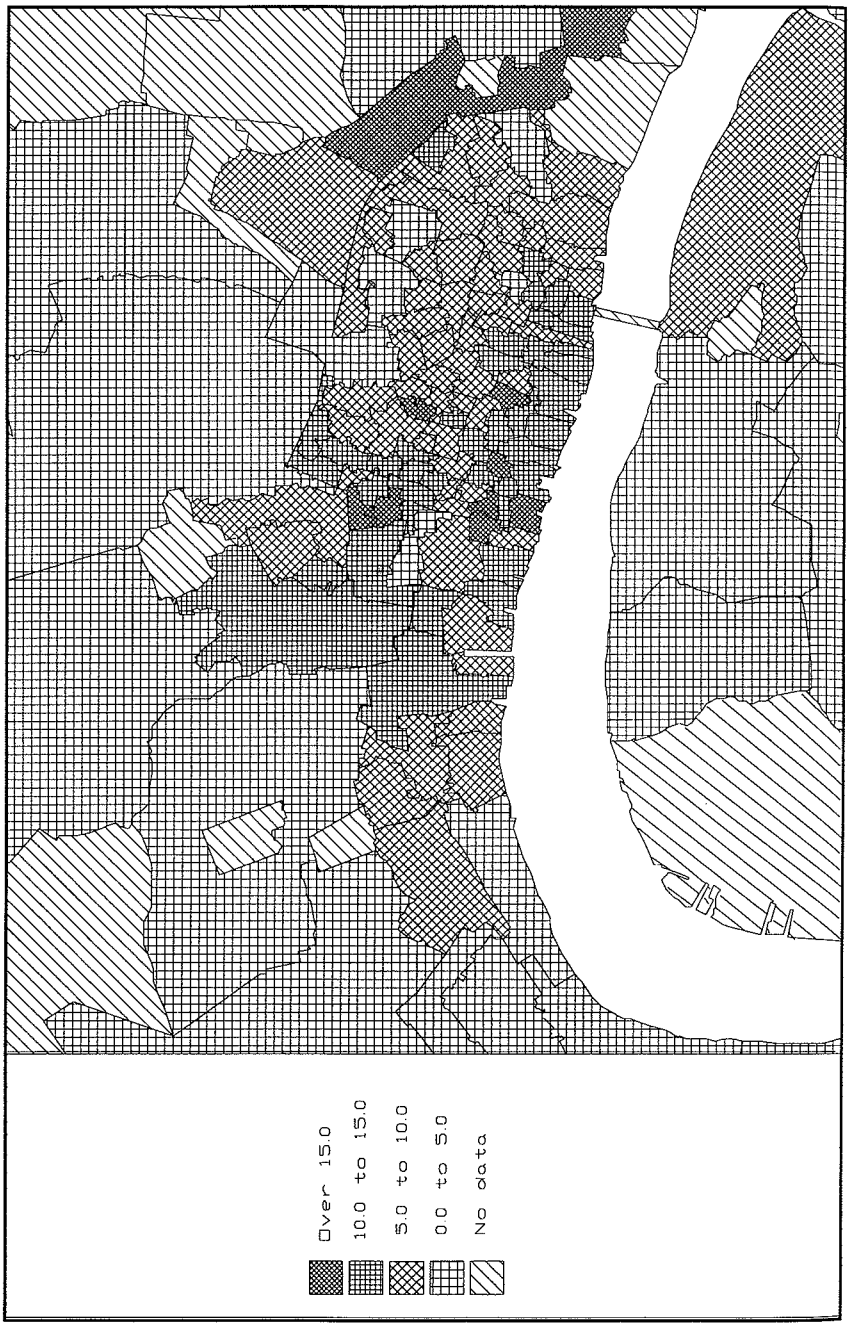

Over 6.0
5.0 to 6.0
3.0 to 5.0
Under 3.0
No data

FIG. 18. Crisis mortality ratios by parish, 1665


Over 15.0
10.0 to 15.0
5.0 to 10.0
0.0 to 5.0
No data

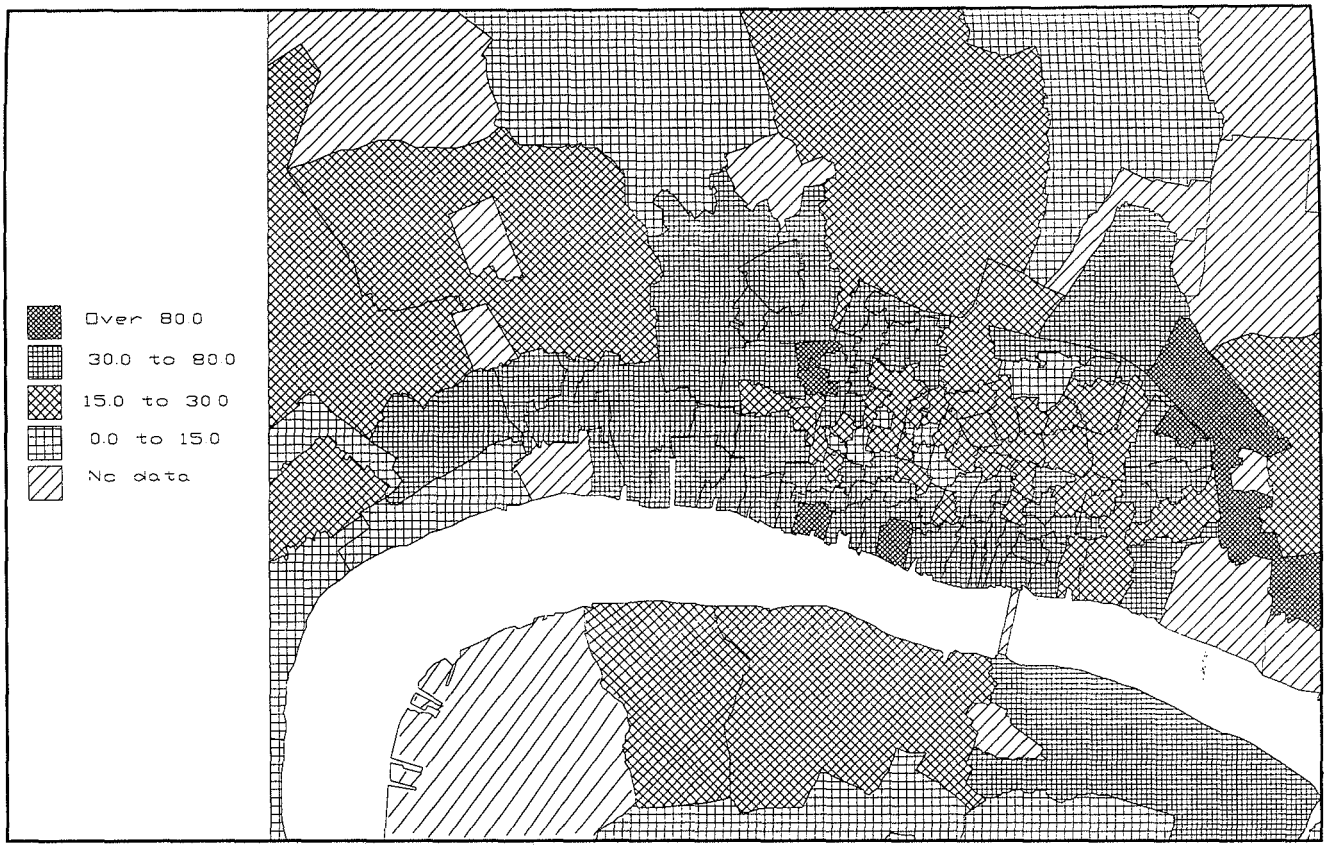
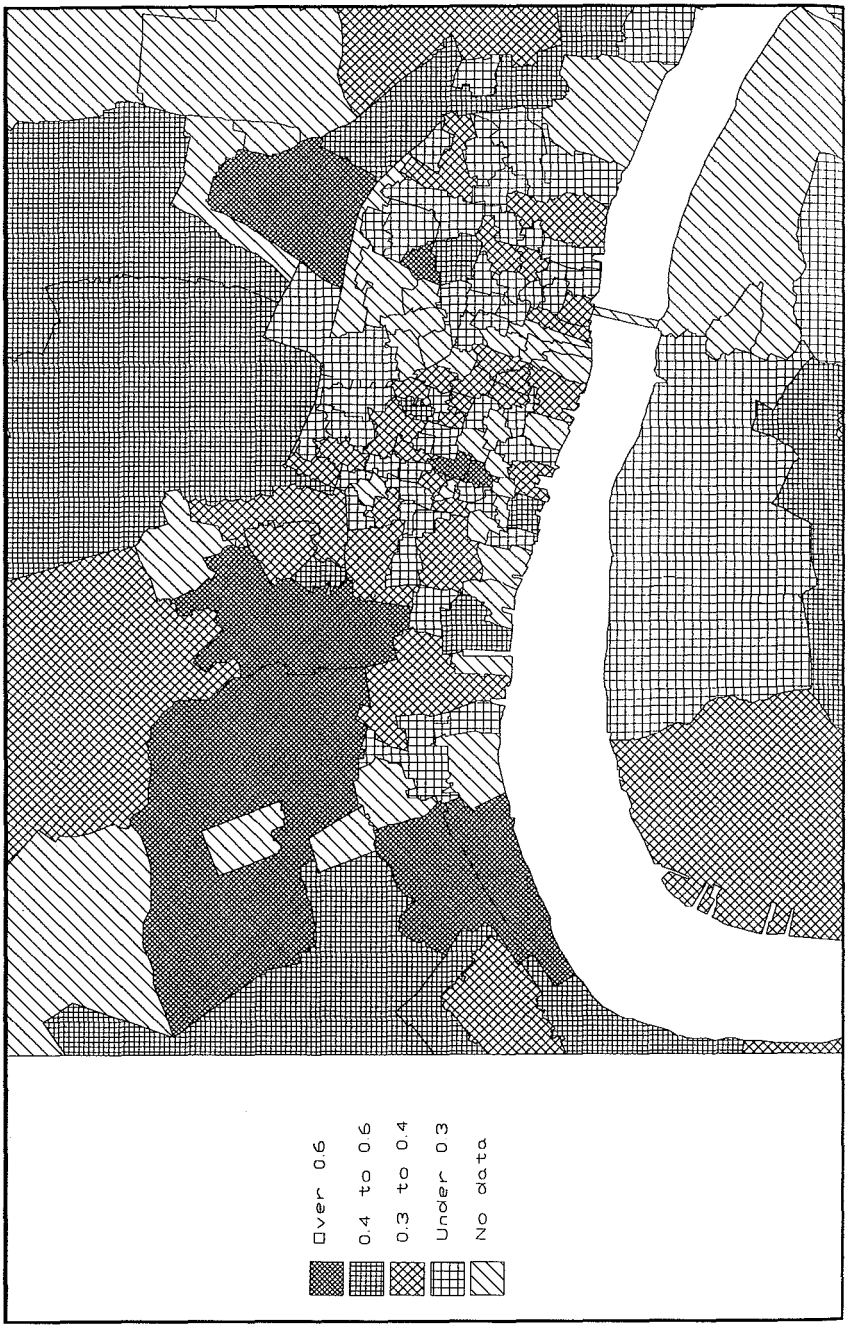


FIG. 20. Total deaths per acre by parish: the epidemic experience (1665)


Over 0.6
0.4 to 0.6
0.3 to 0.4
Under 0.3
No data

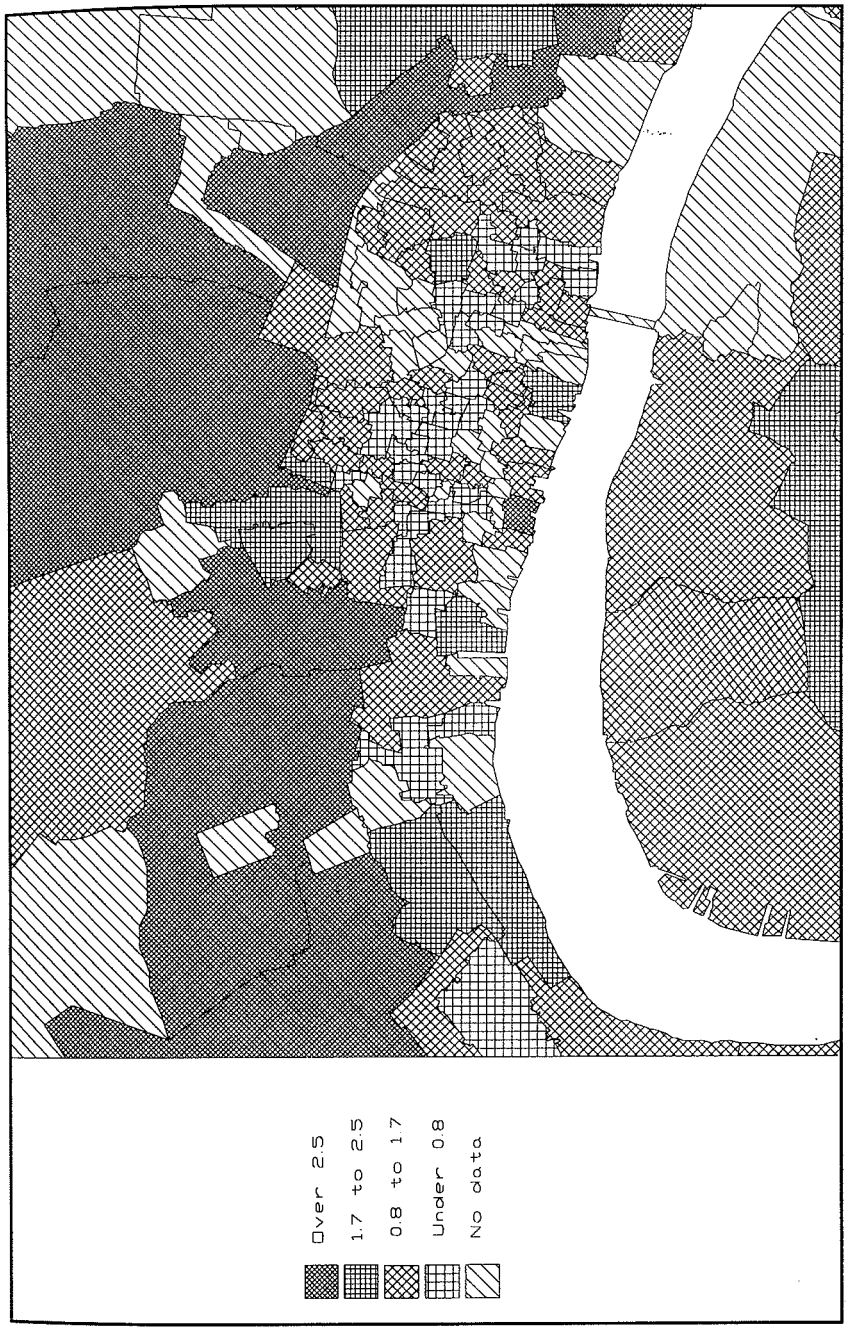


FIG. 22. Total deaths per household by parish: the epidemic experience (1665)

parishes each time. St Bride and St Sepulchre to the west, St Botolph Bishopsgate and St Botolph Aldgate to the east, along with the band of parishes inside the city walls and along the riverside (such as St Mary Somerset, Christ Church Newgate Street, All Hallows by the Tower, and St Anne Aldersgate) were all the focus of high rates of deaths per acre prior to and during 1665. Although such an exercise illuminates some part of the density of mortality, it will tend to undervalue the density of deaths in the larger, semi-rural locations like St Saviour, St James Clerkenwell or Stepney where, while there was a great deal of space, much of the residential building would have been focused upon certain topographical features (streets, churches, or industrial resources like the river bank) rather than being evenly distributed. Examining the distribution of deaths per household will not describe the density of housing in any particular area but will enable comparison between locations of very differing topography and size. As illustrated (Fig. 21) the pattern of deaths per household before 1665 was fairly uniform: the differences between city and outlying parishes were not really significant as the vast majority of communities fell between a rate of 0.2 and 0.5 annual deaths per household. The dataset for 1665 (Fig. 22) does not show such a uniform disposition or narrow band of rates. Most apparent is the unbroken line of outlying parishes curved from St Sepulchre in the west, St Giles Cripplegate and St Leonard Shoreditch to the north, and St Botolph Bishopsgate and St Botolph Aldgate stretching to the Thames in the east, which all had rates of between 3 and 4 deaths per household. Across the river Southwark, Bermondsey and Newington all endured rates above 2 per household. Although there were exceptions, as the map illustrates, the majority of city parishes had rates below one: indeed unsurprisingly those locations that were higher than this were those already identified as those intramural parishes prone to high CMRs along the riverside. This pattern is reinforced when the distribution of deaths per hearth in each specific area are considered. Such an exercise combines both a sense of the physical number and quality of the built environment in London since a parish with more substantial housing will produce a lower rate than one with a similar number of smaller houses.

Some of the figures found in Fig. 22 seem overly high: can it be that each household in St Botolph Aldgate or St Mary Somerset suffered such losses? It seems more probable that these high rates did not actually reflect such a density of mortality in independent households but was a consequence of the outward migration of those driven from the city in search of food, lodging and employment.

Although exercises that map variables of CMR, MHH, deaths per household and deaths per acre, for each individual parish suggest that the crisis was worst where the general character of the built environment, as reflected in household wealth and density, was the poorest they also argue that the ecology of disease, the built environment and geographical location was complex. In particular the variability, or instability, of mortality patterns within the city walls and the distinct experiences of the outlying parishes east and west of London suggests that the epidemiological pathways were not simply directed down the alleys and side-streets of poverty.

V

Mortality in the Metropolis by Gender, Age and Wealth

Having explored the parochial dimensions of epidemic mortality it is now worth examining in similarly general terms the categories of those who died. Before the eighteenth century the *Bills of Mortality* do not contain information on the age of those who died, but they do provide aggregate weekly totals of deaths by gender. While reducing 'several great confused Volumes [of the *Bills*] into a few perspicuous Tables',[1] suggests, with some qualifications, that poorer areas suffered during the epidemic disproportionately to wealthy ones, similar exercises illustrate significant patterns in the gender of those who died. Unfortunately, the *Bills* not present this information for each parish, so direct comparisons with social structure and location for the distinct areas is not possible, but the overall picture poses some intriguing questions which may contribute to an understanding of the dynamics of the epidemic.

The Overall Picture

The Hollingsworths, working from an analysis of burial records for St Botolph without Bishopsgate in 1603, suggest that males were more likely to endure higher rates of mortality in plague epidemics than females.[2] As Slack has shown the sex ratios of burials varied from epidemic to epidemic and from location to location.[3] Finlay's analysis of six metropolitan parishes also suggests that there was really no clear imbalance between the sexes in crisis conditions, although, typically, male rates were persistently higher than female.[4] As many historians have noted, reasons for the fluctuations in the incidence of mortality by gender are obscure, and indeed rendered more so by the lack of accurate information concerning the gender structure of the population at risk. Before discussing the specific bias of deaths according to gender, it is worth addressing the thorny issue of what proportion of adults and children died in the crisis compared with endemic patterns. One suggestion that will become manifest is that different parishes suffered quite different ratios of child to

[1] Graunt (1676), 320.

[2] See Hollingsworth and Hollingsworth (1971). It should be noted that the 'Further Remarks' (145–6) relating age incidence of mortality in St Botolph to that of St Margaret Westminster is defective since the transcript of the burial register for the latter was incomplete.

[3] See Slack (1985), 179–81 and footnote references at 382–3.

[4] See Finlay (1981), 130–1 especially Table 6.15.

adult mortality, a variable which may have been determined in some respects by the proportion of adult women in these locations. The comparative data of Table 8 suggests that compared with the endemic and epidemic patterns described by Wrigley and Schofield, Forbes and the Hollingsworths, the 1665 epidemic was quite distinct from previous outbreaks of the 'plague' at least in crude terms of the relative numbers of child and adult deaths.

TABLE 8

Population and burials by age categories, as percentages for endemic and epidemic years[1]

Age category	Endemic years				Epidemic (plague years)			
	Age structure of English population in[3]		Age structure of burials in:		Age structure of burials in:			
	1661	1666	St Bot. Aldgate 1583–95[4]	St. Bot Bpsgate 1600–3[5]	St Bot. Bpsgate 1603[5]	St Bot. Bpsgate 1625[5]	10 London parishes 1665[6]	8 Londo parishes 1665[7]
Children (0-14)[2]	29.3	29.1	51.2	49.5	51.3	53.6	35.1	45.8
Adults (15+)[2]	70.7	70.9	48.8	50.5	49.7	46.4	64.9	54.2
Total %	100	100	100	100	100	100	100	100

[1] It is worth stressing the provisional and exploratory nature of this data. The classifications of deaths into child or adult categories for 1665 has been, as is suggested in sources to Table 9, a rather imprecise exercise. Clearly there are potential problems of continuity of naming practices across parish boundaries: one parish clerk's 'son', might be another clerk's 'head of household'. So the variations of understanding age and family status insist that this data ought to be treated with great care. Even with this proviso it is possible to draw some very broad conclusions from the comparisons.

[2] For 1603 and 1625 'children' and 'adults' are as defined in Table 9.

[3] From Wrigley and Schofield (1981), Table A.3.1. (p. 528).

[4] From Forbes (1979), Fig. 2.

[5] From Hollingsworth and Hollingsworth (1971), Table 2.

[6] The ten sample parishes as listed in Table 1, above.

[7] The ten sample parishes in Table 1, excluding St Botolph Aldgate and St James Clerkenwell.

The age structure of non urban England (Table 8 cols. 1, 2) showed that broadly one in three of the population were infants or children. This ratio was not reflected in the age structure of mortality because, particularly in the seventeenth century, of an increase in the rates of infant mortality. This high rate of infant mortality was even more pronounced in urban areas. The studies of Forbes and the Hollingsworths indicate that within London children and adults died in approximately equal numbers (Table 8 cols. 3, 4), while in epidemic years the proportion of child deaths increased slightly so as to account for just over half the total (Table 8 cols. 5, 6). For the sample of London parishes in 1665 chosen for detailed study, however, it appears that the deaths of children were less numerous than those of adults and that this was especially so in large, outlying parishes such as St Botolph outside Aldgate and St James Clerkenwell (Table 8 cols. 7, 8).

TABLE 9

Burials by age and gender, as percentages for six London parishes, 1665

Parish	Age categories (all burials)			Adult gender categories		
	Adults[1]	Children[2]	Total	Females		Males
				Wife or widow	Others[3]	
Intramural:						
St Magnus	61	38	99	13	9	39
St Michael Queenhithe	52	48	100	18	9	25
Extramural:						
St Botolph Aldgate	86	15	101	6	35	45
St Dunstan in the West	63	37	100	5	27	32
St Saviour Southwark	40	60	100	14	3	22
Outlying:						
St James Clerkenwell	87	13	100	4	34	49

Source: Parish Database.

[1] All categories in burial registers excluding those relating to children

[2] Including 'son', 'daughter', 'chrisom', 'infant', 'youth', 'child' and others.

[3] Incuding females described as 'maidservant', 'servant', 'lodger', 'inmate'.

Table 9 presents a more distinct impression of the differential experience of the sample parishes in 1665. St Michael Queenhithe and St Magnus reveal a ratio of child to adult deaths close to what appears to have been the common metropolitan experience in non-epidemic years. This is to be contrasted with the larger extramural parishes like St Botolph, St James, and St Dunstan, where the surplus of adult over child deaths was much more pronounced. On the opposite bank of the river, in St Saviour, children accounted for well over half the burials. Constructing explanations for these differences is a difficult and ultimately speculative matter. Some clues are provided by the categorisation of adult deaths by gender and of the female deaths by status (Table 9 cols. 4–5). The latter exercise allows a fairly robust distinction to be made between those women who, as 'wife' or 'widow', will often have formed part of a substantial family or conjugal unit, and those who, as 'servant', 'lodger' or 'inmate', were probably single or attached to households in a non-kinship manner. In the two parishes where female deaths represented the smallest proportions of the total, children also represented the smallest proportion, suggesting that to some degree the mortality figures reflect the composition of the population at risk, and that in those areas both females and children tended to be relatively numerous. It further appears that in those parishes where the adult females who died tended to be single women rather than wives or widows the proportion of deaths represented by children also tended to be low. This probably also reflects the composition of the population at risk. Thus the populations of the parishes of St James Clerkenwell and St Botolph outside Aldgate

on this evidence appear to have been characterised by high proportions of males and single females, and a low proportion of children, while the opposite was the case in the parishes of St Michael Queenhithe, St Saviour and St Magnus. St Dunstan in the West may represent a third pattern of composition, characterised by moderately high proportions of both children and single females. In each of these cases, of course, there may have been some feature of the parish which caused particular elements of its population to be especially at risk during the epidemic. The most significant of these factors probably concerned the degree to which households were able to maintain themselves through the crisis and whether they were able to flee from London.

As will be discussed below, the economic viability of the household was a crucial factor in anchoring populations to London during the crisis. Clearly the differing socio-economic infrastructures of the parishes would have meant both that composition of the populations at risk differed and that the function of their households in the wider metropolitan economy would have been disrupted to different degrees, thus determining (in a loose sense) their ability to leave the city. So, for example, families in poor riverside areas like St Michael Queenhithe, where much economic activity focused on the quayside and on river transport — both heavily disrupted during the plague — would have been faced with a very different set of options from those open to families in larger, more mixed parishes like St Dunstan in the West, where the economic viability of most households during the crisis might have been less at risk. Even from this cursory discussion it is apparent that the experience of adult females during 1665 should be conceived as arising from an interaction of economic and epidemiological processes.

John Graunt addressed the wider issue of the gender balance of the metropolitan population and its experience of epidemic mortality in Chapter VIII of the *Natural and Political Observations* 'of the difference between the numbers of males and females'. His starting point was that 'the masculine sex bears the greatest part' because 'London is the great stage and shop of business'. Although more men were born, more also died. Graunt's estimate was that there were (both living and dying) fourteen men for every thirteen women.[5] Aggregated totals from the *Bills of Mortality* for the years between 1655 and 1664 correspond precisely to that estimate (Table 10), and it seems, according to Graunt's figures, that this broad ratio holds for the entire period between 1629 and 1664.[6] During the plague year, however, this pattern altered radically. Taking the whole year into account, the Crisis Mortality Ratio for deaths attributed to females was significantly greater than that for males (Table 10). For every 100 female victims there were about 99 male deaths in 1665, while in normal years the comparable figures were 90 and 100. Compared with the data discussed by the Hollingsworths, Finlay and Slack,

[5] Graunt (1676) 374–8.
[6] See Graunt (1676), 411.

TABLE 10

Male and female burials as percentages of the total: endemic and epidemic patterns

	1655–64 (endemic)	1665 (epidemic)	CMR
Male	52.3	49.9	5.9
Female	47.7	50.1	6.6

Source: *Bills of Mortality*

where there were very pronounced biases in the gender of burial, this differential does not seem immediately significant. The significance is to be found in the convergence of the mortality experience between the sexes. This convergence might be explained by two possibilities. The first explanation might suggest that females were inherently more susceptible to the pathogenic quality of the disease. A second view could propose that the gender profile of the population at risk in the urban environment shifted as a result of flight from the city during the epidemic.

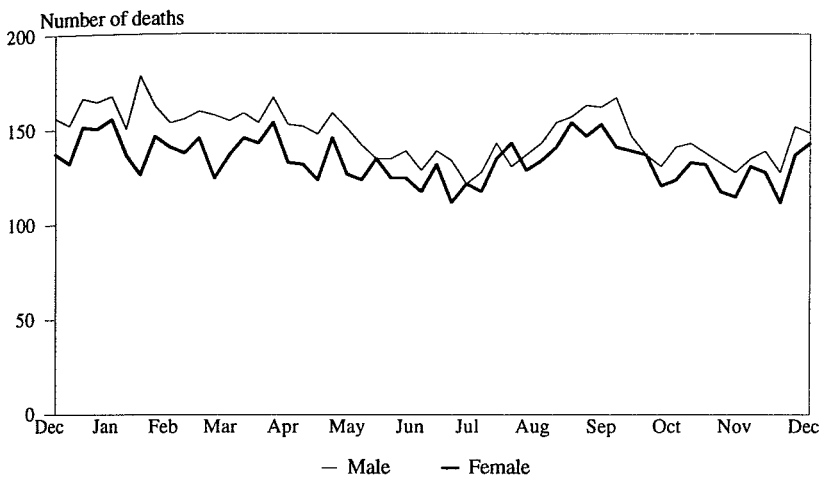


FIG. 23. Mean weekly totals of male and female deaths, 1655–64.

Source: Bills of Mortality.

This alteration of mortality levels in terms of gender is even more apparent when considered over the course of the year. As with the different seasonalities of death displayed in the various parishes, it appears that male and female experienced a different crisis. In normal years female deaths followed the same general seasonal pattern as those for males, with coincident peaks in winter and spring (Fig. 23). Female mortality exceeds male only in mid July, presumably because many men left London at that time for hay-making and the harvest. During the epidemic year, however, the Crisis Mortality Ratios for men and women show a different pattern (Fig. 24).

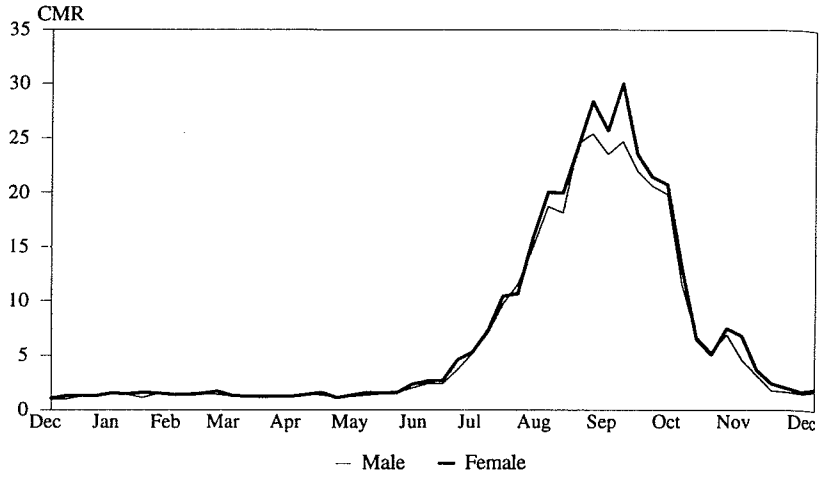


FIG. 24. Crisis mortality ratios for male and female deaths by week, 1665.
Source: Bills of Mortality.

Up to August, compared with the background experience, women suffered more tha men: so even before late June and early July, when the epidemic was diffused throughou the city and its environs, the difference between the mortality ratios for men and wome was narrowing. In late July, August and September the ratio for female deaths becam markedly worse. In late summer London experienced a crisis with successive peak when total mortality was respectively 21 and 24 times worse than in normal years. A the first peak the crisis ratios were 25.4 for males and 28.3 for females, while at th second they were 24.7 and 30.0, respectively.[7] The trend in the differential betwee male and female crisis mortality ratios illustrates the visibility of female mortality durin the epidemic even more dramatically (Fig. 25). At the high point of the crisis betwee two and five times more women were dying than would normally expected.

This is not to argue that female mortality was substantially worse in real terms tha male, for in the whole year only 168 more females than males died, but that the trend of a surplus of male over female deaths for the previous decade was altered to a more equal incidence of death. Indeed this generalisation can be given more support in the light of the evidence of Fig. 26 which is designed to express the cumulative trend of deaths in non-epidemic and epidemic years calculated by subtracting female deaths from male for each week. Clearly, reflecting the persistent surplus of male over female deaths, the endemic regime shows a pattern of regular surpluses of male over female deaths throughout the year. If the endemic ratio of male to female deaths had been maintained during the epidemic a similar sort of series would have been expected. The data for 1665 shows an almost level, or non-cumulative pattern, clearly indicating that male and female deaths occurred with almost consistent seasonal parity.

[7] See Appendix III 'Weekly Crisis Mortality Ratios for the Metropolis, 1665' for the data.

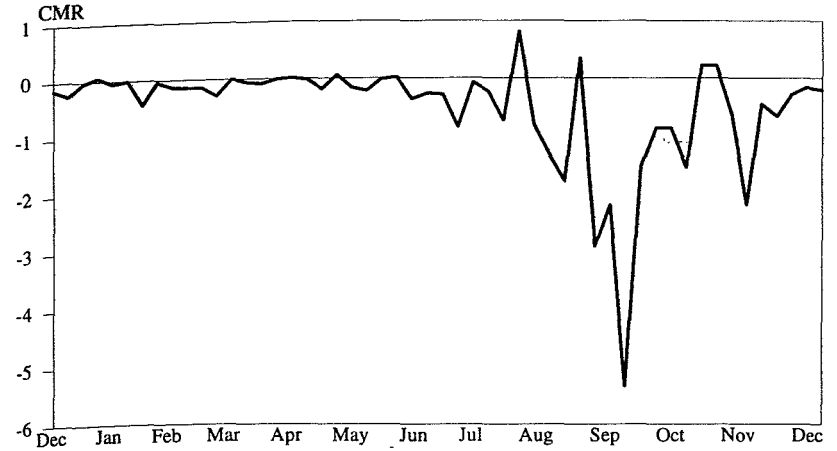


FIG. 25. Differential between male and female CMRs, 1665.

Source: Bills of Mortality, 1655–65. The figures were calculated by subtracting female from male CMRs for each week. A negative value thus represents a high seasonal crisis mortality ratio for female deaths.

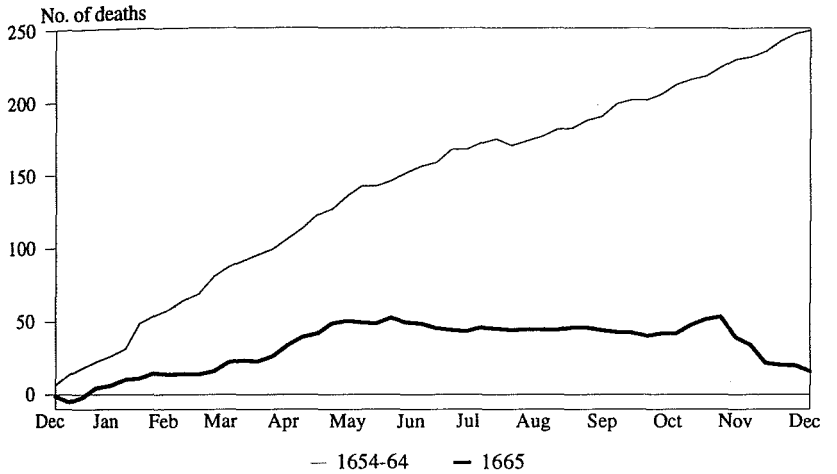


FIG. 26. Cumulative surplus of male over female deaths by week, 1655–64 and 1665.

Source: Bills of Mortality, 1655–65. Calculated by subtracting mean female from mean male deaths (1655–64), and by subtracting weekly totals of female from male deaths (for 1665). The cumulative products for both calculations is displayed.

The parish studies reinforce this picture of the distinctive female pattern of mortality during 1665. Concentrating on the experience of the three larger parishes (St Saviour, St Botolph Aldgate and St Dunstan) it seems clear that the general point derived from the *Bills*—that male and female endured different seasonal moments of epidemic

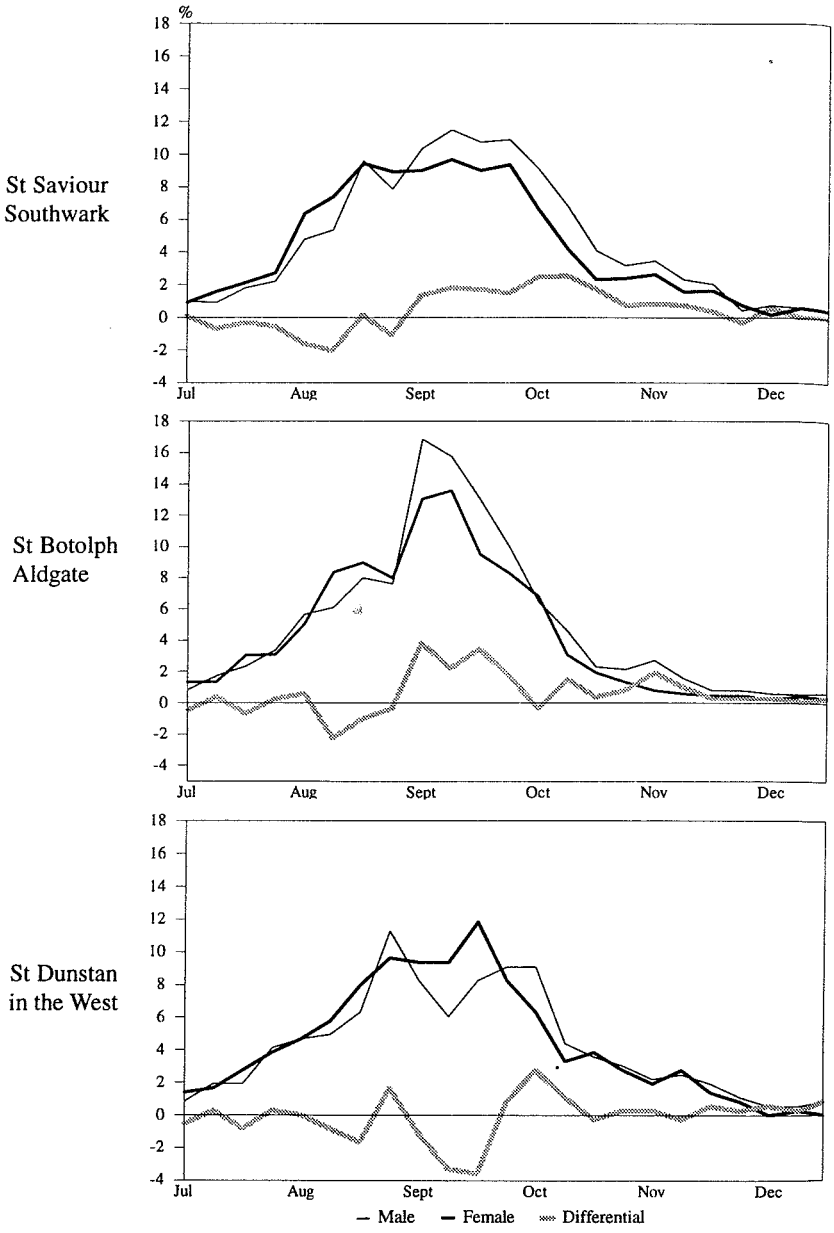


FIG. 27. Seasonality of male and female deaths, and of the differential between them, in three parishes, 1665.

Source: Parish Database. The weekly total of deaths is expressed as a percentage of the annual total for the category. The differential was calculated by subtracting the percentage of female deaths from male deaths for each week.

crisis — was sustained. Although invariably more males than females died *in toto* in these parishes over the whole year, there are quite distinct gender biased patterns of mortality. One theme that runs through the data was that in all three parishes the incidence of female deaths increased earlier in the year compared with male mortality. A simple means of displaying the differentials of these patterns can be achieved by a comparison of the number of male and female deaths per week in the crisis period (see Fig. 27). A very clear indication of the differences between male and female experience can be illustrated by subtracting the percentage of female deaths from the male. As Fig. 27 shows, while there may have been quite distinct variations in mortality between the different parishes which may reflect the differences in environment, there are some evident coincidences in the relationship between male and female mortality. The most obvious common experience is the seasonal priority of female mortality, which is replicated in each of these areas. Beyond this point there are manifest variations in mortality between the parishes. In the large extramural parishes of St Botolph and St Saviour, for example, male mortality rates in the late summer and early autumn were higher than elsewhere. In these parishes, despite the earlier incidence of female mortality, the seasonal patterns of male and female deaths broadly mirror each other. This sharply contrasts with the evidence for St Dunstan, where the seasonal pattern for males and females, and presumably their underlying dynamics, appear to be quite distinct and out of kilter. Male mortality in the parish follows the double peak pattern evident in the general data derived from the *Bills*, although the time span between the two peaks is extended over a period of four to five, rather than one to two weeks. Female mortality, however, had only one peak, which coincides almost exactly, in mid September, with the trough of male deaths.

These differences suggest that the contours and dynamics of the epidemiological structures in the outbreak of 1665 were spatially, socially and demographically complex. While it is a relatively straightforward business to tease out patterns from the data, it is much more difficult to give historical explanations for them. Thus, one explanation for the initial incidence of female mortality might be that the epidemic simply contributed to the traditional seasonal surplus of female deaths in early summer and that this pattern did not persist because a disproportionate percentage of females left the city as the crisis manifested itself. Evidence from the parish of St Dunstan in the West, where the crisis weeks saw a peak of female rather than male mortality, might seem to contradict this suggestion. This relatively prosperous locality is one where a high out-migration might be expected, with a consequent fall in the proportion of females in the resident population and a concomitant decline in their mortality rates. This model clearly does not obtain. An alternative possibility for the parish is that there was an imbalance in the resident population prompted by an excess of male flight from the epidemic.[8]

[8] See below for a more detailed discussion of female mortality in St Dunstan's parish: a high percentage of the female deaths can be attributed to women servants presumably left behind to protect the household.

It seems then that some general points can be made from an initial examinatio of mortality in London from the evidence of the *Bills of Mortality* in 1665. Firs that the epidemic thrived in areas of poverty, especially in the suburbs. The connectio between the suburbs and the epidemic was not transparent given the distinc seasonalities to the different geographical locations. Furthermore, the simpl connection between suburban poverty and crisis mortality was muddled by the evidenc from both the *Bills* and the selected registers concerning the imbalanced distributio of deaths according to gender. It may be that the spatial differences and imbalance of mortality that initially point to a relationship between poverty and disease perhap were determined at a more fundamental level by factors related to the sexua composition of the population at risk. The epidemiological regime then may hav been driven not just by vectors associated with a crisis of poverty but also by thos associated with, to borrow Michael Robert's phrase, a 'crisis of gender'.[9] The res of this study will attempt to explore whether there are any correlations between thes two issues, and if there are, to suggest a process for understanding such a connectio

Parish Studies

Seasonal patterns

The parish studies add precision to the view of the relations between poverty, gende and mortality provided by the aggregate data in the *Bills of Mortality*. It is possibl with the material in the relational database to deepen an understanding of the socia dimensions of mortality by examining the distribution of deaths according to the range of hearths per household within each parish: that is, to flesh out the simple relationship between CMR and MHH. Although, a detailed discussion of the progress of the epidemic in each and every parish is not possible it is important briefly to discuss the general epidemiological variants related to the specific topography of the distinct localities. Much of this assessment will focus upon the experiences of the four large parishes (St Dunstan in the West, St Saviour Southwark, St Botolph outside Aldgate and St James Clerkenwell) rather than the smaller intramural and riverside locations. There are two reasons for this. Firstly, the numbers of deaths and households in the smaller parishes will not sustain profound statistical investigation, and secondly, these smaller parishes broadly conform to the pattern of the intramural area as a whole, notably in their low crisis mortality ratios. On the other hand, the larger wealthy, suburban and semi-rural locations provide both statistically significant data and a variety of epidemiological regimes.

Using a combination of the series of the *Bills of Mortality* and the extant burial registers, it is possible to calculate the seasonal patterns of endemic and epidemic deaths. The four locations represent a range of social and material environments: from the wealthy western suburb, through the poor eastern suburb, to the Surrey

[9] See Roberts (1990).

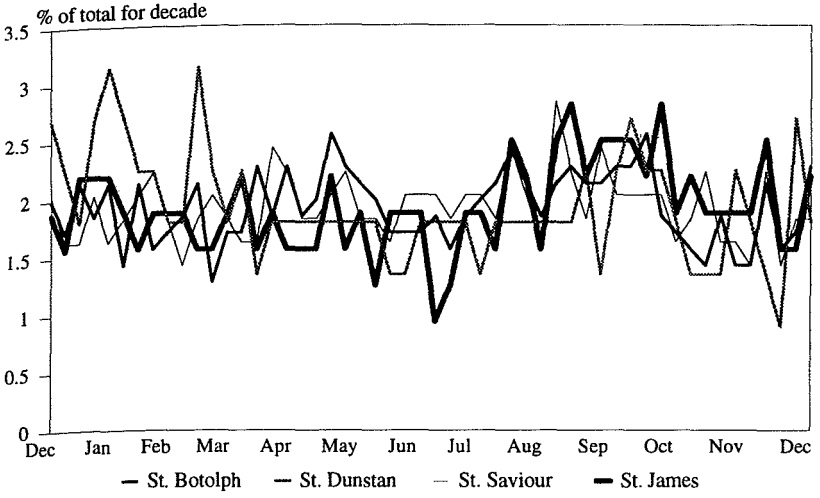


FIG. 28. Endemic mortality in four parishes by weeks, 1655–64.

Source: Bills of Mortality, 1655–64. Mean deaths per week were calculated and then each week was displayed as a percentage of total mean deaths for the year.

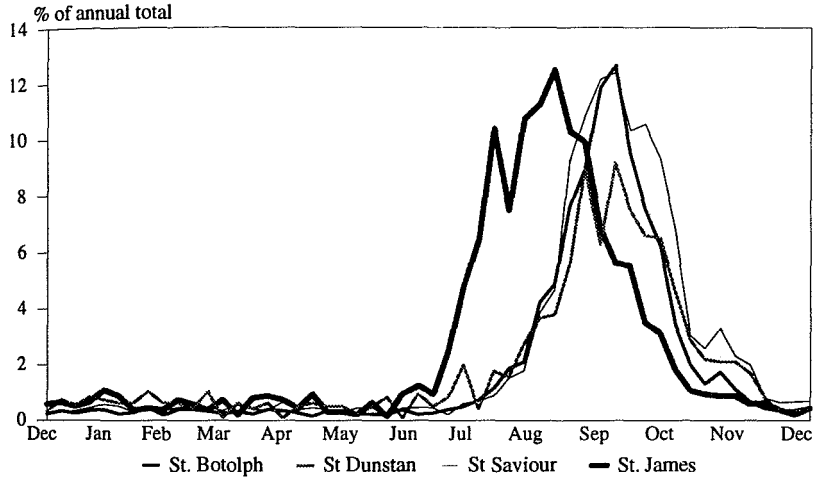


FIG. 29. Epidemic mortality in four parishes by weeks, 1665.

Source: Parish Database. Weekly totals for all deaths are expressed as percentages of the yearly total for each parish.

parish of St Saviour, which while poor overall contained both a dense riverside settlement and a more open semi-rural area. Nevertheless, the evidence for the four parishes suggests that in normal years the seasonal distribution of deaths in each of them was broadly similar, despite substantial differences in the totals. In

other words, the seasonal patterns of death derived from the mortality database fo the decade before 1665 was broadly similar in these sample parishes, almost regardles of the geographical location, the size and social and economic status of the population contained within their boundaries (see Fig. 28). Thus, minor winter and autum peaks enclosed a summer plateau, and at the critical periods the timing of increase and decreases in mortality were coincident. Among the minor variations, it appear that in St Botolph parish winter mortality was lower and the late spring peak highe than elsewhere.

The epidemic crisis intruded upon the commonplace pattern of death in quit distinct ways (see Fig. 29). Importantly, although there are some general patterns each parish reacted in a non-uniform way. St James Clerkenwell had the most distinctive pattern of plague deaths from the seasonality that held in the previous decade, enduring marked increases in mortality six to eight weeks before the other three parishes, tha is in mid June rather than late July. The patterns which most resembled each othe were those for the large and poor parishes of St Botolph and St Saviour, although in the latter case the mortality crisis was more extended than in the former. In S Dunstan parish the 'take off point' was similar, but plague deaths represented a smaller proportion of the total than in the three poorer parishes. Only in this parish was the curious double peak manifest. Examining the same data in terms of Crisis Mortality Ratios for the year 1665 reveals further distinctions. Comparing the four parishes with the general spatial pattern of the different metropolitan sectors (see Fig. 30, and compare with Fig. 16 above) all, with the exception of St Dunstan parish, sustained CMRs substantially higher than average: in the parishes of St Saviour and St Botolph the levels of mortality were at their peak forty times greater than usual, by comparison with a mean value of no more than thirty for all extramural parishes. The St Saviour ratios betray some striking characteristics, in particular the double peak in late August and early September, and a pronounced crest in late October when perhaps fifteen times as many deaths occurred. St Dunstan displays a shallow and regular pattern compared with the very irregular and steepled profile for St James. Quite clearly, some of the complexities of interaction between location and disease teased out of the *Bills of Mortality* can be seen to follow through into the data for the local studies. Each of the variations in seasonal rates for CMR and mortality rates reflects a different, and presumably complex network of vectors between the 'quality' of the population at risk and the density and virulence of pathogens.[10]

Mortality and household status as indicated by hearth tax assessment

The different social, economic and topographical qualities of these parishes can be explored by comparing the incidence of deaths with the social and economic

[10] Here 'quality' is meant to imply not only the gender and age structure of the population but also qualities such as their nutritional status, their genetic immunity to disease: for a general discussion see Landers (1993).

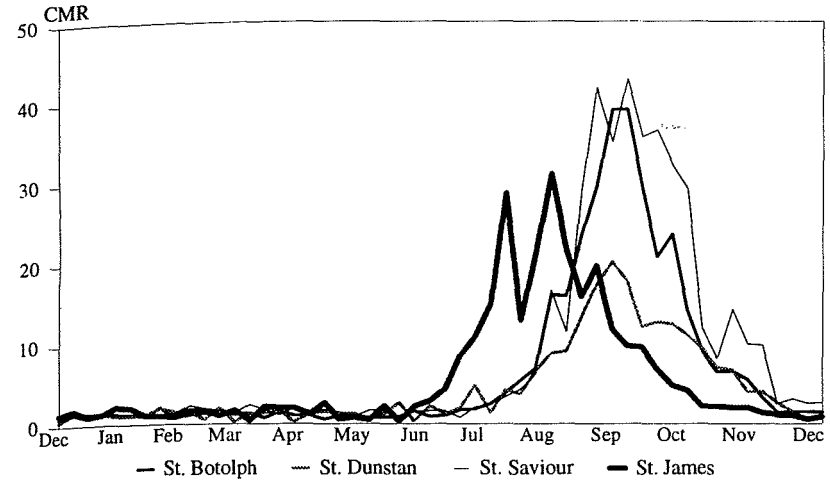


Fig. 30. Seasonal crisis mortality ratios for four parishes, 1665.

Source: Bills of Mortality, 1655–65. CMRs calculated by dividing weekly totals of all deaths for 1665 by the mean weekly totals derived from the 1655–64 series.

status of the deceased (as represented by the numbers of hearths per household) in the period immediately before the epidemic. The parish database enabled a detailed examination of the different patterns of mortality. One expectation might be that households of similar size and, presumably, wealth would share a environmental and epidemiological experiences which were broadly similar, while at the same time there would be clear variations between the relative conditions of households in different parishes. If wealth, or environment, played a constant role in the distribution of infection, then, other things being equal, it might be expected that the incidence of death would be closely related to the constituents of the social structure as described by the tax assessments. The difference or coincidence between the estimates of expected and observed mortality provide a simple way of identifying the possible presence of other causal factors. Obviously, given that the computer assisted linkage was variable in its success rate, these figures should be handled with some care: they do not describe a complete picture of all deaths in a specific location but only those that fell within the surveillance of the records of the local authorities. Nevertheless, some general points can be made. It is apparent that those deaths which have been linked to households recorded in the hearth tax assessments show a distribution in relation to the assessments for those households (constituting the 'observed mortality') which is broadly similar to the distribution of all the households assessed (Table 11). This also indicates that the deaths linked to households have some value as a sample.

It is far from clear, however, that those living in the poorer households suffered more than those in the richer ones, and there were some striking

TABLE 11

Burials in relation to the status of households in eight parishes, 1665

Parish		Status of household as indicated by number of hearths in 1662–6: a. Percentage of all deaths linked to households **b. Percentage of total of houses at this size**							% of deaths linked to households of known status
		1	2	3	4	5	6	Over 6	
Intramural: St Magnus	a.	20	14	26	10	4	8	18	59
	b.	**9**	**11**	**16**	**17**	**18**	**13**	**16**	
St Mary le Bow	a.	0	10	10	35	0	20	25	58
	b.	**6**	**7**	**10**	**16**	**13**	**19**	**29**	
St Michael Queenhithe	a.	35	24	16	5	5	3	11	20
	b.	**24**	**13**	**20**	**7**	**15**	**10**	**11**	
St Stephen Walbrook	a.	0	0	12	28	4	4	52	91
	b.	**0**	**6**	**9**	**19**	**15**	**12**	**40**	
Subtotal	a.	17	13	21	15	4	7	23	57
	b.	**12**	**10**	**15**	**14**	**15**	**13**	**21**	
Extramural: St Botolph Aldgate	a.	31	25	22	8	5	5	4	41
	b.	**27**	**33**	**24**	**5**	**4**	**4**	**3**	
St Dunstan in the West	a.	16	12	13	20	9	5	26	49
	b.	**11**	**8**	**7**	**14**	**12**	**11**	**38**	
St Saviour Southwark	a.	14	32	28	1	7	4	2	42
	b.	**30**	**34**	**20**	**8**	**4**	**3**	**2**	
Subtotal	a.	23	26	23	11	6	5	6	44
	b.	**26**	**28**	**19**	**8**	**5**	**5**	**9**	
Outlying: St James Clerkenwell	a.	32	21	25	10	3	3	8	44
	b.	**40**	**19**	**17**	**7**	**4**	**3**	**10**	
Total	a.	24	25	24	11	5	5	6	48
	b.	**27**	**25**	**19**	**9**	**5**	**5**	**10**	

Source: Parish Database.

Note: Total and subtotals are means of real figures, not means of the percentages for each parish.

variations between parishes (Table 11). In the parishes of St Saviour and St James Clerkenwell, for example, there were substantial shortfalls between the observed and the expected distributions at households with only one hearth. In the former, 30 per cent of the householders were assessed at no more than one hearth, but only about 14 per cent of those who died and who can be linked to households in the tax assessment lived in single-hearth households, while for the latter parish the corresponding values are 40 per cent and 31 per cent. This mismatch probably reflects the large numbers of inmates or lodgers who are likely to have been resident in these parishes: for such people the chances of linking the record of

their death to their household of residence will be especially low. Both parishes are also notable for the high proportion of deaths associated with three-hearth households by comparison with the expected distribution. This may reflect a distinctive pattern of residence associated with these large, and in part semi-rural, suburban areas: houses with three hearths may commonly have been in multiple occupation. In the other parishes, however, slightly more people died in single hearth households than would be expected from the distribution of hearths. The two contrasting parishes of St Botolph and St Dunstan betray both similarities and differences. In both parishes over half the linked deaths occur in houses with four or fewer hearths: in St Dunstan 60 per cent of deaths occurred in only 40 per cent of households, but in St Botolph the observed and expected values were approximately equal.[11] However, if we take a broader view of these differences by looking at the experiences of households with above and below the mean number of hearths, it seems that the individual variations point to a general conclusion that households below the average assessment fared perhaps 5 per cent worse than households above the average. Moreover, as the houses above the mean increase in size so their 'observed mortality' seems progressively to fall short of their 'expected mortality'. Significantly, these general observations seem to cover the experiences at the extremes of wealth and poverty. In very poor parishes such as St Botolph or St Saviour the expected and observed incidence of death tended to match one another uniformly across the range of hearth tax assessments, but in smaller and more wealthy areas, such as St Mary le Bow and St Magnus, observed mortality in the poorer households greatly exceeded the expected levels, while in the wealthier households the reverse tended to be the case. This perhaps reflects a genuine difference in the degree to which households were afflicted by plague. Thus in the large suburban parishes deaths have been identified in between 38 and 55 per cent of the taxed households, while for the more affluent areas deaths have been identified for only between 20 and 26 per cent.

There thus appears to have been a broad correlation between the incidence of mortality in 1665 and the status of households as indicated by hearth tax assessments. It may be that the residents of the more affluent central areas were, for environmental or other reasons, genuinely less susceptible to the epidemic than those of poorer areas. Other factors, however, could determine the patterns revealed in Table 11. Thus the more affluent may have fled the city to a far greater degree than the inhabitants of poorer neighbourhoods. Moreover, it is impossible to determine how many people lived within households of a given number of hearths in different areas of the city: in the poorer outlying parishes the mean number of inhabitants for houses of below average size may have been greater than in central

[11] Eighty-seven per cent of the mortality occurred in 1–4 hearth households which accounted for 89 per cent of the total housing stock..

TABLE 12
Observed and expected deaths in ten parishes, 1665

Parish	No. of households		No. of deaths		DHH[1]		% of
	Total	Linked[2]	Total	Linked[3]	Expected	Observed	houses linked[2]
Intramural:							
All Hallows Honey Lane	37	5	10	6	0.3	1.2	13.5
St Magnus	122	25	85	50	0.7	2.0	20.5
St Mary le Bow	103	28	60	35	0.6	1.3	27.0
St Mary Colechurch	54	6	11	6	0.2	1.0	11.0
St Michael Queenhithe	157	24	185	37	1.2	1.5	15.3
St Stephen Walbrook	69	22	33	30	0.5	1.4	32.0
Extramural:							
St Botolph Aldgate	1799	1036	4555	1860	2.5	1.8	58.0
St Dunstan in the West	972	257	939	460	1.0	1.8	26.0
St Saviour Southwark	2587	776	3215	1341	1.2	1.7	30.0
Outlying:							
St Saviour Southwark	1172	391	1296	567	1.1	1.5	33.0

Source: Parish Database.

[1] No. of deaths per household

[2] i.e number of households in the Hearth Tax for which deaths have been identified.

[3] i.e. number of deaths attributed to households.

areas, increasing the size of the population at risk. A more effective way of comparing the susceptibility of the different groups than the incidence of the total number of deaths might be to measure the incidence of households which were infected. There is no information on infection and morbidity rates in 1665, but some measure of the extent of infection can be obtained by counting those households where any death occurred in that year and by calculating the mean numbers of deaths in those households (see Table 12). The smaller intramural and riverside parishes sustained a low percentage of total households infected (ranging from a low of 11 per cent for St Mary Colechurch to 32 per cent for St Stephen Walbrook) combined with a low number of deaths per household.[12] This pattern of low density of infection both within the parish and the household was not reflected in the larger locations. When considering the comparative experiences of the larger and smaller parishes it should be noted that the differentials between expected and observed DHH in the smaller central parishes was much higher than the figures for the larger and extramural parishes. This might suggest that the relatively low levels of parish wide mortality was actually concentrated in a small number of infected households in the central wealthier parishes, compared with a much more diffuse pattern of mortality in the larger and extramural parishes.

[12] The average DHH for the four Cheapside parishes was 1.17, while the larger riverside parishes of St Magnus and St Michael Queenhithe combined was 1.63.

TABLE 13

Household infection rates and burials per household in relation to the status of households in four parishes, 1665

Parish		Status of household as indicated by number of hearths in 1666: a. Percentage of houses of that size from which one or more burials are recorded (infection rate) **b. Burials per house**						
		1	2	3	4	5	6	Over 6
Extramural:								
St Botolph Aldgate	a.	73	48	66	53	83	77	64
	b.	**1.9**	**1.9**	**1.7**	**1.7**	**1.5**	**1.8**	**2.1**
St Dunstan in the West	a.	32	47	34	35	30	18	17
	b.	**1.5**	**1.6**	**1.6**	**1.7**	**1.4**	**1.2**	**2.0**
St Saviour Southwark	a.	21	34	48	61	76	62	46
	b.	**1.5**	**1.8**	**1.9**	**1.8**	**1.6**	**1.5**	**1.4**
Outlying:								
St James Clerkenwell	a.	28	43	47	44	41	52	32
	b.	**1.5**	**1.3**	**1.7**	**1.6**	**1.1**	**1.2**	**1.2**

Source: Parish Database.

As the data in Table 12 illustrates there was some considerable variation within and between these larger locations. At a general level there is a distinction between St Dunstan, where one house in four sustained infection compared with one in three in St Saviour and St James, and the extreme case of St Botolph, where two out of every three households endured plague mortality. Whereas the smaller wealthy parishes suffered DHHs between 1 and 1.4 these larger locations had much higher ratios; the experience of the riverside parishes (St Michael Queenhithe 1.5, St Saviour 1.8, and St Magnus 2.0) was the worst. Although there was an evident difference between the epidemic mortality in the wealthy parish of St Dunstan and the poor extramural St Botolph Aldgate (compare the expected DHH of 1.0 for St Dunstan, with 2.5 for St Botolph) this was not reflected in any differential in the observed number of deaths per household. Indeed, if the variations of percentages of households infected and DHHs according to the numbers of hearth per household are considered (see Table 13) the differentials are considerable. So in St Saviour, for example, the observed household incidence of infection varied between a 20 per cent 'hit' rate in single hearth households to a high point of 75 per cent in those with five hearths. St Dunstan, on the other hand, shows evidence of the expected patterns of a higher rate of infection in the poorer households compared with those with more wealth. St Botolph, the poorest parish of those examined here, does not replicate this expected model, and has a notable, but non-linear, fluctuation between the percentage of those households infected and their wealth.

This evidence tends to suggest that the vectors of the disease were not focused upon the wealth or poverty of the household in isolation from the environmental context of that family or group of residences. The low rates of deaths per household combined with the high variation in percentages of households infected might suggest that the disease had stronger links with locational or spatial qualities rather than social and economic categories. The exercise of relating infection rates and the numbers of deaths per house to the size of the house (Table 13) suggests that living in a wealthy household in the poor outlying parishes of St James Clerkenwell or St Botolph Aldgate was no guarantee of immunity from mortality. Similarly living in the poorer quality housing did not necessarily imply an higher rate of fatal infection. In one sense the low numbers of deaths per household suggest that the density of population within the household had very little relationship to the spread of the disease. Indeed, as discussed below, there is evidence to suggest that the most common experience of mortality was singular rather than multiple.

One of the assumptions of this investigation, that households with similar social and economic status shared a common response to the epidemic, can be further explored when the seasonality of mortality, according to the number of hearths per household, is plotted for each of the larger parishes (see Appendix IV). In three out of the four cases it is possible to isolate two components. Excluding the case of St Dunstan, it appears that households with between one and three hearths sustained a different series of peaks than those with four and above. In St Botolph, St James and St Saviour, although there are minor variations in the precise seasonality and levels of mortality, there is a perceptible contrast between the sharp jagged profile of poorer households and the much flatter experience of the wealthier families. This conspicuous duality is not found in the case of St Dunstan. Whereas it would be accurate to suggest that the poorer households suffered worst in the crisis weeks in the other suburban locations, in St Dunstan those households with four hearths and seven and over were the worst hit. With the exception of the sharp peak for households with four hearths in late August there is no evident logic to the seasonalities of richer or poorer households. In fact the most lucid point of the St Dunstan's evidence might be that households with different numbers of hearths endured discrete seasonal experiences during 1665.

Alternative Interpretations of Wealth and Poverty in Relation to Mortality

There appears to have been a broad association between socio-economic status and the incidence of the epidemic. This is apparent both in the aggregate data drawn from the *Bills of Mortality* and in the more detailed investigation of mortality in relation to hearth tax assessments, but the correlation seems to be mediated by components related to geographical location, the quality of the physical environment (built and otherwise) and the time of the year, as well as by the presumed wealth or status of the household as indicated by the number of its

hearths. It is not possible to predict the ideal concatenation of these factors: being poor in an extramural parish in late August does not seem necessarily to have involved a higher risk of infection than being of middling wealth in an intramural location at the same time. In addition to these impersonal factors — space, time, and some amalgam of housing and wealth — there is the issue of the personal condition of the individuals at risk. Some insight into the condition of the population beyond the number of hearths that their homes contained is provided by the hearth taxes dating from after 1662, which often included details on the exempt as well as the chargeable householders. These amount to a contemporary evaluation of the economic standing of householders which is sometimes at variance with a straightforward deduction from the number of hearths at which they were assessed. The number of hearths might indicate the size of the house rather than the condition of those inhabiting it. Thus, as will be clear from the discussion below, some households with single hearths might be considered 'chargeable' while others with three or four might be exempt. This social perception of the relative wealth or poverty of households can be further embellished when the taxation material is combined with records of those individuals, families and households that received parochial relief when 'visited' with the plague.[13]

Hearth Tax returns for the large extramural parishes of St Botolph outside Aldgate, St Saviour Southwark, and St James Clerkenwell, include good indications of those who did not pay or were not chargeable. The significance of some the terms as an absolute measure of poverty is far from clear, nevertheless they provide a good indication of its general incidence. The simplest distinction is between those householders who paid the taxed assessed on them and those who did not. A number of those falling in the chargeable category did not pay because they possessed too few chattels for a distress to be made. The dwelling or other property of those who were not chargeable was to be worth no more than 20s. a year, while the 'poor' comprised those in receipt of alms or exempt from parish dues on account of 'poverty or the smallness of their estate' (Table 14). It is clear that in these four parishes those who may be defined as 'poor' because they did not pay the tax represented a substantial proportion of all householders, and that both payers and non-payers were spread widely across the range of house sizes as indicated by numbers of hearths (Tables 14–16).

Those who paid the tax were more evenly distributed than those who did not. In the parishes of St Botolph, St James, St Margaret, and St Saviour there was a slight tendency for them to cluster around houses with three hearths, while in the parish of St. James there was a distinctive group also in the largest houses. In St Margaret Westminster, where there was a greater preponderance of small houses, the tax-payers were more clearly associated with the larger houses (Table 15). Non-tax-

[13] For a discussion of civic policy and poor relief see Slack (1985), 258–9, 267–8, 279–82; see also Archer (1991), 254–5.

TABLE 14

Household payment categories in the Hearth Tax, for four parishes, 1662–6

Parish	Percentage of total household assessments				
	Chargeable		Exempt[1]		Total
	Tax payers	'No distress'[2]	'Not chargeable'[2]	Poor[3]	
St Botolph Aldgate	38	20	27	15	100
St James Clerkenwell	44	15	-	41	100
St Saviour Southwark	49	-	33	18	100
St Margaret Westminster	50	-	50	-	100

Source: Parish Database

[1] For exempt categories, see Arkell (1992), 39–40, 47, 49, 50.
[2] Terms used in original returns.
[3] Includes those described as 'poor' and as 'in receipt of alms'.

TABLE 15

Tax-paying households as a percentage of all householders, according to the number of their hearths, for four parishes, 1662–6

Parish	Number of hearths							
	1	2	3	4	5	6	Over 6	Total
St Botolph Aldgate	4	7	10	6	4	4	3	38
St James Clerkenwell	2	6	12	7	4	3	12	46
St Saviour Southwark	2	12	19	7	4	3	2	49
St Margaret Westminster	2	4	9	7	6	8	14	50

Source: Parish Database. Figures in Tables 15 and 16 have been rounded up, which accounts for discrepancies in the totals.

TABLE 16

Non tax-paying households as a percentage of all householders, according to the number of their hearths, for four parishes, 1662–6

Parish	Number of hearths							
	1	2	3	4	5	6	Over 6	Total
St Botolph Aldgate	25	23	13	1	<0.5	<0.5	<0.5	63
St James Clerkenwell	39	13	4	1	<0.5	0	0	57
St Saviour Southwark	27	22	1	<0.5	<0.5	<0.5	<0.5	52
St Margaret Westminster	16	16	12	3	1	1	<0.5	49

Source: Parish Database.

payers in all four parishes were clearly associated with the smaller houses, especially in St James Clerkenwell, which was perhaps notable for a degree of polarity in the distribution of personal wealth (Table 16). Thus, while most of those who could not pay only lived in houses with one or two hearths (65 per cent in St

Margaret, 77 per cent in St Botolph, 91 per cent in St James, 96 per cent in St Saviour), there were significant proportions of households with the same number of hearths which were not considered by contemporaries to be too poor to pay taxes.

Hearth tax returns throw a different light on poverty in their record of the gender of heads of household (see Table 17). In the central parishes the percentage of women heading households was very low. Many such women were presumably economically-independent widows who had not chosen to remarry.[14] In the suburbs female heads of household were much more prevalent. In St Botolph 20 per cent of all households were headed by women, compared with 17.7 per cent in St James Clerkenwell, 18.9 per cent for St Saviour and only 16.7 per cent in St Dunstan in the West. It is significant that many of these female householders were categorised as non-chargeable or poor in the hearth taxes. Of those poor households with one or two hearths in St Saviour sizeable minorities of between 20 and 30 per cent were headed by women. In St James Clerkenwell nearly 70 per cent of women householders did not pay the tax, and the vast majority of them lived in single hearth households.[15]

Turning to examine how the patterns of mortality overlay this structure of wealth and poverty at the household level indicates some of the interesting variations from the expected impact of the disease. The first and most striking point is that, contrary to expectation, households that paid tax suffered a higher proportion of deaths than those who did not pay: this pattern is distinct both from the household structure which was evenly balanced between payers and non-payers, but also goes against the expectation that households treated as poor by contemporaries would feel a greater impact of the plague. It is still true to say that households with less than the mean number of hearths suffered the bulk of the mortality — between 45 and 55 per cent of all deaths — but those deaths were balanced between paying and non-paying households. For example, in St Saviour 45 per cent of those who died lived in households of 1 or 2 hearths, two thirds of them came from tax-paying rather than poor households. A similar pattern holds for St James Clerkenwell and St Botolph.

Further light is thrown on this when the gender of those who died is considered (see Table 18). In all the parishes studied in detail more males than females died, although the seasonal patterns were very similar. There seem, however, to be significant variations in the type of household in which females died. The vast majority of females died in households headed by males. The majority of both sexes died in the poorer households, but this was in varying proportions. For example, in St James Clerkenwell 22.7 per cent of the female deaths linked to identifiable households occurred in single hearth households rated as non-tax paying compared with 19.6 per cent for males, a pattern reflected in St Saviour and to a lesser extent in St Botolph. Of more significance is the indication that female deaths were especially prominent in small (1–3 hearths) tax-paying households: in St James 47.8 per cent of the linked

[14] See Rappaport (1989), 38–42.
[15] For full details, see Parish Database.

TABLE 17

Social and gender characteristics of St James Clerkenwell, St Saviour Southwark, St Botolph Aldgate and St Dunstan in the West (figures as percentage of all households) derived from tax returns 1662–6

Status of household as indicated by no. of hearths	Categories of heads of household															
	Paid								Exempt							
	St James		St Saviour		St Botolph		St Dunstan		St James		St Saviour		St Botolph		St Dunstan	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1	1.6	0.2	1.7	0.4	4.0	0.4	5.7	4.9	21.3	8.9	18.0	9.4	18.8	7.2	0.0	0.0
2	7.7	0.7	10.5	1.3	6.0	0.9	5.7	1.8	10.3	1.7	18.0	4.4	14.3	5.8	0.0	0.0
3	11.4	2.0	17.8	1.2	9.4	1.2	5.7	1.4	6.6	1.2	0.0	1.3	11.4	5.8	0.0	0.0
4	6.8	0.9	6.7	0.4	4.9	1.0	12.4	1.8	1.2	0.2	0.0	0.3	0.5	0.1	0.0	0.0
5	2.1	0.6	3.7	0.2	3.4	0.3	10.0	2.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	2.1	0.5	2.7	0.1	3.4	0.8	9.3	1.2	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0
Over 6	11.0	0.9	2.0	0.0	3.0	0.3	34.4	3.5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total	42.7	5.8	45.1	3.5	34.1	5.0	83.3	16.7	39.6	11.9	36.0	15.4	45.2	15.7	0.0	0.0

TABLE 18

Deaths in St James Clerkenwell, St Botolph Aldgate and St Saviour Southwark according to gender and taxation status

Status of household as indicated by no. of hearths	Percentage of female deaths						Percentage of male deaths					
	St James		St Botolph		St Saviour		St James		St Botolph		St Saviour	
	Paid	Exempt	Paid	Exempt	Paid	Exempt	Paid	Exempt	Paid	Exempt	Paid	Exempt
1	10.0	22.7	6.0	26.1	4.9	8.6	10.5	19.6	5.2	24.7	5.8	8.5
2	14.3	6.4	9.6	15.1	22.4	10.2	10.5	10.1	10.2	15.6	23.0	8.5
3	23.5	6.8	11.6	10.9	20.9	6.6	15.7	4.9	11.5	11.0	22.8	7.1
4	6.8	0.4	7.3	1.3	11.7	2.3	9.2	2.6	7.1	0.8	9.1	2.2
5	2.0	0.8	4.3	0.4	5.9	0.5	2.6	0.3	4.0	0.2	6.8	0.4
6	1.2	0.0	3.6	0.1	4.0	0.0	4.6	0.0	5.6	0.3	4.0	0.0
7	0.4	0.0	1.3	0.0	0.7	0.0	4.6	0.0	1.7	0.0	0.9	0.0
8	4.8	0.0	2.3	0.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

female deaths occurred in houses of this size, as opposed to 36.4 per cent of linked male deaths. Although similar, if less distinct, patterns obtain in the other poor parishes, perhaps the case of St Dunstan in the West, a large wealthy parish, makes the distribution more profound: female deaths in households of around or just below the mean (4 and 5 hearths) accounted for 19.8 per cent of all the mortality in the linked database.[16] This evidence, especially when combined with that drawn from the *Bills of Mortality*, throws into relief the broad conclusion that female mortality in 1665 was higher than male, and that this applied across the range of poverty and wealth.

The Incidence of Plague as Revealed by Patterns of Relief

Further evidence of the social and gender profile of those who suffered during the epidemic can be drawn from those records that give an account of the social management of the crisis. As Kearns has pointed out, the civic response to the problems of public health focused on controlling the movement of the sick within the public environment.[17] The city fathers and parish officers implemented two simple strategies: quarantine and isolation of the sick, combined with 'the Charitable relief and ordering of the poor infected'. The *Book of Orders,* enacted by the Privy Council in 1578, in combination with the statute of 1603 embodied these prescriptions: on 1 July the Lord Mayor reissued the Orders and commenced the policy of 'shutting up' the sick. The backbone of the strategy, reflecting early modern conceptions of safe/unsafe and private/public spaces, was the monitoring and isolation of the infected. A diagnostic apparatus was instituted: examiners and searchers were to be appointed for every ward 'to inquire and learn from time to time what houses in every parish be visited, and what persons be sick, and of what disease, as near as they can inform themselves'. Once plague was diagnosed the parish constable was empowered to shut the house up, with all its inhabitants (infected or not) for 28 days. Watchmen were to be appointed to supply the household with food and necessaries, but more importantly to prevent the inmates from fleeing their quarantine. If help was needed 'nurse-keepers' might be appointed at the cost of the parish.

The role civic policy had in shaping the pattern of the epidemic will be discussed later. Whatever its medical effect, the response provides the historian with ample material for understanding the inter-related process of the management of the disease and its impact in local communities. By weaving together details from vestry minutes, poor rate assessments, and most importantly churchwardens' accounts, it is possible to reconstruct the pattern of infection and how it was dealt with at the parish level. Suitable evidence survives for many parts of the metropolitan area, but this study has examined just two parishes: those of St Margaret Westminster and St Dunstan in the West. Although the parish records, in particular the

[16] For full details, see Parish Database, and Tables 17–18.
[17] See Kearns (1989), 108.

TABLE 19

Payments for services associated with the epidemic in St Dunstan in the West and St Margaret Westminster, 1665

Service performed	Number of payments		Percentage of total expenditure	
	St Dunstan	St Margaret	St Dunstan	St Margaret
Plague Relief	122	8,182	25	80
Watching	36	357	14	7
Nursing	47	649	21	13
Locking Up	10	2	2	<0.5
Burial	30	49	21	<0.5
Health	5	14	18	<0.5
Total	250	9,253	101	100

Source: Database compiled from Churchwardens' Accounts for St Dunstan in the West and St Margaret Westminster, 1665.

churchwardens' accounts, enable a reconstruction of expenditure on all types of activity ranging from money for dogkillers, gravediggers and padlock makers, the most significant information concerns payments for relief of the infected, nursing, and watching the quarantined houses through the year (Table 19).

If the series of payments is allocated to broad categories the comparisons between the two areas is instructive: of a total of £149 spent in St Dunstan, 25 per cent went on plague relief, 20.6 per cent on nursing services, and 37 per cent on watching, locking up and the various services to do with the disposal of the dead. In Westminster, the proportions were different: of £1232 expended, 79.5 per cent went in relief for the visited, 12.9 per cent on nursing, 7.2 per cent on watching, and less than 0.5 per cent on disposal of the dead. As the figures suggest, the magnitude of the crisis was very different in each parish. In St Dunstan, a wealthy parish where 958 died, the parish officers gave relief to some 160 households: as the figures suggest, they were concerned as much to police the public environment by 'watching' infected houses and disposing of corpses as to proffer relief, and their expenditure (18 per cent) on burning coals and on whitewashing infected houses betrays a noteworthy concern for measures which might promote health. In St Margaret's, a larger and less affluent parish, the crisis was greater and, as indicated by the many details of payments for relief in the churchwardens accounts, the overwhelming concern of the officers was to alleviate distress.

The epidemic provoked a health policy that altered the structure of need for relief: 'shutting up' meant that the numbers of those considered marginal and therefore in need of parish support expanded as the infection multiplied. So in one very significant way the parish administration of the epidemic had social implications by redefining and widening the social constituency of poverty. As historians like Slack, Macfarlane, and Archer have argued, parochial relief in normal times was directed towards those groups at the extremes of age- and life-

TABLE 20

Relief payments in St Margaret Westminster, 1665: percentage distribution in relation to size of household and gender

Sex of recipient	Number of persons in household receiving relief[1]								Total
	1	2	3	4	5	6	7	8	
Male	11	11	9	6	2	1	1	<0.5	41
Female	25	16	9	5	2	1	1	<0.5	59
Total	36	27	18	11	4	2	2	<1	100

Source: Churchwarden's Accounts database.

[1] It seems that the number of persons receiving relief in a household represented the size of the household at that time, but certainty is impossible.

cycle: either the very young or the very old, or those migrants who had failed to establish an economic or social niche within the fabric of the urban community.[18] Thus the parish response to 'background' patterns of poverty resulted in sometimes regular, but still essentially *ad hoc*, payments to small groups: so, for example, the account books of St Dunstan or St Bartholomew by the Exchange record payments to the 'poor aged' like the one-off sum of 6s. 8d. to William Gurney of Cock and Key Alley or regular pensions of 8s. per month to Widow Smithson. Single payments for clothes, rent arrears or distress due to illness characterise the non-epidemic economy of relief.[19]

The evidence of parish accounts in 1665 argues that there was a need for a much more extensive and organised objective of relieving a much larger section of the community and one that was biased towards adult women. If in a non-crisis year payments were distributed with only a small bias towards widows, the crisis accounts point to an increase in the amount of funds received by women. In St Dunstan, for example, twice as many payments were made to infected poor women as men — the vast majority of them to 'widows'.[20] The pattern of a significant bias towards payments to women is also found in the much more detailed and larger accounts of St Margaret Westminster. Between May and December 1665 there were over 8,000 outgoings to individuals and families in the parish. The seasonality of payment related to burials follows the pattern noted by Macfarlane for London in the 1690s which argued for a clear correlation in increased relief tracked by increased deaths: the peak in relief distributed in late July and early August is followed by a peak in burial in late August and September.[21]

[18] See Slack (1989).

[19] St Dunstan in the West Vestry Minutes, folio 3r.

[20] See 'Payments for poor and plague ridden in the Rolls Liberty and Whitefriars by Henry Dorsett Churchwarden St Dunstan in the West' GL Ms 2968/4, folios 453–9. See also Churchwardens' Accounts ibid folios 432, and Vestry Minutes, MS 3016/2.

[21] See Macfarlane (1982), esp. 138–40.

If the payments for relief are distributed according to the gender and number of people within infected households (Table 20) there are a number of distinct themes that emerge. The most apparent being the concentration of payments for single individuals: indeed one in every four payments was made to single women. The overall pattern of relief given out was biased towards women: 59 per cent of all disbursements were made either to lone women or households headed by women. Important light

TABLE 21

Social structure of St Margaret Westminster according to the 1664 hearth tax: percentage distribution of households within each category

Status of household as indicated by no. of hearths	Categories of heads of household								
	All heads of household			Chargeable[1]			Exempt[1]		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	17	21	18	3	2	3	32	36	33
2	21	15	20	8	6	8	34	22	32
3	21	19	21	19	9	18	24	27	24
4	10	9	10	15	9	14	5	10	6
5	7	9	7	11	16	12	3	3	3
6	10	8	9	17	15	17	2	2	2
7	6	6	6	11	14	11	<0.5	0	<0.5
Over 7	8	13	9	15	31	17	<0.5	0	<0.5
Total %	100	100	100	99	102	100	100	100	100

TABLE 22

Social structure of St Margaret Westminster according to the 1664 hearth tax: households in each category as a percentage of all households

Status of household as indicated by no. of hearths	Categories of heads of household								
	All heads of household			Chargeable[1]			Exempt[1]		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	15	3	18	1	<0.5	2	14	3	16
2	18	2	20	4	<0.5	4	15	2	16
3	18	3	21	8	0.5	9	10	2	12
4	9	1	10	7	0.5	7	2	1	3
5	6	1	7	5	1	6	1	<0.5	1
6	8	1	9	8	1	8	1	<0.5	1
7	4	1	6	5	1	6	<0.5	0	<0.5
Over 7	7	2	9	7	2	8	<0.5	0	<0.5
Total %	86	14	100	44	6	50	43	8	50

Source for Tables 21–24: Parish Database.

[1] For these categories, see Table 14.

can be shed on the social and economic profile of those who received relief by linking the data from the churchwardens' accounts with the records of the hearth tax collectors in 1664. Tables 21–2 give a snapshot view of the social structure of the parish before the outbreak of the epidemic. As we can see only 14 per cent of all households were identified as having female heads the majority of whom were listed as too poor to be charged with payment of the tax. Turning to the linked data (Tables 23–4) the

TABLE 23

Social status of infected households in St Margaret Westminster, 1665: percentage distribution within each category according to status of household

Status of household as indicated by no. of hearths in 1664	Heads of infected households receiving relief in 1665								
	All heads of household identifiable in 1664			Chargeable[1] heads of household in 1664			Exempt[1] heads of household in 1664		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	23	44	34	26	45	36	21	42	32
2	31	32	32	29	29	29	32	35	34
3	22	14	18	22	14	18	22	14	18
4	16	5	11	14	6	13	17	4	11
5	3	2	3	2	2	2	3	2	3
6	1	2	2	1	2	2	2	3	3
7	1	2	2	1	2	2	1	1	1
Over 7	4	<0.5	2	4	<0.5	2	4	0	2
Total	101	101	102	99	100	102	102	101	104

TABLE 24

Social status of infected households in St Margaret Westminster, 1665: households in each category as a percentage of the total

Status of household as indicated by no. of hearths in 1664	Heads of infected houses in 1665								
	All heads of household identifiable in 1664			Chargeable[1] heads of household in 1664			Exempt[1] heads of household in 1664		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	9	27	36	5	14	19	4	13	17
2	12	19	31	5	9	14	7	10	17
3	9	9	18	4	4	8	5	4	9
4		3	9	3	2	5	4	1	5
5	1	1	2	<0.5	1	1	1	<0.5	1
6	<0.5	2	2	<0.5	1	1	<0.5	1	1
7	<0.5	1	1	<0.5	1	1	<0.5	<0.5	1
Over 7		<0.5	2	1	<0.5	1	1	0	1
Total	39	61	101	18	31	50	21	30	52

[1] For these categories, see Table 14.

most immediate point to be made is that 61 per cent of those households that received poor relief were headed by women. Importantly those women who received money were not just living in households that were classified in the hearth tax as non chargeable. Just over half (51 per cent) of the women who were paid plague relief were in households that were considered wealthy enough to pay contributions to the hearth tax, although it should be noted that the vast majority of these were in households with two or fewer hearths. Indeed, to reiterate the point of the gender bias of this data (as Table 24 illustrates), one in four payments were made to women in poor households assessed with only one hearth.

In St Margaret Westminster, women seem to have taken upon the role of head of household traditionally exercised by males. All the evidence points to a crisis of mortality with a specific gender bias. It also suggests that those who suffered lived preponderantly in small or single-person households, and that this was especially the case with women. How can this be explained? The gender bias complicates the commonplace arguments about the relationship between poverty and disease: why should poor women have suffered any worse than poor men if they held their poverty in common. Similarly why should women further up the social scale suffer disproportionately with their menfolk? A biological or epidemiological explanation of these phenomena may well be inappropriate. It may well be the case that women suffered because they remained in the epidemic environment, while the men fled. The social isolation of the victims also presents a problem for interpreting the epidemiology of the disease.

VI

Explanation: The Epidemic and its Effects

Neither the bias towards female deaths, nor the high percentage of single isolated deaths, both of which were distinctive features of the pattern of mortality during 1665, are explained by the current historiography of the causes and aetiology of the disease identified as the 'plague'. This is not the place to develop a wide-ranging debate on how historians might identify diseases in the past, but it is worth pointing out that assumptions concerning the clinical nature of the disease have moulded the argument about the relationship between mortality and poverty in the period. Modern anglophone clinical understandings of 'plague' originates in the epidemiological researches undertaken to combat the epidemics in India, China and Australia in the late 1890s and 1900s. What the modern medical community describes as *Yersinia pestis* was clinically defined between 1894, when the bacillus was isolated, and 1908, when the role of the flea as a vector between rat and man was accepted. This biomedical theory states that the plague is primarily a disease of the rat: first the animal community becomes infected, in a phase known as the epizootic, then the disease transfers to the human community through the movement of fleas from dying rats to the human population. L. Hirst's lucidly-written and intelligently-argued account of this medical theory, *The Conquest of the Plague* (1953), is widely-read and remains canonical for historians. Open any book on early modern plague written in English, and Hirst's account of the rat-flea theory will be cited almost verbatim. The problem with the wholesale adoption of this theory is that first it does not seem to fit the facts, at least for the Great Plague of 1665, and that second it seems to have obscured the role of social processes in the diffusion of the disease.

Rats and Fleas

There are two major problems in applying this theory to London's experience of epidemic disease in 1665. The first concerns the epidemiological pattern of the outbreak across the whole metropolis, while the second concerns the pattern of infection within the household.

The spread of plague across the metropolis

According to the rat-flea vector theory, the disease is dependent for its movement upon the existence of infected rat populations, since technically an epizootic must

precede an epidemic.[1] The disease, therefore, should move slowly and regularly from identifiable foci. However, the incidence of plague deaths in the parishes week by week throughout the epidemic, as indicated by the *Bills of Mortality* does not conform to this epidemiological model. By plotting the first incidence of plague recorded by the *Bills of Mortality* in each parish, it is possible to indicate the movement of the disease in both space and time. A map illustrating this (see Fig. 33, and further discussion below) this shows patterns of independent infection which do not conform with the rat flea theory. Further research and analysis of the epidemiological vectors, for example, relating them to the proximity of water courses, to the Thames, to sources of piped water, or perhaps to the more general systems of transport and trading networks, would allow a more profound understanding of the dynamics of the diffusion of the disease.

Clustering of infection within households

It is clear from the parish studies that the pattern of infection within the household does not match the predictions of the rat/flea theory. Once a household became infected, the disease should gradually have been transferred from the fleas to all or most members of the household, killing them one by one. Infected households would thus be characterised by a pronounced clustering of deaths: members of the household who were all were 'shut up' together should suffer multiple casualties. Both Slack and Schofield found this pattern in earlier epidemics.[2] Slack suggested that 'thanks to its dependence on domestic rodents and fleas as carriers, plague had an independent clustering effect: this was one of its most conspicuous features in early modern England'.[3] The sample of London parishes, semi-rural, extramural and intramural, studied in detail here for 1665, however, does not betray this pattern (Table 25 and Table 26). In these parishes, between 50 and 90 per cent of the households experiencing mortality suffered only one death. It is noteworthy that the wealthier parishes within the walls, and to a lesser extent the relatively wealthy parish of St Dunstan in the West experienced the highest proportions of households with single deaths. A similar pattern is apparent in the clustering of deaths within individual parishes: across the whole range of households defined by their hearth tax assessments the total of deaths was greatest for those households where only one death has been identified (Table 27). In the case of St Saviour Southwark, for example, the mean proportion of single deaths as a percentage of all deaths in households with that number of hearths was 64.3 percent, with a range of 56.7 to 76.2 per cent.

[1] See Benedictow (1987). For an excellent account of the biological history of plague, see Twigg (1989), esp. 81–91.

[2] See Slack (1985) 177–8, Table 7.1 'The household distribution of plague deaths' gives details of epidemics in 1579, 1603–4, 1645–6, 1665-6. See also Schofield (1977), and Bradley (1977).

[3] See Slack (1985), 178; see also Slack (1989) 'the available English evidence suggests that between 1/3 and 2/3 of all burials during an epidemic occurred in families which had three or more deaths', 183.

TABLE 25

Clustering of deaths within households in eight parishes, 1665

Parish	No. of households with linked deaths	Percentage of households experiencing the following numbers of deaths:				
		1	2	3	Over 3	Total
Intramural:						
St Magnus	25	52	28	12	8	100
St Mary le Bow	28	88	8	4	0	100
St Michael Queenhithe	24	67	21	8	4	100
St Stephen Walbrook	22	86	10	5	0	101
Extramural:						
St Botolph Aldgate	1,036	62	23	9	6	100
St Dunstan in the West	257	69	20	8	3	100
St Saviour Southwark	776	59	26	9	6	100
Outlying:						
St James Clerkenwell	391	66	20	9	4	99
Total	2,559	63	23	9	5	100

Source: Parish Database.

TABLE 26

Clustering of deaths (as percentage of all deaths) in eight parishes, 1665

Parish	Deaths per household				
	1	2	3	4	All deaths
Intramural:					
St Magnus	29.5	31.8	20.5	18.2	100
St Mary le Bow	76.7	13.3	10.0	0.0	100
St Michael Queenhithe	44.4	27.8	16.7	11.1	100
St Stephen Walbrook	72.0	16.0	12.0	0.0	100
Subtotal	51.8	23.7	15.6	8.9	100
Extramural:					
St Botolph Aldgate	38.6	28.9	17.5	15.0	100
St Dunstan in the West	48.0	28.3	16.7	7.0	100
St Saviour Southwark	36.7	31.7	16.5	15.1	100
Subtotal	39.2	29.8	17.0	14.0	100
Outlying					
St James Clerkenwell	52.0	3.3	22.0	22.7	100
Total	41.3	26.4	17.5	14.8	100

Source: Parish Database.

Factors other than those directly relating to the character of the disease probably had some effect. The most significant of these is likely to be the degree to which the population fled. This may explain the especially high proportions of single deaths in the wealthier parishes, for it was there that the parishioners enjoyed the freedom and resources to flee. Some of the values for St Dunstan in the West may be the product of such a phenomenon: by far the highest proportion of single deaths in this parish is associated with the houses containing most hearths. These houses may have been inhabited by no more than one or two servants at the time of the plague. Despite such qualifications, however, it seems from the values for the smaller houses as a whole that the disease was not as infectious as the previously-postulated models of 'plague' have suggested. If calculations of proportions of total deaths are examined it does seem to be the case that between a quarter and two fifths of all deaths occurred in clusters of three and above (see Table 26). Indeed this evidence, superficially, fits well with the models discussed by Slack and Schofield. If this incidence of clustering is examined, not from the perspective of the distribution of total deaths but from the total number of households infected with the disease a different model can be constructed. What appears to have happened in 1665 was that a high number of households were infected and suffered at least one or two casualties, but that only a small proportion of those went on to suffer a high density of mortality (see Table 26). So, for example, only about one in ten of the infected households experienced three or more deaths, ranging from 8.6 per cent (St Dunstan) to 14 per cent (St Botolph). Only one out of every three infected households experienced more than one death, with a range of between 24.9 per cent (St Dunstan) and 36.9 per cent (St Saviour). Importantly, the data suggests that those households that suffered multiple casualties were knotted in the poorer quality housing (one- to three-hearth households) (see Table 27). So it seems that although households of all qualities contracted the disease (as evidenced by the incidence of single deaths along the range of number of hearths per household) it was those in the smaller physical size and poor-quality buildings that suffered a higher density of fatalities.

This pattern of infection and mortality is quite distinct from the clustering identified in other studies. As Slack has suggested, clustering in other epidemics could be considered as a beneficial factor since it meant that most households escaped without any deaths.[4] In the parishes studied in detail here, however, it seems that the pattern of fatal infection was quite diffuse: between two-thirds and three-quarters of households infected had only a single death. This incidence could have two implications. First, as mentioned above, this pattern might be a reflection of the differentials of populations at risk. That is, the high incidence of single deaths could have simply been the result of the high percentage of households that were composed of lone individuals. If this model was to hold it might be expected that

[4] See Slack (1985), 178.

TABLE 27

Clustering of deaths in relation to the status of households in four parishes, 1665

Status of household as indicated by number of hearths in 1666	Percentages of deaths per household in four parishes																			
	St Botolph Aldgate No. of deaths per household					St Dunstan in the West No. of deaths per household					St Saviour Southwark No. of deaths per household					St James Clerkenwell No. of deaths per household				
	1	2	3	3+	Total	1	2	3	3+	Total	1	2	3	3+	Total	1	2	3	3+	Total
1	18	7	3	2	29	11	4	1	1	17	10	4	2	<0.5	16	22	5	3	1	31
2	16	4	3	1	24	9	2	2	0	13	19	7	2	2	30	16	5	1	<0.5	22
3	15	7	2	1	25	9	4	<0.5	0	13	16	6	2	2	26	13	5	3	<0.5	21
4	6	2	1	1	10	13	4	2	1	20	7	3	1	1	12	5	2	1	1	9
5	4	1	1	<0.5	6	8	2	<0.5	<0.5	10	5	2	<0.5	<0.5	7	2	2	0	0	4
6	3	1	<0.5	<0.5	4	6	<0.5	0	<0.5	6	3	1	<0.5	<0.5	4	3	0	0	0	3
Over 6	2	<0.5	1	<0.5	3	21	1	1	0	23	2	1	<0.5	0	3	6	0	1	<0.5	7
Total	64	22	10	4	100	77	17	6	2	102	62	24	7	5	98	67	19	9	2	97

Source: Parish Database.

the concentration of multiple deaths would occur in poorer households since the more wealthy families would have the economic means and opportunity to flee the epidemic. Indeed, certainly in the poorer suburban and semi-rural parishes like St Botolph, St James and St Saviour, this model seems to explain the incidence of clustering. Such an argument might imply that the poorer households suffered a higher incidence of fatality not simply because they were poor and therefore more liable to infection than their wealthier and presumably stronger neighbours, but rather because their poverty tied them to an infected location. The second implication is that the pathogen had a low infectivity rate: that is, that it was only in certain exceptional circumstances that it might kill more than one in any infected household. Such a pattern of death, and presumably of morbidity too, precludes a disease conforming to the classic biological description of plague. That classic model implies an ecological infrastructure where the disease was deeply embedded in the rodent population. That, in combination with a social policy of 'shutting up', ought to have resulted in a much higher percentage of multiple deaths.

An alternative argument to the commonplace suggestion of a close correlation between economic and epidemic factors might propose that the disease operated, in some respects, independently of the socio-economic environment. The case of clustering patterns in St Dunstan in the West offers some support for this argument. First, the persistence of single deaths in households with over five hearths: 27.5 per cent of all those who died alone did so in substantial households with six or more hearths. Although the incidence of multiple deaths was in terms of real numbers small, and although the proportion of single deaths increases as the quality of the households improves (Table 27), there was still a significant proportion of multiple mortality in households with between four and six hearths. This evidence has two converging implications. Firstly, it suggests that, in a parish quite topographically and socially distinct from the poor suburban areas, the disease affected the households of rich and poor alike especially in the incidence of single deaths: so once again exposure to the pathogen, independent of spatial or social location, resulted in fatal infection. Secondly, the existence (although in admittedly small numbers) of clustering of deaths in middling and wealthy households reinforces the suspicion that the disease, if present, struck households in wealthy and poor environments alike.

The pattern that strikes the eye most immediately from this data relating to patterns of clustering is the similarity of the proportions between single and multiple deaths in socially, topographically and geographically diverse locations. Although it is not possible to discuss real morbidity rates because there is no information on the numbers of those who were infected but survived, the evidence of the proportions between households with different numbers of deaths suggests that there was a complex relationship between the density of populations within households and the autonomous pathogenicity of the disease. Contemporary evidence indicates that, in some areas at least, the poorer households, containing

one or two hearths, were packed with adults and children living in close and squalid proximity. The present study indicates that such a household was as likely to contract the disease as one of higher economic standing where there was more physical space. It is important to distinguish two separate but related issues. The first is that the high incidence of single deaths across the range of hearth tax valuations suggests a vector for the initial infection of households. The second is that the differential patterns of clustering within households indicates that the disease could act in different ways once it had infected any particular household. The pattern of initial infection clearly will be influenced by physical and infrastructural factors, while the question of intra-household incidence of deaths will be affected by demographic factors such as household size, nutritional well-being and gender ratios. In discussing the 'impact' of the plague in 1665, therefore, it is important to bear in mind this distinction between internal and external components of the epidemiological regime if an understanding of the complexity of the epidemic is to be achieved.

One of the central problems with the dominance of the rat flea theory is that it has meant that historians have accepted a very static medical model of the interaction between disease and social structure. Part of the difficulty lies in the implicit connection between a definition of both disease and poverty that relies upon ideas of cleanliness and dirt. For example, William Bell illustrates the worst of this presumption in his classic study of the plague. He insisted that Stuart England was as filthy as 'Old Cairo', and described the 'squalid and overcrowded quarters where the poor herded' that attracted fleas and 'became a focus for the accumulation and dissemination of poison'.[5] In this manner the understanding of the relationship between poverty and disease is static: poor households are dirty therefore they attract the plague. This model does not explain some of the patterns pointed to earlier: undoubtedly men were as dirty as women and rich as poor, but each of these groups experienced the epidemic in a different manner.

The Effects of Social Policy

One way of explaining some of the variations in mortality would be to develop a more dynamic model of the epidemiology of the disease that took into consideration the role of human agency. Specifically, this would consider the ways in which both flight from the city and the public health or other measures imposed during the crisis influenced the social composition of the dead.

London was wracked by outbreaks of the plague throughout the Early Modern period, but was slow to introduce a cogent public health response, in marked contrast to continental cities such as Milan, Florence and Venice. By the end of the fifteenth century many continental towns had precise and sophisticated

[5] Bell (1924 and 1951), 250-2.

measures to combat the diffusion of infection. Quarantine and isolation of the sick were the backbone of civic practice. The movement of goods and people was restricted to prevent the spread of the disease, and those who had contracted the disease were either isolated in their own houses (for a period of 40 days — thus the origins of the word quarantine) or carried off to public hospitals. The hallmark of that policy was the separation of the sick from the healthy. London was slow to follow these exemplars of civic humanism. Cardinal Wolsey's emulation of other Renaissance states caused some of the Continental ideas to be introduced in London. Diseased households had to identify themselves by hanging a bale of hay outside their windows for 40 days, while residents venturing abroad had to carry a white stick. At the same time the Royal College of Physicians issued medical directions towards the 'improvement' of the health of the city and its inhabitants. Later, in the 1550s, the *Bills of Mortality* were adopted by the city as a means of providing a diagnostic apparatus for alerting the authorities of the impending threat of infection. While there were other piecemeal attempts at developing an effective health strategy, as Paul Slack has argued, no fully-fledged official policy was achieved until the enactment, by the Privy Council, of the plague *Orders* in 1578. The central plank of the civic policy was quarantine and isolation of the sick: the aim was to control the movement of the infection by restricting the movement of people and goods in the public environment. Appended to these *Orders* was a series of medical prescriptions drawn up by the College of Physicians. These *Orders*, with a few amendments and statutory reinforcements, were reprinted to form the basis of policy in every succeeding epidemic outbreak in London between 1592 and 1665.[6]

On 1 July 1665 the Lord Mayor and Aldermen of London re-issued the traditional *Orders*. As Slack rightly noted, the policy blurred the distinction between medical provision and the civic requirement to control the activities of the poor, distressed and diseased in a time of social crisis. The medical and the social purpose was to achieve the isolation and surveillance of the sick household. Examiners were appointed for each ward, with instructions 'to inquire and learn from time to time what houses in every Parish be visited, and what persons be sick, and of what diseases, as near as they can inform themselves'.[7] Once 'plague' was diagnosed then the parish constable was empowered to 'shut up' the house and all its inhabitants (infected or not) for 28 days. 'Lord have mercy upon us' was chalked on the doorway, along with a red cross of identification. Watchmen were appointed to supply the 'shut up' houses with food and necessaries, and more importantly to prevent the 'inmates' from fleeing their quarantine.[8] If illness

[6] See Slack (1980).

[7] The *Book of Orders*, 1665.

[8] Pepys suggests (*Diary* entry for 12 August) that some parish authorities did allow the sick to leave their houses by imposing curfews (nine o'clock in the evening) 'that the sick may have liberty to go abroad for aire'.

afflicted the household with severity 'nurse-keepers' were appointed at the expense of the parish to tend to the sick and disabled. The stress on 'shutting up' was unique to England. On the Continent the sick were carefully isolated from the healthy within each family and carried away to public hospitals. In England, there was provision for removing infected persons to the public hospitals known as pesthouses, but the number of individuals involved was small since the total of deaths in the pesthouses was insignificant.[9]

As well as being concerned with the regulation and policing of the infected private sphere the *Orders* also paid attention to the surveillance of the public environment. Human and animal movement was controlled. Individuals and families could only move from parish to parish, and out of London, on production of certificates of health.[10] Burial of the dead, ordinarily an occasion for public ceremonial, was restricted, as the text went, 'either before sun-rising or after sun-setting'. The social celebration of bereavement was similarly disrupted as it was commanded that 'no neighbours nor friends be suffered to accompany the corpse to Church' upon pain of being shut up too.[11] The streets were to be regularly cleaned, bedding fumigated, and the sale of second-hand clothes halted. The very air itself was to be 'corrected' by the plentiful burning of brimstone and sea-coals. Plays, games, bearbaiting, feasting and 'tippling in taverns, alehouses, coffee-houses and cellars' were either prohibited or curtailed, or, in the words of the *Orders,* 'severely looked into'.

One part of this strategy had a specific medical therapy behind it: extra attention was paid to keeping the streets clean of 'all manner of dirt, filth and rubbish'.[12] Strict regulations were imposed concerning the disposal of household and commercial waste.[13] Early in July the Lord Mayor issued proclamations supplementing the traditional plague orders. They had profound social and economic implications since they were concerned to regulate two marginal aspects of metropolitan life. The 'inmates and undersitters', many of whom would have been highly mobile, relying on casual labour for their living, were subject to weekly examination by parish officers. Furthermore, economic activity that involved a high rate of human contact or movement of bodies was curtailed.

[9] The *General Bill* for 1665 gives the total deaths for both the City and Westminster Pesthouses as 315. All but 3 were diagnosed as 'plague'. For a discussion of these aspects of civic policy in Florence, see Henderson (1989); see also Cipolla (1973).

[10] Bell (1924 and 1951) gives an example of such a certificate of health (or 'plague pass') at 332. See also (ibid, 333–5) 'Privy Council Rules and Orders' issued in 1666 for a continuation of traditional policy.

[11] Pepys made various comments about the disruption to burial patterns during 1665: see for example *Diary* entries for 3–7 September concerning the problems of daylight burials and attendant crowds. See for a discussion of funeral practices, Litten (1991). For general attitudes to deaths see Gittings (1984), 77–80. For a specific discussion of burial during epidemics, see Harding (1993).

[12] CLRO, *Journals* 46, folio 59.

[13] CLRO, *Repertory* 70, folio 126.

Thus, 'no vintner, inholder, cook, ordinary keeper, seller of strong waters, alehousekeeper, or coffee house keeper, shall henceforward, during the infection receive or entertain any person or persons (not of their own family) to eat or drink in their houses or shops'.[14] Street sellers, balladeers and hawkers were prohibited from selling any 'goods or commodities whatsoever'. Patterns of public sociability that focused upon transactions of neighbourliness and exchange in the streets were disrupted.[15] As Vincent commented 'few ruffling gallants walk the streets; few spotted ladies [are] to be seen at windows'.[16] Samuel Pepys repeatedly avoided the main thoroughfares for fear of casual contact with infected bodies or goods.[17]

There is little doubt that these measures greatly exaggerated the basic effect of the epidemic in disrupting the metropolitan economy, and that those who were already in a marginal position suffered disproportionately. It is difficult, however, to quantify the degree of dislocation involved. At a national level one contemporary commented that 'the Citizens of London are put to a stop in the career of their trade'.[18] Trade at the Royal Exchange was reduced to a minimum: Dutch traders decided to return to Holland, 'there being no manner of trade left, nor conversation, either at the Court or on the Exchange'.[19] By late summer Pepys feared that insufficient revenue would be available to raise forces against the Dutch, since 'the Chimney money comes almost to nothing'.[20] Although too much should not be made of the figures, the 'Hallage' receipts of the London cloth markets between August 1665 and 1666 show a 20 per cent decline.[21] Manufacture and production also suffered. The Lord Mayor, having halted all public feasting and assembly by the Livery Companies in late July, insisted that one-third of all funds thereby saved should be distributed as relief to the 'great multitudes of poor persons who, by reason of the infection, have their houses shut up, and are restrained from their daily trades and labours whereby to maintain themselves and their families'.[22] Typical of this disruption is the case of the owner of the Cock and Bottle at Temple Bar. In July 1665 he placed an advertisement in the *Intelligencer* to the effect that he had 'dismissed his servants, and shut up his house for this long vacation; intending God willing to return at Michaelmas next'. The 'bitter cessation of trade' meant that many 'do endure great wants and extremities'.[23] The author of *Shutting Up Infected Houses* made the same connection. The civic policy of

[14] The Mayoral proclamation is reproduced in Bell (1924 and 1951), at 117.
[15] Archer (1991), 76–7.
[16] Vincent (1722) 36–7.
[17] See *Diary of Samuel Pepys* entries for 15, 21 and 22 of August.
[18] See *Diary of Samuel Pepys*, 37.
[19] CSPD 1664–5, 488.
[20] See *Diary of Samuel Pepys*, 9 September and 15 October.
[21] See Jones (1972); from 20 August 1665 to 20 August 1666 the receipts were only £1262 compared with £1533 the previous year.
[22] Bell (1924 and 1951) (citing *Journal* 46, folio 61), 129–30.
[23] CLRO, *Repertory Journal* 46, folio 61.

shutting up families obstructed trade, leaving 'thousands without employment, to tipple, loyter, and wonder from one place to another'. The unemployed could not work, so had 'nothing to do but commit those sins, which certainly *deserve*, and infallibly *bring* the plague upon them'. As early as August Henry Compton, bishop of London, had insisted in correspondence with Lord Arlington about the stability of realm, that the 'greatest danger is from the distress of the poor'.[24] Pepys had been beset by starving and rioting seamen in late summer and autumn.[25] The epidemic caused widespread unemployment and want. As Sir Edmund Bury Godfrey commented in December 1665, 'the poor people cry out upon the deerness of fuel and want of employment'.[26] The crisis disrupted the business even of established and prosperous tradesmen. The goldsmith Arthur Manwaring, a highly-skilled artisan who both before and after the epidemic received prestigious commissions from the Goldsmiths' Company, was in receipt of poor relief during the crisis months, and in September and October buried his wife and two children. The ledgers of several banking enterprises similarly reveal closures of business during that time,[27] while in February 1666 Lord Craven spoke of the plight of the 'middling sort of person so much impoverished by the late calamity of the plague'.[28]

The problems of poverty and economic distress began to be manifest early in the epidemic as the wealthy and middling sorts fled the city. In late July Stephen Bing, chaplain to Dean Sancroft of St Paul's (who had left London for Tunbridge), was concerned for his parishioners: 'the increase of God's judgem[t] deads peoples hearts that trading strangely ceaseth & bills of exchange are not accepted so yt they shutt up thir shopps & and such a fear possesseth them as its wonderful to see how they hurry into the Countrey as though ye same God were not there as in ye City'. He pointed out that the flight of the wealthy made things worse for the poor: 'great complaint there is of necessity & needs must it be ye more when ye rich hast away yt should supply ye pores want'. Relying on Sancroft's pious intentions Bing had been giving funds to those 'in a very necessitous condition', 'outrunning ye bank you hon[ed] me with'.[29]

From July 1665, the nature of economic life and opportunity within London and its suburbs altered. Its primary focus shifted from the exchange of goods, services, and specie which supported normal production and consumption towards

[24] CSPD 1664–5, August 19, 524.

[25] See *Diary of Samuel Pepys* 7 October [255] 'the horrible crowd and lamentable moan of the poor seamen that lie starving in the streets for lack of money... or then a whole hundred of them followed us - some cursing, some swearing, and some praying to us'. 16 October [268] Streets empty or full of 'poor sick people'. 27 October [279] Poverty. 4 November [288] Rioting Seamen. 14 November [297] Kent St begging poverty.

[26] Anon (1665), 18. CSPD 1665–6, 107.

[27] Many thanks to David Mitchell for providing the details of these disruptions.

[28] See Bell (1924 and 1951), 316.

[29] See Nicholson (1919), 141–2.

a market in the services associated with social policy. Since the politics of urban order stressed the danger of the infected poor, the central aim of civic government was to control that marginal and potentially subversive population. In the context of the epidemic, that control could not be achieved without introducing a system of providing relief on a large scale. From late July funds collected from the counties upon the Lord Mayor's request poured into the capital to supplement local sources. Altogether, between 25 July and 22 December, some £7664 were distributed to the worst affected areas.[30] In essence, civic and parish officers were in charge of managing an epidemic economy.

It seems likely that the disruption of the economy bore heavily upon particular social groups, and especially upon women. Recent research emphasises the 'casual' nature of income for many of the poorer households and the significance of the contribution of women to that casual economy. Many such households depended upon recycling and pawning second-hand goods and on what can only be described as casual theft.[31] During the epidemic these types of activity were either explicitly restrained (trade in second hand clothes was prohibited) or more closely policed than usual. Moreover, the proscription of the customary economy of informal exchange in the street and the restriction of the market in domestic service would both have affected women worse than men. Women's work, as Peter Earle has written was, 'casual, intermittent or seasonal'.[32] Migrant women were increasingly attracted to London during the latter part of the seventeenth century to work in such service sectors as prostitution, nursing, laundressing, retailing, casual and domestic service, and victualling. Running alehouses and cook shops required little outlay and could be combined with other casual activities. These were precisely the types of activities most likely to be restricted by the civic proclamations and by the general disruption of trade. Many of the wealthy and middling sort left London in early July leaving their servants to fend for themselves: that many died is apparent from the burial registers of affluent parishes like St Dunstan in the West which show a concentration of servant deaths in the wealthier households. It is possible that in lesser families the men fled, leaving women to cope. Single women would have been one of the groups most lacking the resources which would have enabled them to flee. In any case the London poor would have received little welcome in rural parishes. The increase in the mortality suffered by women during 1665 may thus be a product of the distinctive economy which emerged in the city during the plague of the public policies which were deliberately adopted. Thus women were both exposed to infection and deprived of the means of subsistence to a greater degree than other groups.

[30] CLRO Ms 270.

[31] See Woodward (1985), and Linebaugh (1991). See also for rural equivalents, Woodward (1981).

[32] Earle (1989), 342; idem (1994), especially Chapter 4. See also Kent (1989). For a discussion of under- and unemployment and crime, see Shoemaker (1991), and Beattie (1986).

As discussed in the previous chapter, that women did suffer material distress is indicated by the high rates of poor relief paid to single women and households headed by women during 1665. There is also more direct evidence from the Middlesex quarter sessions records: in eleven out of twelve cases of burgling infected houses noted for 1665 the perpetrators were women, either singly or in groups. Isabella Petty, for example, a widow of Wentworth Street, Whitechappel, '(with others) did illegally break in to the house of one Richard Scavell lately deceased, in ... the night, notwithstanding a padlock was hanging on the door, which they broke off'.[33] It was a common accusation that nurse-keepers stole from the sick or persecuted those in their care for gain, but it seems, from the sessions records, that women were driven to crime by desperation rather than lured by opportunity.[34]

Employment generated by the epidemic

The epidemic economy brought business and employment for some.[35] Doctors, surgeons, and apothecaries who provided medical services boosted their incomes. In 1665 the city authorities paid out more than £2000 to such people.[36] Dr Nathaniel Hodges received £100 for his 'pains in looking to the poor', for example, while Mr Loveday Fenner, apothecary, got the enormous total of £570 for his skill.[37] The epidemic provided much employment for nurses: Nurse Littlejohn of St Dunstan in the West made £3. 8s. 6d during the year; in St Mary at Hill the going rates for relief were 6d. per day, while a nurse might receive as much as 10s. a week, compared with 12d. for a watcher. Coffin makers, padlock fitters, watchers, dog killers, gravediggers, bearers, whitewashes, launderers, shroud makers, and shovel menders were all kept in busy employment during the crisis months.[38] Some clearly profited from the increased demand for casual employment, although this was admittedly dangerous in the case of nursing or other activities that meant close contact with infected or decaying bodies. Such a close working proximity with the casualties of the epidemic may have placed such people at a higher risk of contracting the illness.[39]

From the records for St Margaret Westminster it is possible, in some measure, to quantify the employment opportunities which the management of the epidemic

[33] Jeaffreson *Middlesex Quarter Sessions,* 37.
[34] *Shutting Up Infected Houses* (1665), 8–10.
[35] See Pullan (1992) for a similar analysis of work opportunities on the continent.
[36] CLRO Ms 359 'City Payments for Plague Relief'.
[37] See CLRO Ms 270 'Monies received for ye relief of the poor visited with ye plague', folio 58 'Moneys payd by the Lord Mayor'.
[38] Much detail can be derived from the churchwardens' accounts for the metropolitan parishes. Those for St Botolph Bishopsgate, St Michael Queenhithe, St Margaret Lothbury, St Bartholomew by the Exchange, St Dunstan in the West and St Margaret Westminster have been examined here.
[39] Database derived from the churchwardens' accounts for St Dunstan in the West, 1665.

provided for poor and marginal women. They were paid for many different types of service, ranging from the 2s. 6d. paid for washing infected linen to regular payments to the five women who acted as midwives during the period (receiving a mean of 2s. 6d. per birth), but the service purchased in greatest quantity was that of 'nursing'.[40] The form of this type of care is far from clear. According to the instructions of the plague *Orders*, provision was to be made for 'funding of victual or fire, or medicine for the poorer sort, during their time of restraint'. Certainly it seems likely that a nurse attended the sick and dying in their own homes which would have meant almost undoubtedly that they would be incarcerated or 'shut up' with their patients. But how different 'nursing' was from other services mentioned in the accounts, such as 'keeping', 'looking to' and 'looking after', and whether any of these services involved specifically medical therapy in addition to more commonplace domestic care, is difficult to say. Whatever the form of these services, they were performed almost without exception by women.

The parish accounts suggest that the care provided was predominantly domestic in character, and they clearly demonstrate that many women were employed during the epidemic. The turnover of nurses in the pay of the parish was high. While precision is impossible, because many payments were noted simply to 'nurse', it is possible to identify at least 350 women who acted intermittently as nurses in the parish. The vast majority of these women received only one or two payments (76.7 per cent single payments; 90.6 per cent for single and double payments). Indeed there were only 31 women who received three or more payments: some like Widow Clarke may have received as many as ten separate payments, while others, like Elizabeth Harrard, Durance Moore and Sarah Porter, were employed between 5 and 8 times. Durance Moore and Elizabeth Hutton, who were paid nearly £2 each for repeated care made a significant income from their nursing services. Of the money spent 46.2 per cent was distributed to one-off nurses, while a further 16 per cent went on women who received two payments. A quarter of the money dispensed was devoted to nurses who appear to have been regular employees of the parish.

What can be deduced from the nature and distribution of these payments about the roles the women played? Several explanations for the high turn over and short duration of employment can be offered: women perhaps tended to care for one household only, an unpleasant experience they did not care to replicate; the nurse herself might succumb to the disease of her wards; or she might simply change to another method of getting a living according to the normal pattern of female employment. The proliferation of one time or dual payments suggests that women tended to act as nurses for their neighbours rather than to serve as a pool from which the parish drew as required. If nurses were to be locked up with their cares they might only have been prepared to be so if they felt some bond with that family or individual.

[40] For a discussion of nursing, see Slack (1985), 288–90.

A few women nursed in one household over a longer time span. Hannah Brown received 12s. for a two week period. The mean remuneration for the eighteen women who provided extended care of this type was 10s. 3d., while some received as little as 7s. 6d. On 30 November Anne Taylor was paid 12s. for seven weeks' work, but others received the same for only four weeks. Clearly there was great variety in the rates of pay, which might vary according to the number of people, and perhaps the status of household, the nurse was looking after. Women who were paid for the longer periods possibly may have acted in a more general capacity for particular neighbourhoods rather than for individual households: for only two out of the eighteen entries are the names of the sick identified.

Patterns of employment and rates of pay fluctuated as the needs of the parish changed during the course of the epidemic. During the early weeks of the outbreak infrequent use was made of nursing care, but that changed as the disease took hold (Fig. 31). The peak in the frequency of payments and in the number of women employed, however, came after the peak in deaths, suggesting that the response of the parish officers lagged behind the needs of the community. Interestingly, fluctuation in the rates of pay are perhaps counter-intuitive. Over the whole period the mean amount of money paid to any one nurse was probably 4s. 4d. per week. From week to week the rate rose into August and then fell (Fig. 32), suggesting that in the early weeks of the epidemic the women who were willing or available to act as nurses were in short supply. In the first weeks of August, for example, women were receiving between 5s. and 6s. for their work. As more were employed the rate fell. During the early weeks of the epidemic, as the number of deaths surged rapidly ahead of the number of nurses employed, it looks as if the nurses were expected to shoulder an increasing burden of care (Fig. 31). The total of nurses employed rapidly caught up. In each of the early weeks of the epidemic there were more than 40 deaths for each nurse employed, but by its peak the number had fallen to five. It seems possible that as the economy became increasingly disrupted, so more women were forced to seek dangerous employment as nurses, and that the provision of this employment was seen as form of relief for the women employed as well as for those to whom they supplied care.

Male employment provided by the parish of St Margaret Westminster during the epidemic followed a different pattern. The churchwardens' accounts show that men were employed in tasks ranging from dog killer to padlock maker and from gravedigger to doctor. One of the most frequently-recorded male tasks was that of 'Warder', which appears to have been close in function and status to that of 'nurse': during the epidemic, approximately £84 were spent on employing possibly as many as 100 men.[41] Unlike the women, the men constituted a defined

[41] As with 'nurses' it is impossible to be precisely accurate in these figures because a significant number of payments were made to anonymous individuals.

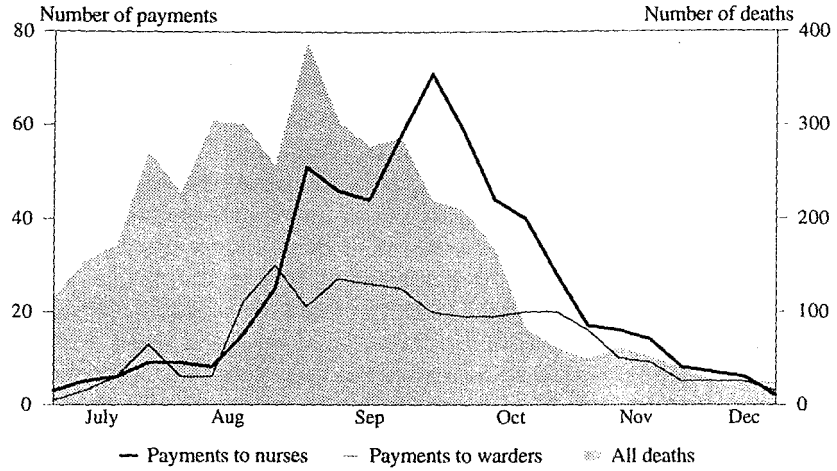


FIG. 31. Deaths and payments to nurses and warders in St Margaret Westminster by week, 1665.

Source: Parish Database.

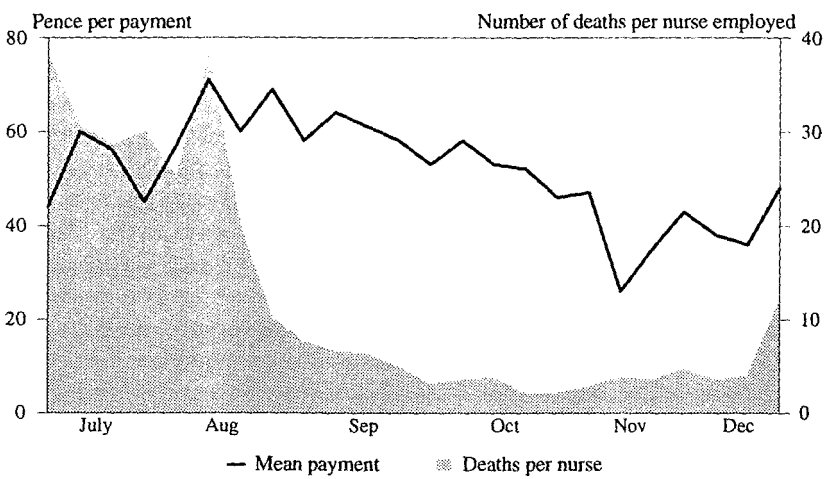


FIG. 32. Mean size of payments and deaths per nurse in St Margaret Westminster by week, 1665.

Source: Parish Database.

and regular workforce, although there were some men who performed duties only on single occasions (Fig. 31). The trend in the number of warders employed was clearly related to the pattern of the epidemic. The number increased to about 25 as the epidemic neared its climax; it then remained steady as the peak passed; and then slowly fell. This trend suggests that the males remaining in the parish may

not have become quite so desperate for employment, or so in need of relief, as the women did. Combined with the fact that a minority of the men seem to have been employed for lengthy periods, it also suggests that warders were employed to take care of certain districts within the parish. It is hard to discover what their duties were, but they perhaps combined a guarding role with that of provisioning those houses that were shut up. The accounts sometimes refer to an individual as warder for a specific area: King Street, Bell Alley, and Theeving Lane are most frequently mentioned. Although the mean payment to a warder was about 5s. for a week, some of the men received substantial remuneration. William Haythorne, for example, was paid a total of £5 12s. between 24 July and 28 December, while Aron Prosser got £3 17s. 6d. between 21 August and 16 November. These men received a tolerable living from their jobs. More significantly, being a warder was an occupation that involved working in the streets, probably making sure that those households which were infected remained secure. It did not involve direct contact with the diseased. So in one sense the men (presumably poor) who were employed had an experience of managing the epidemic which differed from that of the women: their relative safety and secure incomes contrasted with the women's more casual and risky employment.

VII

Conclusion: Economy and Disease in Restoration London

The image of gangs of women breaking into 'shut up' houses and 'imbezilling infected goods' is a powerful one to illuminate the social dynamics of the epidemic in 1665: a central theme of this study is that the relationship between poverty and disease was much more complex than the assumptions of traditional historiography have suggested. Although it is clear that there were broad epidemiological factors that point to determinants rooted in an environmental infrastructure, it is similarly apparent that the social and economic dynamics of metropolitan life contributed to the patterns of disease in 1665. One immediate consequence of the investigation calls for a revision of the classic biomedical theory that identified the epidemiological vectors of rats and fleas as the motor behind the spread and diffusion of the plague. Although there does seem to be a relationship between the areas with less salubrious living conditions and an increased incidence of deaths the connection was neither a necessary one, nor one that can be explained by the bionomics of animal and insect behaviour. To reinforce this suggestion it is worth briefly examining what evidence can be drawn from the *Bills of Mortality* to either support or refute the classical theory. The classic model of infection would propose that epidemics shadow epizootics: that is, that since the disease originates in infected rodent populations and is transmitted by hungry fleas transferring from a dead or dying rat community to human beings it should be possible to track the movement of the infection from an original focus of infection across the urban geography. As epidemiologists have stressed, the diffusion of the disease through a human population is dependent upon the health (or otherwise) of the rat population as well as the very specific ecological conditions that determine the breeding and growth of the flea population. The classic model would then suggest a slow diffusion from an identifiable focus (or foci) of infection.[1] The evidence of the *Bills of Mortality* does not sustain this analysis. By plotting the first incidence of plague in any parish it is possible to construct a map of the diffusion of the epidemic (see Fig. 33). Importantly, when considering this figure it is worth stressing that the relationship represented was not necessarily one that implied movement of the disease from one infected area to another. As illustrated, the plague first took hold in the west of the metropolis (St Giles in the Fields), but the next outbreaks happened simultaneously in the western

[1] The alternative suggestion proposed by Shrewsbury (1970) was that plague was endemic in the metropolis and triggered by changes in temperature: for a rebuttal, see Twigg (1993).

suburb (St Andrews Holborn and St Clement Danes) and within the city walls (St Mary Woolchurch). Clearly the three western parishes are broadly proximate, but equally clearly they share little in common with the central parish. Week three of the outbreak saw an even more diffuse pattern with new infections in St Dunstan in the West (again near the original location), in St Botolph without Bishopsgate (a north-east extramural parish) and in St Olave Southwark the other side of the river. This diverse pattern of new infections persists throughout the first ten weeks of the epidemic: whatever logical connection that might exist between the locations of infection it is not one that falls within the recognised epidemiology of a rat- and flea-borne plague. Although it is difficult to make any specific remarks about the vectors that might link the chronology of infection it is possible to make one or two further comments on the geography of the epidemic. Firstly, the parishes that suffered initially (say within five weeks of the outbreak) with one exception all fall in the extramural suburbs to the west, north, east and even south of the city. Secondly, although there is a clustering of parishes infected within the city walls towards the west end, the disease erupted in a wide variety of intramural parishes, both east and west, and north and along the river front. Indeed, for the twenty infected parishes within the walls for which hearth tax figures survive, the mean number of hearths per household stood at 5: thus, both poor riverside parishes such, as St Martin's Vintry or All Hallows, Barking, and wealthy areas such as St Andrew Cornhill and St Helen Bishopsgate were among the initial casualties of the epidemic.

One theme that can be developed from the material under examination in this study is that each parish in the metropolis, although part of a wider urban ecology, also had its own localised epidemiological and environmental regime which was not necessarily shared with even very proximate locations. Indeed, further evidence for this suggestion can be found from examining the data for the individual seasonalities of plague deaths for each parish in the metropolitan area. As discussed above (pages 23–42) within the four different sectors of the metropolis (as defined by the *Bills of Mortality*) it is possible to discern distinct and different seasonal patterns (both endemic and epidemic). Moreover, focusing upon the individual parish locations provides an even more textured picture of the experience of death. Using Graham Twigg's working definitions, it is possible to classify the types of epidemic seasonalities according to three broad categories: plague mortality pattern, extended mortality pattern and enteric mortality pattern.[2] Applying this classification to the 1665 mortality data derived from the *Bills* with some modification results in a pattern of distribution represented by Fig. 34.[3] Not only did the parishes of metropolitan London suffer different chronologies of peak

[2] For a full discussion, see Twigg (1993), 7–9.

[3] Although Twigg's threefold classification has been used it would be possible to introduce a distinction between the plague mortality pattern that had a single peak and that which had a double peak. Interestingly, at a metropolitan level this double peak is quite pronounced and may be explained by the different chronologies of seasonalities in diverse areas. See Chapter III, above.

FIG. 33. First recorded incidences of plague in parishes, 1665

The numbers indicate the order of parishes in which plague was first recorded in the bills of mortality for 1665. The numbers correspond to the week numbered in the *Bills* as follows: 1 (week 18), 2 (20), 3 (22), 4 (24), 5 (25), 6 (26), 7 (27), 8 (28), 9 (29), 10 (30). For dates of those weeks, see Appendix II.

FIG. 34. Mortality patterns, 1665.

All parishes other than those with symbols, displayed the plague pattern of mortality. For a discussion of these categories, see Twigg (1993).

mortality, but between July and September the shape of seasonal mortality was different. As can be seen, nearly two-thirds (*c.*63 percent) of the parishes experienced the plague mortality pattern: of these 54 out of the 78 parishes had the double peak noted above, while the remainder suffered a single peak. About a quarter of the parishes suffered the extended mortality pattern, while just over a tenth of the metropolitan locations experienced the enteric pattern. Importantly, with the exception of the Minories and St Mary Savoy, all the non-plague mortality patterns happened within the city walls, although this was not to the exclusion of classic plague seasonalities (both single and double peaked). The most obvious comment to make upon this evidence is that it is very difficult to describe any coherent logic to the distribution. The reasons for extended and enteric patterns of plague mortality within the city walls could have been manifold. For example, the parishes with enteric patterns (with one or two exceptions) do seem to follow a line from the riverside parishes of St Martin Orgar and St Michael Crooked Lane west to St John Zachary, which may have shadowed either the transport network or water supply. Other investigations would need to pay close attention to the relationship between household and population density and these different patterns. What can be noted with some confidence is the lack of correspondence between the chronology of the outbreaks (Fig.33) and the type of outbreak (Fig. 34) which reinforces the suggestion that in one sense each parish suffered different epidemics and indeed may have actually suffered from different combinations of diseases. Certainly, when combined with the evidence of crisis mortality rates on non-plague deaths (see pages 26–8, above) the image of the metropolis being struck down by one single infection that swept uniformly across the urban space is untenable.

Exploring the patterns of deaths across the metropolis and in closer focus in the individual parishes also tends to reinforce the arguments against a simple connection between poverty, location and disease. Thinking about the social dynamics of urban life and work has suggested a different explanation for the way the epidemics of 1665 affected the diverse areas of London, Westminster and the suburbs. In particular, concentrating on the fact of an increase in the mortality of women in 1665 has led to the development of an approach to understanding the dynamics of infection and illness as determined primarily not by the pathogenic qualities of the disease but by the social and material infrastructure of urban life. Thus belonging to a community that occupied a marginal position within the working life of the metropolis (and the consequent disruption of that economy in times of crisis) seems to have been more important in effecting patterns of death than whether or not such communities or individuals lived or were proximate to dirty or rat-infested environments. Poverty caused death during the plague, not because it meant that men, women and children would encounter infested spaces more readily, but because it acted as an anchor to an environment that pretty uniformly entertained the prospect of disease

irrespective of status or local cleanliness. The poor who could not survive without wages were simply prevented from leaving the metropolis: they had to earn a living, and providing services for the ill, dying and dead was a major opportunity. Thus, poverty seems to have had more influence as an epidemiological factor by determining the nature and social characteristics of the population who remained resident during the crisis than by influencing the nutritional or health status of the population in a more straightforwardly biological manner. It seems to have been less that poor and marginal men and women were more liable to contract diseases, and rather that their lack of access to alternative sources of employment outside London, in combination with the civic policy of restricting mobility during the crisis to those of higher rank, tied them to the city and suburbs and thereby caused them to represent a higher proportion than normal of those who were exposed to whatever pathogens were present. Such an argument reinforces and confirms Paul Slack's point that the urban experience of plague epidemics was a process 'bound up with the economic and social fabric of the urban community'.[4]

[4] Slack (1985), 111.

APPENDIX I

THE PARISHES OF METROPOLITAN LONDON AS DESCRIBED IN THE BILLS OF MORTALITY AND ATTRIBUTED DATA.[1]

No.[2]	Parish	No. of Deaths		CMR	No. of households	Total no. of hearths	Mean no. of hearths
		1665	1655-64				
	Intramural parishes						
1	St Alban Wood Street	200	45	4.4	129	606	4.7
2	All Hallows Barking	514	91	5.6	459	1734	3.8
3	All Hallows Bread Street	35	18	1.9	27	189	7.0
4	All Hallows the Great	455	85	5.4	273	849	3.1
5	All Hallows Honey Lane	10	8	1.3	37	215	5.8
6	All Hallows the Less	239	41	5.8	-	-	-
7	All Hallows Lombard Street	90	23	3.9	99	543	5.5
8	All Hallows Staining	185	35	5.3	161	727	4.5
9	All Hallows on the Wall	500	67	7.5	-	-	-
10	St Alphage	271	42	6.5	174	773	4.4
11	St Andrew Hubbard	71	26	2.7	102	404	4.0
12	St Andrew Undershaft	274	55	5.0	222	1337	6.0
13	St Andrew by the Wardrobe	476	86	5.5	-	-	-
14	St Anne Aldersgate	282	42	6.7	266	1163	4.4
15	St Anne Blackfriars	652	102	6.4	267	1482	5.6
16	St Antholin	58	2	2.9	88	510	5.8
17	St Augustine by St Paul's	43	17	2.5	67	317	4.7
18	St Bartholomew Exchange	73	25	2.9	-	-	-
19	St Benet Fink	47	26	1.8	-	-	-
20	St Benet Gracechurch	57	9	6.3	65	351	5.4
21	St Benet Paul's Wharf	355	58	6.1	-	-	-
22	St Benet Sherehog	11	9	1.2	36	183	5.1
23	St Botolph Billingsgate	83	21	4.0	106	411	3.9
24	Christ Church Newgate Street	653	141	4.6	466	1951	4.2
25	St Christopher	60	18	3.3	-	-	-
26	St Clement Eastcheap	38	16	2.4	65	324	5.0
27	St Dionis Backchurch	78	34	2.3	134	851	6.4
28	St Dunstan in the East	265	77	3.4	272	1236	4.5
29	St Edmund Lombard Street	70	21	3.3	97	477	4.9
30	St Ethelburga	195	24	8.1	124	624	5.0
31	St Faith	104	24	4.3	173	1033	6.0
32	St Fosters (St Vedast)	144	31	4.6	135	651	4.8
33	St Gabriel Fenchurch	69	19	3.6	79	439	5.6
34	St George Botolph Lane	41	1	4.1	46	222	4.8
35	St Gregory by St Paul's	376	106	3.5	358	1865	5.2
36	St Helen	108	3	3.6	127	826	6.5
37	St James Duke's Place	262	35	7.5	216	941	4.4
38	St James Garlickhithe	189	39	4.8	183	382	2.1
39	St John the Baptist (Walbrook)	138	3	4.6	112	525	4.7

No.	Parish	No. of deaths		CMR	No. of	Total no.	Mean no.
		1665	1655-64		households	of hearths	of hearths
40	St John the Evangelist	9	6	1.5	-	-	-
41	St John Zachary	85	23	3.7	-	-	-
42	St Katharine Coleman	299	33	9.1	198	821	4.1
43	St Katharine Cree	335	62	5.4	223	928	4.2
44	St Lawrence Jewry	94	47	2.0	163	1005	6.2
45	St Lawrence Poutney	214	38	5.6	-	-	-
46	St Leonard Eastcheap	42	15	2.8	127	508	4.0
47	St Leonard Foster Lane	335	56	6.0	215	718	3.3
48	St Magnus	103	34	3.0	118	541	4.6
49	St Margaret Lothbury	100	34	2.9	-	-	-
50	St Margaret Moses	38	14	2.7	68	369	5.4
51	St Margaret New Fish Street	114	26	4.4	110	479	4.4
52	St Margaret Pattens	49	14	3.5	65	305	4.7
53	St Mary Abchurch	99	35	2.8	-	-	-
54	St Mary Aldermanbury	181	37	4.9	152	766	5.0
55	St Mary Aldermary	105	26	4.0	-	-	-
56	St Mary le Bow	64	19	3.4	103	545	5.3
57	St Mary Bothaw	55	18	3.1	58	341	5.9
58	St Mary Colechurch	17	11	1.5	54	292	5.4
59	St Mary at Hill	94	23	4.1	145	684	4.7
60	St Mary Mounthaw	56	13	4.3	-	-	-
61	St Mary Somerset	342	57	6.0	36	135	3.6
62	St Mary Staining	47	1	4.7	72	298	4.1
63	St Mary Woolchurch	65	21	3.1	-	-	-
64	St Mary Woolnoth	75	19	3.9	103	562	5.5
65	St Martin Ironmonger Lane	21	2	1.0	51	278	5.5
66	St Martin Ludgate	196	51	3.8	237	1158	4.9
67	St Martin Orgar	110	23	4.8	-	-	-
68	St Martin Outwich	60	24	2.5	42	210	5.0
69	St Martin Vintry	417	49	8.5	-	-	-
70	St Matthew Friday Street	24	16	1.5	48	285	5.9
71	St Mary Magdalen Milk Street	44	2	2.2	62	355	5.7
72	St Mary Magdalen Old Fish St	176	37	4.8	-	-	-
73	St Michael Bassishaw	253	41	6.2	165	801	4.9
74	St Michael Cornhill	104	29	3.6	233	1160	5.0
75	St Michael Crooked Lane	179	35	5.1	129	604	4.7
76	St Michael Queenhithe	203	47	4.3	136	495	3.7
77	St Michael le Querne	44	2	2.2	89	469	5.3
78	St Michael Paternoster Royal	152	23	6.6	103	369	3.6
79	St Michael Wood Street	122	21	5.8	107	589	5.5
80	St Mildred Bread Street	59	2	3.0	36	206	5.7
81	St Mildred Poultry	68	24	2.8	74	387	5.2
82	St Nicholas Acon	46	14	3.3	67	359	5.4
83	St Nicholas Cole Abbey	125	31	4.0	157	569	3.6
84	St Nicholas Olave	90	18	5.0	-	-	-
85	St Olave Hart Street	237	48	4.9	274	1403	5.1
86	St Olave Old Jewry	54	16	3.4	58	336	5.8

No.	Parish	No. of deaths		CMR	No. of households	Total no. of hearths	Mean no. of hearths
		1665	1655-64				
87	St Olave Silver Street	250	39	6.4	128	596	4.7
88	St Pancras Soper Lane	30	13	2.3	50	273	5.5
89	St Peter Westcheap	61	16	3.8	82	419	5.1
90	St Peter Cornhill	136	31	4.4	66	337	5.1
91	St Peter Paul's Wharf	79	23	3.4	-	-	-
92	St Peter the Poor	114	22	5.2	89	286	3.2
93	St Stephen Coleman Street	560	123	4.6	621	2888	4.7
94	St Stephen Walbrook	34	18	1.9	69	449	6.5
95	St Swithin	93	31	3.0	106	555	5.2
96	St Thomas the Apostle	163	28	5.8	-	-	-
97	Holy Trinity (the Less)	115	28	4.1	-	-	-
	Extramural parishes						
98	St Andrew Holborn	3958	702	5.6	473	2977	6.3
99	St Bartholomew the Great	493	84	5.9	279	1238	4.4
100	St Bartholomew the Less	193	46	4.2	122	625	5.1
101	St Bride	2111	373	5.7	1428	5637	3.9
102	Bridewell	230	33	7.0[1]	-	-	-
103	St Botolph Aldersgate	997	153	6.5	505	2582	5.1
104	St Botolph Aldgate	4926	712	6.9	1556	3859	2.5
105	St Botolph Bishopsgate	3464	519	6.7	898	2368	2.6
106	St Dunstan in the West	958	237	4.0	1226	6478	5.3
107	St George Southwark	1613	252	6.4	717	2550	3.6
108	St Giles Cripplegate	8069	1149	7.0	222	6722	3.0
109	St Olave Southwark	4793	725	6.6	78	337	4.3
110	St Saviour Southwark	4235	558	7.6	2587	7148	2.8
111	St Sepulchre	4509	761	5.9	1015	1733	1.7
112	St Thomas Southwark	475	54	8.8	-	-	-
113	Holy Trinity Minories	168	13	12.9	114	366	3.2
	Outlying parishes						
114	St Giles in the Fields	4457	78	5.7	1524	7293	4.8
115	Hackney Parish	232	84	2.8	-	-	-
116	St James Clerkenwell	1863	331	5.6	1172	383	3.3
117	St Katharine by the Tower	956	182	5.3	91	210	2.3
118	Lambeth Parish	798	232	3.4	829	2641	3.2
119	St Leonard Shoreditch	2669	342	7.8	800	2083	2.6
120	St Magdalen Bermondsey	1943	363	5.4	1788	4519	2.5
121	St Mary Newington	1272	191	6.7	570	1690	3.0
122	St Mary Islington	-	-	-	-	-	-
123	St Mary Whitechapel	4766	677	7.0	2482	5897	2.4
124	Rotherhithe Parish	-	-	-	-	-	-
125	Stepney Parish	8598	1375	6.3	7278	20372	2.8

No.	Parish	No. of deaths		CMR	No. of households	Total no. of hearths	Mean no. of hearths
		1665	1655-64				
Westminster parishes							
126	St Clement Danes	1969	483	4.1	860	5097	5.9
127	St Paul Covent Garden	408	127	3.2	485	3750	7.7
128	St Martin in the Fields	4804	1122	4.3	3072	15300	5.0
129	St Mary Savoy	303	84	3.6	148	857	5.8
130	St Margaret Westminster	4710	843	5.6	3061	12811	4.2

[1] The figures for the number of households and hearths were compiled from the Parish Database and aggregate data generously provided by Michael Power.

[2] Identification number on the map of metropolitan parishes (Fig. 2, p. 12, above). The parishes are listed in the same order as in the *Bills of Mortality*.

APPENDIX II

CRISIS MORTALITY RATIOS FOR 'RESIDUE' DEATHS, 1665

Week (Bill)	Date	Intramural parishes	Extramural parishes	Outlying parishes	Westminster	Metropolitan area
1	20–27 December	0.91	1.02	0.78	0.83	0.90
2	28 December–3 January	0.99	1.20	1.21	1.00	1.13
3	4–10 January	1.25	1.08	1.22	1.12	1.16
4	11–17 January	1.36	1.17	1.26	1.14	1.22
5	18–24 January	1.63	1.34	1.39	1.33	1.42
6	25–31 January	1.38	1.20	1.47	1.31	1.32
7	1– 7 February	1.29	1.17	1.11	1.21	1.19
8	8–14 February	1.21	1.43	1.43	1.43	1.38
9	15–21 February	1.24	1.33	1.07	1.42	1.26
10	22–28 February	0.99	1.33	1.36	1.37	1.27
11	1– 7 March	1.24	1.45	1.28	1.57	1.39
12	8–14 March	1.13	1.68	1.36	1.20	1.41
13	15–21 March	0.99	1.04	1.27	1.50	1.15
14	22–28 March	0.97	1.23	0.88	1.09	1.07
15	29 March–4 April	1.14	1.15	1.01	1.02	1.09
16	5–11 April	1.13	1.18	1.19	0.92	1.13
17	12–18 April	1.02	1.12	1.16	1.37	1.13
18	19–25 April	1.14	1.23	1.65	1.47	1.36
19	26 April–2 May	1.19	1.12	1.61	1.89	1.37
20	3–9 May	0.78	1.07	1.41	1.04	1.09
21	10–16 May	0.93	1.07	1.42	1.42	1.18
22	17–23 May	1.17	1.12	1.65	1.43	1.31
23	24–30 May	1.06	1.17	1.86	1.51	1.39
24	31 May– 6 June	1.28	1.25	1.34	1.44	1.31
25	7–13 June	1.19	1.43	2.14	1.45	1.59
26	14–20 June	1.06	1.61	1.91	1.95	1.65
27	21–27 June	0.82	1.52	1.75	1.52	1.45
28	28 June–4 July	1.46	1.92	2.22	2.40	2.00
29	5–11 July	1.16	2.11	2.19	2.54	2.03
30	12–18 July	1.77	2.98	2.17	2.25	2.43
31	19–25 July	1.85	3.76	2.69	3.09	3.00
32	26 July–1 August	2.05	4.36	2.58	2.81	3.25
33	2–8 August	2.46	6.19	2.57	3.30	4.03
34	9–15 August	3.00	7.13	3.61	3.23	4.76
35	16–22 August	2.69	5.87	3.30	2.39	4.01
36	23–29 August	3.82	5.14	2.78	3.52	3.99
37	30 August–5 September	4.16	4.64	2.82	2.91	3.80
38	6–12 September	3.79	4.21	2.18	2.23	3.26
39	13–19 September	4.47	4.45	1.76	2.00	3.33
40	20–26 September	4.34	3.52	1.70	1.87	2.89

Week (Bill)	Date	Intramural parishes	Extramural parishes	Outlying parishes	Westminster	Metropolitan area
41	27 September–3 October	3.59	2.97	1.77	2.33	2.64
42	4–10 October	3.45	2.59	2.07	2.18	2.55
43	11–17 October	2.21	2.17	1.69	1.39	1.93
44	18–24 October	1.47	1.41	1.26	0.81	1.29
45	25–31 October	1.56	1.08	1.40	0.85	1.23
46	1– 7 November	1.89	1.01	1.57	1.27	1.38
47	8–14 November	1.62	0.83	1.22	1.33	1.18
48	15–21 November	1.13	0.79	0.89	0.82	0.89
49	22–28 November	0.98	0.67	0.67	0.73	0.74
50	29 November–5 December	0.92	0.78	0.91	0.58	0.81
51	6–12 December	0.58	0.50	0.83	0.51	0.61
52	13–19 December	0.91	0.65	0.93	0.43	0.74

Source: for calculation method, see pp. 24–8, above.

APPENDIX III

WEEKLY CRISIS MORTALITY RATIOS FOR THE METROPOLIS, 1665

Week	Inmural parishes	Extramural parishes	Outlying parishes	Westminster	Male deaths	Female deaths	Total deaths
1	0.91	1.02	0.78	0.83	0.92	1.07	0.90
2	0.99	1.20	1.21	1.00	1.01	1.26	1.04
3	1.25	1.08	1.22	1.12	1.22	1.26	1.16
4	1.36	1.17	1.26	1.14	1.35	1.29	0.93
5	1.63	1.34	1.39	1.33	1.44	1.50	1.12
6	1.38	1.20	1.47	1.31	1.42	1.44	1.32
7	1.29	1.17	1.11	1.21	1.11	1.55	1.19
8	1.21	1.43	1.44	1.43	1.48	1.53	1.39
9	1.24	1.33	1.07	1.42	1.27	1.41	1.26
10	0.99	1.33	1.36	1.37	1.28	1.44	1.27
11	1.24	1.45	1.28	1.57	1.38	1.53	1.39
12	1.13	1.68	1.36	1.20	1.41	1.70	1.41
13	0.99	1.04	1.27	1.50	1.25	1.26	1.15
14	0.97	1.23	0.88	1.09	1.13	1.20	1.07
15	1.14	1.15	1.01	1.02	1.12	1.22	1.09
16	1.13	1.18	1.19	0.92	1.19	1.21	1.13
17	1.02	1.12	1.16	1.37	1.22	1.20	1.13
18	1.14	1.23	1.68	1.47	1.40	1.43	1.36
19	1.19	1.12	1.61	1.89	1.35	1.54	1.37
20	0.79	1.08	1.44	1.12	1.17	1.12	1.12
21	0.93	1.07	1.43	1.47	1.20	1.37	1.19
22	1.17	1.14	1.74	1.55	1.35	1.58	1.36
23	1.06	1.21	1.99	1.60	1.48	1.51	1.45
24	1.28	1.35	1.75	1.47	1.57	1.56	1.47
25	1.26	1.69	3.05	1.68	1.96	2.32	1.99
26	1.25	1.96	3.22	2.40	2.38	2.65	2.27
27	0.89	2.01	3.68	2.83	2.40	2.69	2.38
28	1.94	3.56	4.54	4.84	3.74	4.59	3.75
29	1.72	4.50	5.91	6.86	5.20	5.28	4.73
30	2.94	6.87	7.26	7.25	7.10	7.34	6.36
31	3.95	10.00	10.08	10.15	9.73	10.47	5.68
32	4.00	12.21	9.57	10.30	11.50	10.70	9.75
33	6.31	17.32	12.45	13.77	14.87	15.69	13.34
34	7.75	24.10	17.77	15.63	18.70	20.02	17.73
35	8.41	23.26	15.87	13.00	18.15	19.94	16.77
36	15.30	26.67	19.85	17.82	24.43	24.08	21.48
37	18.33	29.65	24.99	18.06	25.41	28.33	24.78
38	16.97	26.63	22.28	15.35	23.50	25.70	21.85
39	21.96	28.82	23.77	18.30	24.67	30.01	24.40

Week	Inmural parishes	Extramural parishes	Outlying parishes	Westminster	Male deaths	Female deaths	Total deaths
40	22.64	21.68	20.16	13.65	22.00	23.54	20.09
41	20.52	19.98	18.66	16.05	20.60	21.46	19.07
42	19.80	17.13	18.22	13.57	19.85	20.73	17.42
43	13.34	11.27	11.00	8.18	11.51	13.07	11.22
44	5.94	5.80	7.33	4.47	6.70	6.48	6.06
45	5.51	4.43	5.44	3.43	5.28	5.08	4.77
46	7.60	5.46	7.91	5.78	6.88	7.51	6.62
47	6.65	3.75	6.67	3.90	4.60	6.80	5.19
48	3.25	2.92	4.03	2.44	3.20	3.66	3.20
49	2.47	1.42	2.25	1.80	1.73	2.40	1.92
50	1.39	1.45	2.08	1.29	1.66	1.95	1.59
51	1.47	1.07	1.67	1.30	1.46	1.63	1.35
52	1.91	1.26	2.15	1.10	1.70	1.92	1.60

Sources and Calculations: the *Bills of Mortality* 1655–65. See the Glossary for the method for deriving figures. For dates corresponding to week numbers, see Appendix II, above.

APPENDIX IV

SEASONALITY OF DEATHS (AS PERCENTAGE) DISTRIBUTED ACCORDING TO THE NUMBER OF HEARTHS PER HOUSEHOLD IN ST JAMES CLERKENWELL, ST BOTOLPH ALDGATE, ST DUNSTAN IN THE WEST AND ST SAVIOUR SOUTHWARK

St James Clerkenwell

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.68	2.09	0.00	0.00	0.00	2.32
3	0.55	0.84	1.39	0.00	0.00	5.55	0.00
4	0.00	1.68	0.69	1.81	6.66	5.55	0.00
5	0.55	0.84	1.39	0.00	0.00	0.00	2.32
6	0.55	0.00	0.69	1.81	0.00	0.00	2.32
7	0.55	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	1.39	1.81	0.00	0.00	0.00
9	0.55	2.52	0.00	0.00	0.00	0.00	2.32
10	0.55	0.00	2.09	0.00	0.00	0.00	4.65
11	0.55	0.84	2.79	0.00	0.00	0.00	0.00
12	1.67	0.84	0.00	0.00	0.00	0.00	2.32
13	0.55	0.84	0.69	0.00	0.00	0.00	2.32
14	0.00	0.84	0.00	0.00	0.00	0.00	0.00
15	0.55	0.84	0.00	0.00	0.00	5.55	2.32
16	2.79	0.00	0.00	1.81	0.00	0.00	0.00
17	0.55	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.55	0.00	2.09	0.00	0.00	0.00	0.00
21	0.55	0.00	0.00	0.00	6.66	0.00	0.00
22	0.00	0.84	0.00	0.00	0.00	5.55	0.00
23	0.55	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.55	0.00	1.39	1.81	0.00	5.55	2.32
26	2.23	0.00	2.09	5.45	0.00	0.00	0.00
27	1.11	0.84	0.00	0.00	0.00	0.00	0.00
28	5.58	5.04	5.59	3.63	0.00	11.10	2.32
29	5.02	5.88	6.99	9.09	6.66	0.00	0.00
30	8.37	8.40	1.39	1.81	0.00	5.55	0.00
31	7.26	5.04	13.20	3.63	6.66	0.00	4.65
32	15.00	17.60	14.60	18.10	6.66	5.55	9.30
33	7.82	5.04	2.79	9.09	6.66	0.00	16.20
34	11.10	7.56	5.59	5.45	6.66	5.55	6.97
35	5.58	10.00	8.39	9.09	26.60	11.10	16.20
36	7.26	3.36	6.99	7.27	0.00	16.60	9.30
37	3.91	5.04	4.89	0.00	0.00	0.00	0.00

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
38	1.11	3.36	2.79	9.09	20.0	5.55	4.65
39	1.11	2.52	0.00	0.00	0.00	0.00	0.00
40	0.55	0.00	0.00	0.00	0.00	0.00	2.32
41	0.55	1.68	2.09	3.63	0.00	0.00	2.32
42	0.00	2.52	2.09	1.81	6.66	5.55	0.00
43	1.11	2.52	2.09	1.81	0.00	0.00	0.00
44	2.23	0.84	0.69	1.81	0.00	0.00	2.32
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	0.55	0.00	0.00	0.00	0.00	5.55	0.00
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.69	0.00	0.00	0.00	0.00
51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total Deaths	179	119	143	55	15	18	43

St Botolph Aldgate

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
1	0.34	0.21	0.72	0.64	0.00	1.14	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.34	0.00	0.24	0.00	0.00	0.00	1.44
4	0.17	0.42	0.24	0.00	0.00	0.00	1.44
5	0.17	0.21	0.48	1.29	1.14	0.00	0.00
6	0.34	0.21	0.00	0.00	1.14	0.00	0.00
7	0.34	0.85	0.96	0.00	0.00	0.00	0.00
8	0.17	0.00	0.24	0.00	0.00	1.14	0.00
9	0.17	0.21	0.00	0.00	0.00	0.00	0.00
10	0.34	0.64	0.48	0.64	0.00	0.00	0.00
11	0.86	0.21	1.44	0.00	0.00	0.00	2.89
12	0.34	0.00	0.48	0.00	2.29	0.00	0.00
13	0.68	0.21	0.24	0.64	1.14	0.00	1.44
14	0.51	0.21	0.48	0.00	0.00	0.00	0.00
15	0.17	0.42	0.00	0.00	1.14	2.29	0.00
16	0.68	0.00	0.72	0.00	0.00	0.00	0.00
17	0.34	0.21	0.48	0.00	0.00	1.14	0.00
18	0.34	0.85	0.24	0.00	1.14	0.00	0.00
19	0.00	0.21	0.72	0.00	0.00	0.00	0.00
20	0.17	0.21	0.48	0.00	0.00	0.00	0.00
21	0.17	0.42	0.48	0.64	0.00	0.00	0.00
22	0.34	0.42	0.24	0.00	0.00	0.00	0.00

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
23	0.17	0.00	0.24	0.00	0.00	0.00	0.00
24	0.17	0.21	0.24	1.29	0.00	0.00	0.00
25	0.17	0.42	0.48	0.00	1.14	0.00	1.44
26	0.34	0.42	0.00	0.00	0.00	0.00	0.00
27	0.51	0.21	0.00	0.00	2.29	0.00	0.00
28	0.34	0.21	0.72	0.64	2.29	1.14	1.44
29	0.68	0.00	0.24	0.00	0.00	2.29	0.00
30	1.03	1.06	0.72	2.58	0.00	1.14	1.44
31	0.68	1.28	1.20	3.22	3.44	0.00	4.34
32	2.41	3.41	3.61	0.64	1.14	0.00	4.34
33	2.93	2.99	2.65	5.80	1.14	1.14	4.34
34	4.48	5.55	2.89	1.93	3.44	4.59	5.79
35	11.00	4.70	5.78	7.09	2.29	3.44	7.24
36	9.82	7.26	6.50	7.74	8.04	12.60	4.34
37	6.37	7.26	6.74	6.45	5.74	9.19	1.44
38	13.20	12.30	13.40	14.80	11.40	14.90	2.89
39	9.82	12.10	9.87	14.80	12.60	6.89	15.90
40	8.79	9.40	9.15	9.03	6.89	9.19	11.50
41	5.51	8.33	6.50	5.16	2.29	6.89	8.69
42	4.31	5.55	6.98	6.45	6.89	4.59	4.34
43	2.06	3.63	4.33	1.29	5.74	5.74	7.24
44	1.72	1.49	1.92	1.93	2.29	1.14	0.00
45	1.37	1.70	0.72	1.29	1.14	3.44	0.00
46	1.72	1.70	2.16	1.29	4.59	2.29	2.89
47	0.86	0.64	1.20	1.29	2.29	0.00	2.89
48	0.34	0.00	0.96	0.00	1.14	1.14	0.00
49	0.86	0.42	0.00	0.00	1.14	1.14	0.00
50	0.34	0.21	0.24	0.64	1.14	0.00	0.00
51	0.17	0.85	0.96	0.00	1.14	0.00	0.00
52	0.51	0.21	0.00	0.64	0.00	1.14	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total Deaths	580	468	415	155	87	87	69

St Dunstan in the West

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	9.52	0.90
4	1.53	0.00	0.00	0.00	0.00	0.00	1.81
5	0.00	2.04	0.00	1.14	0.00	0.00	2.72
6	0.00	2.04	1.88	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	9.52	0.00

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
8	3.07	4.08	3.77	1.14	0.00	0.00	2.72
9	1.53	0.00	1.88	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	2.77	0.00	0.90
11	3.07	0.00	1.88	2.29	2.77	0.00	0.90
12	0.00	0.00	0.00	0.00	0.00	0.00	1.81
13	0.00	0.00	0.00	1.14	0.00	4.76	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	1.81
15	1.53	2.04	0.00	1.14	2.77	0.00	0.00
16	0.00	2.04	1.88	0.00	0.00	0.00	0.90
17	1.53	0.00	0.00	0.00	0.00	4.76	0.00
18	0.00	0.00	0.00	1.14	5.55	0.00	0.00
19	0.00	2.04	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1.53	0.00	0.00	0.00	0.00	0.00	0.90
22	0.00	0.00	0.00	1.14	0.00	0.00	0.00
23	0.00	0.00	3.77	0.00	0.00	0.00	0.90
24	0.00	4.08	1.88	0.00	0.00	0.00	0.00
25	0.00	2.04	0.00	0.00	0.00	0.00	0.90
26	1.53	0.00	0.00	1.14	0.00	0.00	1.81
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	1.53	4.08	0.00	1.14	0.00	0.00	0.00
29	4.61	2.04	0.00	3.44	0.00	9.52	2.72
30	3.07	2.04	1.88	0.00	0.00	0.00	0.00
31	1.53	2.04	0.00	3.44	5.55	0.00	1.81
32	1.53	2.04	1.88	3.44	0.00	0.00	1.81
33	0.00	2.04	13.20	2.29	5.55	0.00	2.72
34	4.61	4.08	9.43	6.89	8.33	4.76	7.27
35	3.07	2.04	3.77	0.00	2.77	4.76	6.36
36	6.15	4.08	5.66	6.89	16.60	9.52	8.18
37	10.70	6.12	5.66	16.00	11.10	4.76	8.18
38	10.70	4.08	9.43	5.74	5.55	0.00	8.18
39	9.23	8.16	9.43	9.19	5.55	4.76	7.27
40	7.69	6.12	0.00	6.89	5.55	4.76	6.36
41	3.07	6.12	5.66	6.89	2.77	4.76	3.63
42	4.61	6.12	5.66	3.44	5.55	4.76	5.45
43	4.61	8.16	0.00	3.44	2.77	4.76	0.90
44	1.53	0.00	7.54	2.29	0.00	0.00	1.81
45	0.00	4.08	1.88	4.59	0.00	0.00	1.81
46	4.61	0.00	0.00	2.29	5.55	0.00	0.90
47	1.53	4.08	1.88	0.00	0.00	4.76	0.90
48	0.00	0.00	0.00	0.00	2.77	4.76	4.54
49	0.00	2.04	0.00	0.00	0.00	4.76	0.00
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	0.00	0.00	0.00	1.14	0.00	0.00	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total Deaths	65	49	53	87	36	21	110

St Saviour Southwark

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.53	0.47	0.53	0.61	1.08	0.00	3.33
3	1.06	0.23	0.27	0.61	0.00	1.75	0.00
4	1.59	0.94	0.27	0.61	0.00	0.00	0.00
5	0.00	0.23	1.07	1.22	1.08	0.00	0.00
6	0.00	0.47	0.80	0.00	2.15	0.00	0.00
7	0.00	0.70	0.53	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	1.22	2.15	1.75	3.33
9	1.59	0.00	0.53	0.61	0.00	0.00	0.00
10	0.53	0.94	1.07	0.61	1.08	0.00	0.00
11	1.06	0.47	0.80	0.00	0.00	0.00	0.00
12	0.53	0.00	0.53	0.00	1.08	1.75	0.00
13	1.59	0.47	0.00	0.00	0.00	0.00	0.00
14	1.59	0.94	0.80	1.22	0.00	1.75	0.00
15	1.06	0.00	0.27	1.83	1.08	0.00	0.00
16	0.53	0.47	0.53	0.00	1.08	1.75	0.00
17	0.53	0.70	0.27	1.22	1.08	1.75	0.00
18	0.53	0.23	1.07	0.00	1.08	0.00	0.00
19	0.00	0.94	0.27	0.00	0.00	0.00	0.00
20	0.00	0.94	0.53	0.00	0.00	0.00	3.33
21	1.59	0.47	0.00	0.00	0.00	0.00	0.00
22	0.00	0.94	0.27	1.83	0.00	0.00	3.33
23	0.53	0.23	0.80	1.83	0.00	1.75	0.00
24	0.00	0.23	0.53	0.00	0.00	0.00	0.00
25	0.00	0.23	0.53	0.61	0.00	0.00	0.00
26	2.12	0.47	0.00	0.61	0.00	0.00	0.00
27	0.00	0.70	0.53	0.61	0.00	0.00	0.00
28	0.00	0.70	0.27	0.61	0.00	0.00	0.00
29	0.53	1.17	0.27	0.00	2.15	0.00	0.00
30	1.06	0.47	0.80	1.83	1.08	0.00	0.00
31	2.12	0.94	0.53	0.00	1.08	0.00	0.00
32	1.59	2.58	1.60	1.22	1.08	0.00	3.33
33	1.06	3.29	0.53	1.22	0.00	1.75	0.00
34	4.23	4.69	4.27	3.05	3.23	5.26	10.00
35	2.65	6.10	4.27	4.88	8.60	8.77	0.00
36	7.94	6.34	7.73	7.32	9.68	8.77	20.00
37	5.82	6.10	12.00	9.15	4.30	7.02	6.67
38	6.35	7.75	9.60	4.88	7.53	8.77	6.67
39	5.82	7.98	8.00	10.98	8.60	12.28	3.33
40	8.99	7.75	6.40	9.15	7.53	5.26	6.67
41	8.47	8.69	5.87	10.98	7.53	8.77	6.67
42	7.94	4.93	7.73	5.49	7.53	7.02	13.33
43	5.82	3.52	4.27	5.49	8.60	1.75	3.33
44	3.70	4.23	1.60	0.61	1.08	1.75	3.33
45	2.12	3.29	3.47	3.05	0.00	1.75	0.00
46	3.70	2.58	2.40	1.83	1.08	5.26	0.00
47	1.06	1.64	2.40	0.00	3.23	0.00	3.33

Week	Number of hearths per household						
	1	2	3	4	5	6	7+
48	1.06	1.41	0.80	1.22	1.08	0.00	0.00
49	0.00	0.23	1.07	0.00	1.08	0.00	0.00
50	1.06	0.94	0.27	0.61	0.00	0.00	0.00
51	0.00	0.23	0.53	1.22	1.08	1.75	0.00
52	0.00	0.00	0.53	0.00	0.00	1.75	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total Deaths	189	426	375	164	93	57	30

For dates corresponding to week numbers, see Appendix II, above.

Manuscript and Printed Sources

The database files constructed for statistical analysis were derived from the following primary sources. The method used to create and manipulate this raw data is described in J.A.I. Champion 'Relational Databases and the Great Plague, 1665' in *History and Computing* (1993).

General
Bodleian Library Gough Adds London 4° 95-97: *Bills of Mortality*, 1655–65
BL, Add Ms 10,117 folio 143 r: T Rugge 'Diurnall'

St Botolph without Aldgate
GLRO, MR/TH/4: Hearth Tax, 1664, Tower Division (East Smithfield)
GL, Ms 9222: Burial Register, 1665
PRO, E179/252/32/21/6: Hearth Tax,1666, Tower Hill
PRO, E179/252/32/21/1: Hearth Tax, 1666, Houndsditch
PRO, E179/252/27: Hearth Tax, 1662–3, Portsoken

Intramural Parishes
Harleian Society: Burial Registers, St Mary Le Bow
Harleian Society: Burial Registers, St Stephen Walbrook
Harleian Society: Burial Registers, All Hallows Honey Lane
PRO, E179/252/32/4: Hearth Tax, 1666, St Magnus
CLRO, Assessment Box 3.1: Militia Tax, 1661, Bridge Ward Without
CMH Transcript: Burial Register, 1665, St Magnus
PRO, E179/252/27: Hearth Tax, 1662, St Michael Queenhithe
CLRO, Assessment Box 66.24: Royal Aid Assessment, 1666, St Michael Queenhithe
GL, 9147: Burial Register, 1665, St Michael Queenhithe
PRO, E179/252/27: Hearth Tax, 1662, for Cheap Ward including St Mary Colechurch, All Hallows Honey Lane)
GL, Ms 243: 'A Weekly Assessment on the inhabitants of the Parish of St Stephens upon Walbrooke London for the Poore of the said Parish for the year 1664'
GL, Ms 4438: Burial Registers, 1665, St Mary Colechurch,
GL, Ms 11361: Burial Registers, 1665, St Magnus Thames Street
GL, Ms 10952: Burial Registers, 1665, St Michael Queenhithe,
PRO, E179/252/32 (1,3,16): Hearth Taxes, 1666, for All Hallows Honey Lane, St Mary Colechurch, St Stephen Walbrook

St James Clerkenwell
GLRO, MR/TH/1: Hearth Tax, 1664
PRO, E179/252/32: Hearth Tax, 1666
Harleian Society: Burial Register, 1665

St Dunstan in the West
CLRO: Assessments 1663-1664
CLRO: Militia Tax (Whitefriars) 1664.
GLRO, MR/TH/2: Hearth Tax, 1664, Rolls Liberty
PRO, E179/147/627: Hearth Tax, 1663, Farringdon Ward Without (Whitefriars), (transcribed by T.C. Dale deposited at the Guildhall Hall Library)
PRO, E179/252/32: Hearth Tax, 1666
PRO, E179/252/27: Hearth Tax, 1662

GL, Ms 2969/2: 'An Assessment on the inhabitants and Landlords' *c.*1666
GL, Ms 2969/2: 'An Assessment for Poll Money'
GL, Ms 3018/1: Wardmoot Inquests
GL, Ms 2968/4: Churchwardens' Accounts
GL, Ms 3016/2: Vestry Minutes

St Saviour Southwark
PRO, E179/187/479: Hearth Tax, 1662, Clink Liberty
PRO, E179/187/479.4: 'A List of the names of those unable to pay Church Duties or to the poore'
PRO, E179/258/7: Hearth Tax, 1666, Boroughside
PRO, E179/258/4: Hearth Tax, 1666
PRO, E179/258/1: Hearth Tax, 1663–4, Clink Liberty
PRO, E179/187/479: Hearth Tax, 1662, Old Paris Garden
GLRO, P92/SAV/356a, 3001-3004: Burial Register, 1665

St Margaret Westminster
City of Westminster Archives Centre: Churchwardens' Accounts, 1665
City of Westminster Archives Centre: 'Plague Relief 1665'
GLRO, MR/TH/ 7: Hearth Tax, 1664

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ISBN 1 870074 13 0