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The History of Infant, Child and Adult Mortality in London, 1550–1850

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The paper uses a range of sources — parish registers, family histories, bills of mortality, local censuses, marriage licences, apprenticeship indentures, and wills — to document the history of mortality of London in the period 1538–1850. The main conclusions of the research are as follows:

1. *Infant and child mortality more than doubled between the sixteenth and the middle of the eighteenth century in both wealthy and non-wealthy families.*
2. *Mortality peaked in the middle of the eighteenth century at a very high level, with nearly two-thirds of all children — rich and poor — dying by their fifth birthday.*
3. *Mortality under the age of two fell sharply after the middle of the eighteenth century, and older child mortality decreased mainly during the late eighteenth and early nineteenth century. By the second quarter of the nineteenth century about 30 per cent of all children had died within the first five years. This latter fall in mortality appears to have occurred equally amongst both the wealthy and the non-wealthy population.*
4. *There was little or no change in paternal mortality from 1600 to 1750, after which date there was a steady reduction until the middle of the nineteenth century. The scale of the fall in adult mortality was probably less than the reduction in infant and child mortality. The latter more than halved between the middle of the eighteenth and nineteenth centuries, whereas paternal mortality fell by about a third in the same period.*
5. *There appears to have been a minimal social class gradient in infant, child and adult mortality in London during the period 1550–1850. This is an unexpected finding, raising fundamental questions about the role of poverty and social class in shaping mortality in this period.*
6. *Although migration played a leading role in fostering the population increase in London in the sixteenth and early seventeenth centuries, relatively low infant and child mortality made a major contribution to population growth during this period.*

Introduction

It is widely accepted that London's population growth since the sixteenth century has had a significant impact on its economic and social development, influencing not only the supply of labour but also the demand for a range of goods and services, including housing and the urban infrastructure.[1] It has also been generally assumed that because of its high level of mortality before the nineteenth century, most of London's growth was brought about by migration rather than endogenous population increase.[2]

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Furthermore, it has been widely believed that there was a close association between poverty and all forms of mortality from at least the sixteenth century onwards.[3] However, many of these assumptions remain untested due to the lack of reliable evidence as a result of inadequate source material.

Most previous research on London's demographic history has been based on the Bills of Mortality,[4] although the reliability of this source has been subject to much criticism.[5] There is also the problem that the Bills only allow an aggregative study of London's population history, whereas much modern demographic research focuses on individual families enabling a more detailed study of a range of variables.[6] We have attempted to address these issues by creating family-level data, and assessing the quality of these data through detailed methodological analysis.

The present paper concentrates on the history of mortality, seeking to establish changing levels of mortality in the period between the middle of the sixteenth and nineteenth centuries. Parish registers, guild records, wills, census listings and the Bills of Mortality have been used as a basis for creating family reconstitution and other data. The focus in this paper has been on samples of individual families from a variety of different parishes and districts in London. Given the nature of the data, the conclusions reached are necessarily provisional. However, we have attempted to construct a picture of mortality change over this long period, in the belief that this creates fruitful hypotheses about long-term patterns of mortality. Only minimal interpretation of suggested trends has been carried out, mainly because of the absence of studies of disease patterns during the period covered.

An analysis of the relationship between wealth/poverty and mortality has been included. Virtually all writers on the subject — including Chadwick, Marx, Engels and Mayhew[7] — have assumed that poverty was strongly associated with ill-health and high mortality, and yet we have found in our research that this was not the case in London before the mid-nineteenth century. For example, as we will see later, the healthiest areas with the lowest mortality in 1838–44 were not the wealthy districts of the West End, but the poor areas of the East End of London. We will argue in this paper that mortality was not primarily shaped by wealth and poverty, but mainly by exogenous disease patterns largely independent of economic factors.[8]

Likewise it has been widely assumed that London until the nineteenth century was a 'mortality sink', sucking in England's surplus population because of its inordinately high mortality.[9] One of the main findings of the paper is that in the period between 1550 and 1650, London's infant and child mortality was relatively low, and that this helped generate the rapid population growth of the city during this period.

Additional work will be required to evaluate these radical conclusions, but we hope the paper will stimulate further research on London's population history in the belief that this will significantly illuminate the history of the city over a three hundred year period.

Infant and child mortality

Evidence on infant and child mortality is available in the London Bills of Mortality for the period from 1728 onwards, and is summarised as follows:

TABLE 1

Infant and child mortality from the London Bills of Mortality, 1728–1829

Period	Number of baptisms	Number of burials under two years	Burials under two as a proportion of the number of baptisms	Number of burials aged two to five years	Burials aged two to five as a proportion of the number of baptisms	Number of burials aged under five	Burials under five as a proportion of the number of baptisms
1728–29	33,712	20,586	61.1%	4923	14.6%	25,509	75.7%
1730–39	170,196	101,860	59.8%	23,250	13.7%	125,110	73.5%
1740–49	145,260	88,320	60.8%	21,637	14.9%	109,957	75.7%
1750–59	147,792	75,083	50.8%	18,793	12.7%	93,876	63.5%
1760–69	159,603	78,803	49.4%	21,015	13.2%	99,818	62.5%
1770–79	173,178	77,173	44.6%	21,019	12.1%	98,192	56.7%
1780–89	176,299	63,637	36.1%	18,229	10.3%	81,866	46.4%
1790–99	187,345	61,793	33.0%	20,885	11.1%	82,678	44.1%
1800–09	199,043	55,277	27.8%	21,607	10.9%	76,884	38.6%
1810–19	221,334	54,065	24.4%	19,227	8.7%	73,292	33.1%
1820–29	256,576	58,070	22.6%	20,432	8.0%	78,502	30.6%

Source: J. Marshall, The Mortality of the Metropolis (1832).

Table 1 indicates that infant and child mortality was more or less constant between 1728 and 1749, but fell steadily and progressively from 1750 to 1829. There has, however, been controversy about the reliability of the Bills of Mortality and there is no consensus about the quality of either birth or death registration.[10]

Attempts have been made to address this problem by applying family reconstitution techniques to parish register and other data. Finlay has analysed a number of London parish registers for the period 1580–1650,[11] and Landers and Vann & Eversley have used London Quaker records for reconstitution research.[12] None of these studies has been able to completely resolve the problem of burial register reliability. Finlay found very low rates of infant mortality for most of the parishes studied — in one case as low as 55 per 1,000[13] — and assumed that much of this was due to burial under-registration. The findings of the separate studies carried out by Landers and Vann & Eversley on Quaker infant mortality were contradictory,[14] and this may have been because of the different nature of the samples involving variations in data quality.

We have conducted reconstitution research on a number of parishes in the City of London, linked to the published and indexed London 1695 Marriage Duty Act Listing, which provides not only details of living family members, but also levels of taxable wealth.[15] The creation of reconstitution data was facilitated by the genealogical work of Percival Boyd, who in the late 1930s and 1940s compiled 238 volumes of family histories for London inhabitants, covering a total of 59,389 family groups.[16] Boyd used parish registers, guild records, marriage licences, wills and a whole miscellany of sources, to create individual family histories mainly for the sixteenth, seventeenth and eighteenth

centuries, enabling the tracking of children from baptism through to the date of last independent observation of the family.

The individual family sheets are not in standard format but usually include information on names of parents and children, as well as date of baptism and burial of children. Boyd sometimes estimated the year of birth of a child from wills and other documentary sources, and the lack of standardisation means that his family histories have to be treated with some care. However, as we are concerned here with mortality and not fertility, it is the quality of burial registration which is most important. Given the uncertain quality of burial register data, it is important to evaluate its reliability before embarking on detailed research on mortality.

There was a custom in England of giving the name of a dead child to a subsequent child of the same sex. Evidence from local censuses and other listings suggests that there were no living children with the same name in individual families in the period covered by this paper.[17] Where two children of the same family were baptised with an identical name, it is therefore possible to measure the completeness of burial registration by searching for the first same-name child in the burial register. (It is the first of a pair of children with identical names that is designated as a same-name child.) The technique can only be applied to families with at least two recorded baptisms of children of the same sex, but it is a valuable method of assessing the quality of burial registration.

This can be illustrated by the example of one family listed by Boyd and traced in the 1695 Marriage Duty Listing (see Table 2).

Of the three same-name cases, highlighted in bold, two of them were traced in the burial register. The second same-name case — John baptised on the 7th August 1687 — was found neither in the burial register nor in the 1695 Marriage Duty Listing, indicating that he probably died without being registered. (The last John was baptised in late 1695 and therefore did not appear in the Marriage Duty Listing made before that date.)

The same-name method allows for the correction of burial under-registration by multiplying the number of recorded burials by the total number of same-name cases

TABLE 2.

The family of Samuel and Sarah Fowler, tyler and bricklayer, of St. Antholin's, London

Name of child	Date of baptism (day/month/year)	Date of burial (day/month/year)
Thomas	05/07/1677	04/01/1721
Samuel	**04/05/1679**	**29/04/1681**
William	08/01/1683	03/06/1708
Samuel	10/05/1685	15/02/1688
John	**07/08/1687**	–
John	**12/05/1689**	**09/10/1692**
Sarah	22/04/1691	06/02/1748
Mary	18/07/1693	12/11/1694
John	21/11/1695	–

Source: 1695 Marriage Duty Listing: Samuel Fowler, wife Sarah, son James, son Thomas, son William, daughter Sarah. Of St. Antholin's Parish.
Source of main text of table: Boyd's London Inhabitants.

and dividing by the number of same-name cases found in the burial register. In the case of the Fowler family, the correction ratio is 3/2. This inflation ratio corrects both for non-registration due to omission from the burial register, as well as burial in neighbouring parishes and elsewhere, accounting for all forms of under-registration.

A sample was constructed from the Boyd volumes by selecting, in sequence, families from the first eight parishes in volumes 1–28, and this sample has been used in all tables analysing Boyd family listings. The eight parishes included in the sample were: St. Christopher le Stocks, St. Edmund Lombard Street, St. Martin Outwich, St. Antholin, St. John Baptist, All Hallows Bread Street, St. John Evangelist, and St. Mary Woolnoth. These eight parishes are not necessarily representative of over 100 parishes that existed in the City of London, although independent evidence to be considered later suggests that mortality levels in the eight parishes were probably fairly typical of London as a whole.

We can compare the burial registration experiences of wealth holders with those not owning the form of wealth eligible for extra taxation indicated in the 1695 Marriage Duty Act returns.[18] Of 64 same-name children from wealth-holding families included in Boyd's sample and traced in the Marriage Duty Listings, 18 (28 per cent) could not be found in the burial register, compared to 30 of 81 (37 per cent) from non-wealth holding families.

Of 37 eligible same-name children[19] not found in the burial register, none could be found in the Marriage Duty Listing, providing some support for the assumption that a missing same-name case is equivalent to an unregistered burial. Overall, 33 per cent of same-name cases could not be traced in the burial register, suggesting that about a third of all infant and child deaths were not registered. Applying the overall same-name correction ratio to all baptisms and infant burials in the sample generates a corrected infant mortality rate of 334 per 1,000 for the period 1681–1709. John Landers has independently estimated that infant mortality in London at the end of the seventeenth century was at least 360 per 1,000.[20] Given that mortality before baptism is excluded from the figure of 334 per 1,000, it is very similar to that estimated by Landers.

Child mortality can be calculated by establishing the children at risk — children surviving the first year and remaining in independent observation (through a recorded event of another family member in the Boyd and marriage duty records) until their fifth year — and dividing the number of corrected child burials (burials multiplied by the same-name ratio) by the number of children at risk. We can estimate infant and child mortality rates amongst those listed as owning and not owning taxable wealth in the Marriage Duty Act listing as summarised in Tables 3 and 4.[21] Both infant and child mortality were highest among non-wealth holders, although these forms of mortality were still high amongst wealthy families, with nearly half of their children dying under the age of five.

It is possible to extend research on the Boyd data both backward and forward in time. Tables 5 and 6 contrast data for the total sample with that for members of the 12 great livery companies, designated as elite families.[22] After 1750 there is insufficient information on elite families for a breakdown of these data.

The proportion of same-name cases untraced in the burial register for the whole period 1539–1849 is identical in both the total and elite samples — 112/320 and 51/146

TABLE 3

Corrected infant mortality rates (per 1,000) amongst London wealth and non-wealth holders, 1681–1709

Wealth holders				Non-wealth holders			
Number of baptisms	Number of infant burials	Same-name ratio	Infant mortality rate per 1,000	Number of baptisms	Number of infant burials	Same-name ratio	Infant mortality rate per 1,000
611	131	61/46	284	642	155	81/51	383

Source: Boyd's London Inhabitants; Glass, *London Inhabitants.*

TABLE 4

Corrected child mortality (1–4) rates (per 1,000) amongst London wealth and non-wealth holders, 1681–1709

Wealth holders				Non-wealth holders			
Number of children (1–4) at risk	Number of child (1–4) burials	Same-name ratio	Child (1–4) mortality rate per 1,000	Number of children (1–4) at risk	Number of child (1–4) burials	Same-name ratio	Child (1–4) mortality rate per 1,000
448	62	61/46	184	424	62	81/51	232

Source: Boyd's London Inhabitants; Glass, *London Inhabitants.*

— 35 per cent. The proportion of untraced cases for the complete sample over time was as follows: 1539–1599: 17/48 (35 per cent); 1600–1649: 31/83 (37 per cent); 1650–1699: 32/99 (32 per cent); 1700–1749: 29/68 (43 per cent); 1750–1849: 6/22 (27 per cent). The numbers are too small to analyse differences between elite families and the total sample, or variations over time in the period 1750–1849.

Mortality was lower amongst the elite group than in the total sample population during the period 1539–1649, but this differential was reversed in the period 1650–1749 when mortality was higher amongst wealthier families. However, the most striking feature of Tables 5 and 6 is the very significant increase in infant and child mortality between the periods 1539–1599 and 1700–1749 in both groups. Infant mortality increased by about two-and-a-half times in the total sample, and more than tripled among elite families during this period. Child mortality approximately doubled in both groups between the sixteenth and the middle of the eighteenth century. There was also a marked drop in infant mortality among the total sample after the middle of the eighteenth century, similar to that depicted in the Bills of Mortality, although child mortality fluctuated during the eighteenth century before falling sharply in the early nineteenth.

The low infant mortality rate in the sixteenth and early seventeenth century is confirmed by Finlay's research on four parishes: the uncorrected rate for this period was as follows: All Hallows Bread Street, 1538–1653: 83/1,000; St Peter Cornhill, 1580–1650: 107/1,000; St Christopher le Stocks, 1580–1650: 55/1,000; St Michael Cornhill, 1580–1650: 109/1,000.[23] The equivalent uncorrected rate for the total Boyd

TABLE 5
Infant mortality (per 1,000) in the city of London, 1539–1849

Period	Total sample				Elite families			
	Number of baptisms	Infant burials	Same-name ratio	Infant mortality rate (per 1,000)	Number of baptisms	Infant burials	Same-name ratio	Infant mortality rate (per 1,000)
1539–99	839	84	48/31	155	485	38	48/31	121
1600–49	1073	191	83/62	238	610	101	83/62	222
1650–99	1020	177	99/67	256	465	82	99/67	261
1700–49	704	165	68/39	409	194	47	68/39	422
1750–99	720	138	22/16	263	–	–	–	–
1800–49	199	20	22/16	138	–	–	–	–

TABLE 6
Child (1–4) mortality (per 1,000) in the city of London, 1539–1849

Period	Total sample				Elite families			
	Number of children (1–4) at risk	Child (1–4) burials	Same-name ratio	Child mortality rate (per 1,000)	Number of children (1–4) at risk	Child (1–4) burials	Same-name ratio	Child mortality rate (per 1,000)
1539–99	616	67	48/31	168	404	35	48/31	134
1600–49	770	129	83/62	224	485	69	83/62	190
1650–99	686	131	99/67	282	340	67	99/67	291
1700–49	387	39	68/39	176	131	18	68/39	240
1750–99	435	85	22/16	269	–	–	–	–
1800–49	102	9	22/16	121	–	–	–	–

sample for 1539–1649 is 131/1,000, indicating that the latter is not an understatement of London's infant mortality in this period.

Given the unexpected finding of a marked increase in infant and child mortality from the sixteenth to the middle of the eighteenth century, a special reconstitution study was carried out for the parish of St Bartholomew's for the period 1618–1849 (Table 7).

There was no overall change in child mortality between 1618 and 1749, but a sharp increase in infant mortality — from 191/1,000 to 342/1,000 — confirming at least in part the findings from the analysis of the Boyd data. There were also marked falls in infant and child mortality after 1750, similar to those found in Tables 1, 5 and 6. However, the proportion of infants traced through to the age of five was significantly less in the St. Bartholomew's than in the Boyd sample, and this is probably because the latter included a large proportion of permanent householders.

There is also the problem of increasing birth-baptism intervals which occurred in the eighteenth and early nineteenth century. The St. Bartholomew's the Less baptism register contains information on dates of birth and baptism for the period 1650–1812 (Table 8).

The proportion of infants baptised within two weeks of birth fell steadily throughout the eighteenth century. This creates a problem of measuring neonatal mortality, as

TABLE 7

Infant and child mortality in St Bartholomew's the Less, London, 1618–1849

Period	Number of infant baptisms	Number of infant burials	Number of children (0–4) at risk	Number of child (0–4) burials	Same-name ratio	Corrected infant mortality rate per 1,000	Corrected child mortality rate per 1,000
1618–1649	328	45	143	29	25/18	191	282
1650–1699	592	100	224	37	57/37	260	254
1700–1749	564	103	202	30	60/32	342	278
1750–1849	371	32	148	9	15/10	129	91

These figures are derived from the St. Bartholomew's parish register in the Society of Genealogists' library.

TABLE 8

Birth-baptism intervals in St. Bartholomew's the Less, 1650–1812

Period	Under two weeks		Above two and below six weeks		Above six weeks		Total number with information on birth-baptism intervals	Total number of cases
	Number	%	Number	%	Number	%		
1650–99	520	89	57	10	6	1	583	912
1700–49	427	57	320	43	6	1	753	1,043
1750–99	100	22	319	70	38	8	457	527
1800–12	1	1	46	65	24	34	71	80

These figures are derived from the St. Bartholomew's parish register in the Society of Genealogists' library.

many infants would have died before baptism without being registered in the burial register (under canon law unbaptised children were not members of the Anglican Church and were therefore not formally allowed to be buried by it). This is a form of burial under-registration which cannot be measured by the same-name method. However, it has been estimated that nationally approximately 5 per cent of infants died before baptism in the period 1838–1844,[24] which in London would represent about a third of all infants dying in the first year. Some clergymen baptised infants known to be at risk of dying, and so perhaps the lower proportion is a more accurate representation of unregistered infants. Table 8 indicates that the measurement of infant mortality using baptism and burial registers becomes progressively more difficult towards the end of the eighteenth and the beginning of the nineteenth century because of the increasing interval between birth and baptism.

It is possible to analyse infant and child mortality in St. Bartholomew's by socio-economic status. The parish register designates elite status by describing fathers as 'esquire', 'gentlemen' or 'Mr',[25] and the following table compares the mortality of this elite group with that of the non-elite population.

TABLE 9

Infant (IMR) and child (CMR) mortality in St. Bartholomew's the Less by socio-economic status, 1619–1848

	Elite group		Non-elite population	
	1619–1749	1750–1848	1619–1749	1750–1848
Number of infant baptisms	371	119	1152	256
Number of infant burials	57	19	194	13
Number of children (1–4) at risk	200	48	384	101
Number of child (1–4) burials	30	4	69	5
Same-name ratio	44/22	3/3	105/68	11/6
Infant Mortality rate per 1,000	307	160	260	93
Child mortality rate per 1,000	300	83	277	91

For the source of these data, see the St. Bartholomew's parish register in the Society of Genealogists' library.

The sample sizes are small for the post-1750 period, but the figures in Table 9 indicate that infant mortality was slightly higher in the elite than the non-elite group in both 1619–1750 and 1750–1848, and child mortality was higher in 1619–1749. This is similar to the finding on socio-economic status and mortality in Tables 5 and 6 for the period 1650–1749, but different from the conclusions in Tables 3 and 4 for 1681–1709. However, the periods and nature of the samples are different in each of the separate studies, and the mortality differences between wealthy/elite and other families are not greatly significant in any of the samples covered by the above tables.

These findings on infant and child mortality are very similar to those of John Landers on London Quakers for the period 1650–1849.

The Quakers were a relatively prosperous group and perhaps occupied an intermediate socio-economic position between the wealthy and non-wealthy groups analysed in the present article. Table 10 only covers the period 1650–1849, but the

TABLE 10

Age-specific mortality rates per thousand amongst London Quakers, 1650–1849

	Age (years)		
Cohort	0–1	1–2	2–4
1650–74	251	103	190
1675–99	263	113	132
1700–24	342	145	177
1725–49	341	143	186
1750–74	327	150	159
1775–99	231	101	141
1800–24	194	93	85
1825–49	151	77	93

Source: J. Landers, 'London's Mortality in the Long Eighteenth: a Family Reconstitution Study', *Medical History,* Supplement No. 11, (1991), 7.

overall level and pattern of mortality change is similar to that discussed earlier in this paper. Mortality under the age of two increased up to the middle of the eighteenth century, and fell in the last half of the eighteenth and first half of the nineteenth century, while later child mortality decreased mainly in the first half of the nineteenth century.

Landers' study mainly covers the area south of the river, and the evidence discussed in this article has focused on the City of London. However, both appear to have been fairly representative of London in the eighteenth and first half of the nineteenth century. There was relatively little variation in infant and child mortality between different districts in London at the beginning of civil registration, even between those with different socio-economic characteristics.

The Registrar-General published details of the mean rateable value of housing in all registration districts, allowing an analysis of the relationship between poverty and mortality at the district level. Table 11 summarises mortality by district, arranged by level of mean rateable value, in the period immediately after the introduction of civil registration.

The ten districts with the lowest rateable values — mainly in the East End of London — had the lowest infant and child mortality rates. In interpreting these findings, there is the problem of institutional mortality where deaths in hospitals and workhouses sometimes occurred outside the district of birth.[26] There appears to have been greater fluctuations in adult rather than infant or child mortality in the period 1838–44, although Farr made mathematical adjustments to allow for institutional mortality in this period.[27]

Woods found a link between poverty and infant mortality in London during the 1880s,[28] using Booth's estimates of poverty by district. The poor districts at this time were more or less the same as those in the 1840s — most being in the East End of London — so it is possible that the social class gradient in infant mortality only began to establish itself in London during the latter part of the nineteenth century. However, the evidence in this paper indicates little or no association between poverty and infant/child mortality in the period 1550–1850, suggesting that disease played a largely exogenous role in shaping London's mortality patterns. This is an important and unexpected finding which will be discussed later in the paper.

Adult mortality

Adult mortality is difficult to measure through reconstitution research because only a small proportion — usually about 10 per cent — can be traced from birth to the date of adult death. There are also formidable difficulties in establishing correct individual identity in baptism and burial registers.

Special techniques are required to assess adult mortality levels, and there are two main sources available for this purpose in London during the period 1580–1849, marriage licences and apprenticeship records. According to an analysis of a sample of 14 London parish registers, 65 per cent of marriages were by licence in the first half of the seventeenth century, a proportion which had increased to 91 per cent by 1651–1750, before declining to 31 per cent at the beginning of the nineteenth century.[29] For women

TABLE 11

Infant, child and adult mortality in London, 1838–44

Registration district	Mean annual rateable value of house property	Infant mortality per 1000, 1838–1844	Child (1–4) mortality, per 1000, 1838–44	Adult (25–44), mortality, per 1000, 1838–44
Bethnal Green	£8.1	159	54	11
Camberwell	£12.3	141	34	14
Shoreditch	£13.4	149	55	14
Bermondsey	£13.5	140	59	11
Newington	£14.1	160	47	10
Stepney	£14.8	159	50	12
St. George, Southwark	£15.4	182	63	13
Greenwich	£15.8	149	46	20
Rotherhithe	£19.9	146	59	15
Lambeth	£21.5	149	51	10
Mean Average of 10 Districts	*£14.9*	*153*	*52*	*13*
Hackney	£22.4	144	33	11
Whitechapel	£22.4	194	75	20
St. George-in-the-East	£23.6	168	66	14
Islington	£24.9	148	38	10
East & West London	£25.3	186	82	21
Clerkenwell	£25.4	155	47	11
St. Saviour & St. Olave	£27.1	188	76	35
St. Luke	£27.9	132	64	10
Kensington & Chelsea	£29.1	163	47	12
Holborn	£29.7	200	65	10
Mean Average of 10 Districts	*£25.80*	*168*	*59*	*15*
Poplar	£31.7	134	42	15
Westminster	£32.4	180	65	17
Pancras	£33.1	166	52	15
St. Giles	£47.8	188	38	12
Strand	£48.8	173	67	11
Marylebone	£57.5	167	60	14
St. James Westminster	£69	169	68	10
City of London	£77.5	151	61	11
St. George Hanover Sq.	£79.2	166	52	16
St. Martin's-in-the-Fields	£101.8	177	73	15
Mean Average of 10 Districts	*£57.90*	*167*	*58*	*14*

Source: 5th Annual Report of the Registrar General (1843), 446; *8th Annual Report of the Registrar General* (1848), 192–93; *9th Annual Report of the Registrar General, Folio Edition* (1848), 236–38.

marrying under the age of twenty-one, parental consent was required, usually by written affidavit. The majority of marriage licence allegations have survived for London, and they usually contain the following relevant information: 1. Whether father alive or dead at date of marriage. 2. If father alive, his name and place of residence. 3. If father dead, name of mother or where relevant, guardian.

TABLE 12

Spinsters marrying under 21: fathers listed as dead, London Marriage Licences

Period	Total number of cases	Number of fathers dead	Proportion of fathers dead
1600–41	696	303	44%
1661–99	1,950	901	46%
1700–49	2,500	1,171	47%
1750–89	1,937	694	36%
1840–49	500	143	29%

For the period 1600–1641, the data are based on the analysis of Bishop of London's marriage licences in Armytage, *Allegations for Marriage Licences Issued by the Bishop of London 1611–1828,* op. cit. For the periods after 1661, the figures are based on an analysis of cases selected in sequence from the start dates of the Vicar-General's marriage licence allegations deposited in the Society of Genealogists' library.

Because of uncertainty about father's place of residence — many young women who were married in London were migrants from the country — it is difficult to carry out an exact analysis of London's paternal mortality. Also, there is no reliable information on fathers' ages, although this is likely to be strongly influenced by age at marriage. The limited amount of evidence available indicates that there were no long-term changes in the mean age of male marriage during the seventeenth, eighteenth and early nineteenth centuries, suggesting that fathers' ages did not change significantly during this period.[30]

Table 12 indicates a slight rise in paternal mortality between 1600–1641 and 1700–1749, although there were fluctuations of mortality in this period — such as a rise to 55 per cent in the 1660s. This rise was probably partly due to the effect of the plague, although Table 10 includes data on fathers living and dying outside of London, who were presumably less vulnerable to plague mortality.

Overall paternal mortality was high and relatively stable during the period 1600–1749, but declined significantly and steadily from the middle of the eighteenth century onwards, falling from 47 per cent in 1700–49 to 29 per cent in 1840–49. The chronology of the fall in paternal mortality is similar to that found for infant and child mortality, although the latter more than halved between 1725–1749 and 1825–1849, whereas paternal mortality declined by about a third.

The long-term trend in paternal mortality is confirmed by independent evidence from apprenticeship records, although there is some uncertainty about the quality of data because of the potential problem of self-selection.[31] Table 13 summarises data on the London fathers of masons' apprentices.

The proportion of fathers who were dead at the date of the indenture of their sons — which took place on average at about 15 years of age — halved from 42 per cent in 1663–99 to 21 per cent in 1750–1805, a larger reduction than found in the marriage licence data, but the sample sizes of the apprenticeship data are considerably smaller.

The high paternal mortality in London at the beginning of the eighteenth century is confirmed by data from the national apprenticeship register compiled for taxation purposes. Of 373 cases listed in London and Middlesex for the period 1710–1713, 37 per cent of fathers were dead at the date of the indenture of their son, significantly

TABLE 13

Mortality amongst London fathers of indentured masons' apprentices

Date of indenture	Number of fathers dead	Total number of fathers	Proportion of fathers dead
1663–1699	94	223	42%
1700–1749	124	375	33%
1750–1805	43	202	21%

Source: C. Webb, London Livery Company Apprenticeship Registers, 27: Mason's Company 1663–1805 (1999).

higher than the percentage found in the same period for the northern rural counties of Northumberland, Rutland, Westmoreland and Yorkshire — 27 per cent (91 of 336 cases) — and in Scotland — 22 per cent (33 of 151 cases).[32]

An analysis of the socio-economic status of fathers and levels of paternal mortality indicates that mortality was higher amongst wealthy fathers. This was true both nationally and also in London, the latter indicated in Table 14.

Fathers paying the higher premiums were gentlemen, merchants and others with high socio-economic status occupations, whereas those paying lower premiums were labourers, porters and others with manual occupations.[33] Higher paternal mortality in wealthier groups is an unexpected finding, although the sample sizes are small and there are data to indicate that boys from different socio-economic groups were apprenticed at slightly different ages, affecting the period in which fathers were at risk of dying.[34] However, there is evidence that fathers' ages were probably very similar between the different occupational groups.[35] Larger samples are required before confident conclusions can be reached about the relationship between premium levels and paternal mortality.

A review of actuarial evidence from insurance companies and friendly societies found that adult mortality was higher amongst middle class than working class groups in the first half of the nineteenth century, a finding that was confirmed for some occupational groups by early census and civil registration data.[36] It is possible that the families of socio-economic elites were more vulnerable to infection through geographical mobility and contact with a greater number of disease environments, e.g. merchants travelling and trading with foreign countries. There is also evidence that life-style factors — the excessive consumption of food, alcohol and tobacco, accompanied by

TABLE 14

Mortality amongst London fathers listed in the British Apprenticeship Register, 1710–13, by amount of premium paid

Premium paid	Number of cases	Proportion of fathers dead
£9 and under	110	32%
£10–£19	93	41%
£20+	99	42%

The data are based on the analysis of the British apprenticeship register lodged in the Society of Genealogists' library.

the lack of physical activity — damaged the health of the wealthy, both in London and elsewhere.[37]

The impact of mortality on London's population

Table 15 summarises estimates of London's population during the period 1520–1851, estimates which are very approximate because of the uncertain reliability of the source material.[38]

The inverted U-pattern of growth — rapid during the sixteenth and the first half of the seventeenth century, slowing during 1650–1750, and beginning to grow more rapidly after 1750 — is similar to the pattern of infant and child mortality depicted in Tables 5 and 6. This suggests that for the period before 1650, mortality did not prevent rapid population growth as it did after the middle of the seventeenth century.[39] The exact role of mortality in shaping London's population is complex, as there are a number of other factors, including fertility and migration, which were important for population growth.

Before the widespread practice of birth control in the second half of the nineteenth century, fertility was largely shaped by patterns of nuptiality, particularly age at marriage. Although full and accurate information on marriage age in London is not available for the whole period 1550–1850, marriage licences do indicate the numbers of women marrying under the age of 21 due to the legal requirement of parental consent.

TABLE 15

Estimated population size of London, 1520–1851

Approximate date	Estimated population of London	Period	Annual percentage increase	Estimated population of England	London's population as a percentage of England's population
1520	55,000			2,600,000	2.1%
1600	200,000	1520–1600	3.3%	4,300,000	4.7%
1650	400,000	1600–1650	2.0%	5,250,000	7.6%
1700	575,000	1650–1700	0.9%	5,100,000	11.3%
1750	675,000	1700–1750	0.3%	6,000,000	11.3%
1801	960,000	1750–1801	0.8%	8,600,000	11.2%
	Greater London			England & Wales	
1801	1,117,000			8,900,000	12.6%
1851	2,685,000	1801–1851	2.8%	17,900,000	15.0%

The figures for London are taken from E.A. Wrigley, 'A Simple Model of London's Importance in Changing English Society and Economy 1650–1750', *Past and Present*, 37, (1967), 44; E.A. Wrigley, *People, Cities and Wealth* (Oxford, 1987), 162. For Greater London, see B.R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1971), 19. Estimates of England's population for 1600–1801 are based on Rickman's returns of national baptisms, assuming a constant baptism rate. See Mitchell and Deane, op. cit., 5; E.A. Wrigley and R.S. Schofield, *The Population History of England, 1541–1871* (1981), 574. The estimate of English 1520 population is derived from Wrigley and Schofield, op. cit., 575.

According to figures in Table 16, nearly half of single women living in London were married under the age of 21 in the early seventeenth century, and this was one of the factors associated with rapid population growth during the period. The proportion of women marrying under 21 fell significantly during the eighteenth and early nineteenth centuries, and this may have been partly the result of the reduction in adult mortality, which allowed women to achieve desired fertility at a later age of marriage. The decline in early marriage probably contributed to the slowing of population growth, although in the long run it did not prevent a resumption of a very rapid increase in London's population during the first half of the nineteenth century, which was largely the result of the reduction in mortality.

Table 15 indicates that population increased much more rapidly in London than it did in the rest of England and Wales. It grew from 2.1 per cent of the national total in 1520 to 15.0 per cent in 1851, and some of this growth was probably fuelled by migration. Table 17 summarises data on the geographical origin of plumbers' and masons' apprentices.

Migration patterns revealed by Table 17 are confirmed by additional evidence based on apprenticeship records,[40] although data derived from marriage licences suggest a lower level of in-migration in the early seventeenth century. Bishop of London licences indicate that 61 per cent of single women in London were migrants in 1583–1586, a proportion that had fallen to 53 per cent in 1601–1605, and 38 per cent by 1630–1640.[41] Although lower than the proportions for apprentices, the marriage licence data confirm that in-migration was very important in London during the late sixteenth and early seventeenth century.

TABLE 16

Proportion of single women resident in London marrying under the age of twenty-one, marriage licences, 1600–1849

Period	Number of single women marrying under 21	Total number of marriages of single women	Proportion of single women marrying under 21
1600–39	188	400	47.0%
1661–99	162	400	40.5%
1700–49	138	500	27.6%
1750–99	50	500	10.0%
1800–49	28	500	5.6%

The first hundred consecutive marriages were selected at the beginning of each decade for the periods covered by Table 16. For 1600–39, the marriages were taken from Armytage, *Allegations for Marriage Licences Issued by the Bishop of London 1611–1828,* op. cit. For all subsequent periods, the marriages were selected from the copies of the Vicar General's marriage allegations in the Society of Genealogists' library. The early age of marriage at the beginning of the seventeenth century is confirmed by V.B. Elliott, 'Single Women in the London Marriage Market: Age, Status and Mobility, 1598–1619', in R.B. Outhwaite (ed.), *Marriage and Society: Studies in the Social History of Marriage* (1981). The proportion of single women marrying in London during the first half of the nineteenth century is similar to that found by the Registrar General in 1843–44: 7.7%. See the *Registrar General's Seventh Annual Report*, *1843–44* (1846), xxx, xxxi.

TABLE 17

Geographical residence of fathers of plumbers' and masons' apprentices indentured 1570–1799

Period	Number of plumbers' apprentices	Proportion of fathers residing outside London	Number of masons' apprentices	Proportion of fathers residing outside London
1570–1599	21	86%	–	–
1600–49	67	85%	–	–
1650–99	140	71%	994	68%
1700–49	129	57%	884	37%
1750–99	56	39%	347	32%

For the source material on which these figures are based, see C. Webb (ed.), *London Apprentices, Volume 33: Plumbers' Company, 1571–1800* (2000); C. Webb (ed.), *London Apprentices, Volume 27: Masons Company, 1663–1805* (1999). The figures for plumbers in the 1650–99 category are based on the period 1663–99.

The decline in the percentage of migrants among apprentices in the eighteenth century was probably linked to the slow-down in population growth in the country at large, although Table 15 indicates that there was little or no change in London's share of the national population between 1650 and 1801, suggesting that London's increase was hampered by the high infant and child mortality in this period. However, mortality fell sharply after the end of the eighteenth century, engendering a rapid endogenous growth in population with minimal inward migration.

Discussion

The reasons for the patterns of mortality discussed in this paper must be largely speculative, given the absence of detailed work on the history of disease mortality in London during this period. The more than doubling of infant and child mortality between the sixteenth and the middle of the eighteenth century was not mirrored by a similar increase in adult mortality during the same period. Early mortality appears to have increased significantly in all socio-economic groups in the period 1550–1750, suggesting that changes in the standard of living did not play a significant role in shaping mortality patterns, particularly as this was a period when real incomes were rising generally in London and elsewhere.

There is evidence that some diseases became more virulent during the period 1550–1850. Most people dying from smallpox in London during the sixteenth, seventeenth and eighteenth centuries were children, indicating that the disease was endemic, affecting everyone born in the city.[42] The case-fatality rate of smallpox in two London parishes during the sixteenth century was approximately 5 per cent,[43] compared to a case-fatality rate of about 45 per cent amongst unvaccinated children in London in the 1880s.[44] There is considerable evidence that smallpox became more fatal in London throughout the seventeenth, eighteenth and nineteenth centuries[45] — possibly as a result of the importation of more virulent strains with the growth of world trade — and this

could explain in part the increase in infant and child mortality up to the middle of the eighteenth century. Inoculation and vaccination were practised in London after that period, although it is doubtful whether they made a major impact, particularly amongst the poor, until the end of the eighteenth century.[46]

The disappearance of the plague in the 1660s does not appear to have made a significant long-term impact on mortality in London. It is possible that this was because other diseases were replacing plague as a cause of death. We have seen that smallpox was becoming more fatal to children, and this was probably true of certain other diseases. Typhus was probably introduced into England in the sixteenth century,[47] it affected adults more than children,[48] killed rich and poor alike, and became widespread in both town and countryside during the seventeenth century.[49] In London, diseases classified by contemporaries as 'fevers' increased significantly during this period. Fever and ague accounted for about 6 per cent of all deaths in Aldgate during the period 1583–1599, most deaths occurring amongst adolescents and adults.[50] According to the London Bills of Mortality, about 15 per cent of all deaths were due to fever in the first half of the eighteenth century, again most of them adults.[51]

There was a fall in the number of 'fever' deaths amongst adults in London and elsewhere during the second half of the eighteenth century,[52] and much of this reduction in mortality was probably linked to the gradual elimination of typhus infection.[53] Woollen underwear was replaced by linen and cotton garments during this period, and more effective washing — involving the boiling of clothing — was probably responsible for the progressive elimination of both body lice and typhus.

In addition to inoculation and the introduction of linen and cotton garments, there were a number of other improvements which may have helped reduce mortality, e.g. the use of colostrum in breastfeeding after the middle of the eighteenth century. However, many of these improvements would have been adopted first by the wealthy and then only later by the general population, and the evidence on the fall in mortality is that it affected all socio-economic and all age groups from the middle of the eighteenth century onwards. A study of the Bills of Mortality and parish registers which list cause of death suggests that a range of diseases diminished during the latter half of the eighteenth and first half of the nineteenth century: — smallpox, 'fevers' (probably including typhus and typhoid fever), and convulsions (probably including diarrhoea/gastrointestinal diseases).[54] Most of these are dirt diseases and it is possible that there was a transformation of the environment in the middle of the eighteenth century which had a major impact on a number of diseases. Roy Porter wrote of the 'cleaning up the Great Wen' during this period, associated with a number of Local Improvement Acts which appeared to have transformed London's overall disease environment.[55]

The economic and social consequences of London's population growth have been well-documented by Fisher, Wrigley and others.[56] London provided an expanding market for a range of agricultural and industrial commodities, and was a major centre of manufacturing activity.[57] Its national and international trade laid the foundation for subsequent industrialisation, and it acted as a focal point for the dissemination of a more cosmopolitan way of life.[58] None of this would have been possible without population growth, and the inverted U-shaped curve of economic and social development — rapid expansion between 1520 and 1650, followed by a long period of

stagnation and subsequent rapid growth at the end of the eighteenth century — would not have occurred without a similar cycle of exogenous demographic development, both in London and nationally.[59]

Conclusions

The overall conclusions to be reached on the history of mortality in London from this research are as follows:

1. Infant and child mortality more than doubled between the sixteenth and the middle of the eighteenth century in both wealthy and non-wealthy families.
2. Mortality peaked in the middle of the eighteenth century at a very high level, with nearly two-thirds of all children — rich and poor — dying by the time of their fifth birthday.
3. Mortality under the age of two fell sharply after the middle of the eighteenth century, and older child mortality decreased mainly during the late eighteenth and early nineteenth century. By the second quarter of the nineteenth century, about 30 per cent of all children had died within the first five years. This latter fall in mortality appears to have occurred equally amongst both the wealthy and the non-wealthy population.
4. There was little or no change in paternal mortality from 1600 to 1750, after which date there was a steady fall until the middle of the nineteenth century. The scale of the fall in paternal mortality was probably less than the reduction in infant and child mortality. The latter more than halved between the middle of the eighteenth and nineteenth centuries, whereas paternal mortality fell by about a third in the same period.
5. There appears to have been a minimal social class gradient in infant, child and adult mortality in London during the period 1550–1850. This is an unexpected finding, raising fundamental questions about the role of poverty and social class in shaping mortality in this period.[60]

The absence of a general link between wealth and mortality has been one of the major findings of this paper. The research has also found an inverted U-shaped pattern of long-term infant and child mortality, with mortality more than doubling between the sixteenth and the middle of the eighteenth century, before falling sharply after this period. These findings represent a radical challenge to conventional assumptions about London's mortality history. However, the explanations and implications of these demographic patterns have yet to be fully explored, and only detailed further reconstitution research on individual parishes — particularly those with information on cause of death, age and occupation in the burial register — will answer some of these outstanding questions.

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Notes

[1] V. Harding, 'Early Modern London 1550–1700', *London Journal,* 20, (1995), 36; L. Schwarz, 'London, 1700–1850', *London Journal,* 20, (1995), 46–55; L. Schwarz, *London in the Age of Industrialization: Entrepreneurs, Labour Force and Living Conditions* (Cambridge, 1992).

[2] Harding, 'Early Modern London', 36.

[3] R. Finlay, *Population and the Metropolis, the Demography of London 1580–1640* (Cambridge, 1981); Harding, 'Early Modern London', 39; B. Luckin, 'Perspectives on the Mortality Decline in London, 1860–1920', *London Journal,* 22, (1997), 123–41; R. Woods, 'Mortality, Poverty and Environment', in R. Woods and J. Woodward (eds.), *Urban Disease and Mortality* (1984), 24.

[4] See for example J. Brownlee, 'The Health of London in the Eighteenth Century', *Proceedings of the Royal British Medical Society,* 18, (1925), 73–84; A.B. Appleby, 'Nutrition and Disease: the Case of London, 1550–1750', *Journal of Interdisciplinary History*, 6, (1975), 1–22; P.R. Galloway, 'Annual Variations in Deaths by Age, Deaths by Cause, Prices and Weather in London 1670–1830', *Population Studies*, 39, (1986), 487–506.

[5] W. Heberden, *Observations on the Increase and Decrease of Different Diseases* (1801); W. Ogle, 'An Inquiry into the Trustworthiness of the Old Bills of Mortality', *Journal of the Statistical Society,* 55, (1892), 442–43; A. Hardy, 'Diagnosis, Death and Diet: the Case of London, 1750–1909', *Journal of Interdisciplinary History*, 18, (1988), 387–401.

[6] For this type of individually based research, see Finlay, *Population and Metropolis,* op. cit.; J. Landers, *Death and the Metropolis: Studies in the Demographic History of London* (Cambridge, 1993).

[7] E. Chadwick, *The Sanitary Conditions of the Labouring Population* (1842); For Marx's and Engel's views on the relationship between poverty and health, see F. Engels, *The Condition of the Working Class in England* (1845); for Mayhew's discussion of the effects of poverty, see H. Mayhew, *The Morning Chronicle Survey of Labour and the Poor: the Metropolitan Districts,* 6 Volumes (Firle, 1980).

[8] For a discussion of these complex issues, see P. Razzell and C. Spence, 'Poverty or Disease Environment? The History of Mortality in Britain, 1500–1950', in M. Breschi and L. Pozzi (eds.), *The Determinants of Infant and Child Mortality in Past European Populations* (Udine, 2004); P. Razzell and C. Spence, 'The Hazards of Wealth: the History of Adult Mortality in Pre-Twentieth Century England', *Social History of Medicine,* 19, No. 3. (2006).

[9] See Harding, 'Early Modern London 1550–1700', op. cit., 36.

[10] The uncertain quality of the Bills of Mortality has led scholars to adopt significantly different correction ratios for inflating baptisms and burials into estimated births and deaths. For two very different estimates of mortality based on the Bills of Mortality, see J. Landers, 'Mortality and Metropolis: the Case of London 1675–1825', *Population Studies*, 41, (1987), 63, and R. Woods, 'Mortality in Eighteenth-century London: a New Look at the Bills', *Local Population Studies*, No. 77, (2006).

[11] Finlay, *Population and Metropolis*.

[12] Landers, *Death and the Metropolis*; R.T. Vann and D. Eversley, *Friends in Life and Death: the British and Irish Quakers in the Demographic Transition* (Cambridge, 1992).

[13] R.A.P. Finlay, 'The Accuracy of the London Parish Registers, 1580–1653', *Population Studies*, 32, (1978), 99.

[14] See J. Landers, 'Mortality in Eighteenth-century London: a Note', *Continuity and Change,* 11, (1996), 303–10.

[15] See D. Glass (ed.), *London Inhabitants Within the Walls* (1965).

[16] This material is deposited in the library of the Society of Genealogists. For details of this source, see A. Camp, 'Boyd's London Burials and Citizens of London', *Family Tree*, 1, (1985), 12; J. Beach Whitmore, 'London Citizens', *Genealogists Magazine*, March 1944.

[17] We have examined the 1695 census listing of the city of London carried out under the Marriage Duty Act, and have been unable to find any living same-name children in any of the families

enumerated. See D. Glass (ed.), *London Inhabitants Within the Walls* (1965). For an examination of other censuses and a discussion of the same-name method, see P. Razzell, 'Evaluating the Same Name Technique as a Way of Measuring Burial Register Reliability', *Local Population Studies*, 64, (2000), 8–22.

[18] The main form of wealth listed was the ownership of real estate worth £600 or more, although other categories of wealth-owners were also included.

[19] These 37 same-name children were those born before 1695.

[20] Personal communication from John Landers. According to the London Bills of Mortality, child burials under the age of two represented about 60 per cent of baptisms in the period 1728–1739, suggesting that the same-name ratios in Table 2 do not overstate the levels of under-registration of burials. See Marshall, *Mortality*, 63.

[21] Boyd's data probably includes more wealth-holders than was typical for London as a whole. Glass estimated that about 27 per cent of the population were wealth-holders paying the higher level of taxation, lower than the proportion of wealth-holders in Tables 3 and 4.

[22] B. Weinreb and C. Hibbert, *The London Encyclopedia* (1983), 167–77.

[23] Finlay, *Population and Metropolis,* op. cit.

[24] P. Razzell, *Essays in English Population History* (1994), 147.

[25] Additional research confirms the elite status of fathers given the titles of esquire, gentleman or Mr. In the two periods 1655–1670 and 1751–1812, information is given on whether people were buried inside or outside the church: 75 of 92 (82 per cent) members of elite families were buried inside the church, compared to 4 of 29 (14 per cent) servants. Of 55 people buried inside the church and located in the 1695 Marriage Duty Listing, 33 (65 per cent) were in families with £600+ fixed wealth or £50 p.a., whereas none of the 26 people buried outside and traced in the 1695 Listing were in the higher wealth category.

[26] B. Luckin and G. Mooney, 'Urban History and Historical Epidemiology: the Case of London, 1860–1920', *Urban History*, 24, (1997), 47.

[27] Ibid.

[28] R. Woods, 'Mortality, Poverty and Environment', in R. Woods and J. Woodward (eds.), *Urban Disease and Mortality* (1984), 24.

[29] P. Razzell, 'The Conundrum of Eighteenth-century English Population Growth', *Social History of Medicine*, 11, (1998), 484.

[30] According to marriage licence data, the mean age of marriage of London bachelors was 27.6 in 1630–1636 and 27.2 years in 1693–1695. The figures for 1630–1635 are based on the first 200 marriages selected from the Bishop of London marriage licences. See G.J. Armytage (ed.), *Allegations for Marriage Licences Issued by the Bishop of London 1611–1828* (Harleian Society, Volume 26, 1887). The figures for 1693–95 are derived from the first 200 marriages selected from the Vicar Generals' marriage allegations in the Society of Genealogists' library. The mean age of marriage of bachelors in England & Wales in 1867–82 was 25.8 years, but the London average was probably higher than this in the early nineteenth century. 4.3 per cent of bachelors married under 21 nationally, compared to 1.6 per cent in the metropolis in 1843–44. See the *Registrar General's 7th Annual Report, 1843–44*, xxx, xxxi; *Registrar General's 45th Annual Report, 1882,* viii.

[31] It is possible that poor widows had an incentive to place their sons into apprenticeships, although there is no direct evidence on this and any possible distortions are unlikely to have varied greatly over time.

[32] The data are based on the analysis of the British apprenticeship register lodged in the Society of Genealogists' library.

[33] See Razzell and Spence, 'Poverty or Disease Environment?', op. cit., 63.

[34] Samples taken from the national apprenticeship register for the period of 1710–1713 indicate that the average ages of apprentices in the different premium categories were as follows: £1–£5: 14.4 years; £6–£14: 14.9 years; £15+: 15.9 years. See Razzell and Spence, 'Poverty or Disease Environment?', op. cit., 63. These figures are based on an analysis of Vicar General's marriage allegations in the Society of Genealogists' library.

[35] The mean age at marriage in London does not appear to have varied greatly by social status at this time. In 1687, the mean age of marriage of London bachelors according to marriage licences was as follows: merchants, gentlemen and professionals: 26.8 years (N = 200); tradesmen and artisans: 26.4 (N = 360); mariners, servants and labourers (1687–94): 27.5 (N = 135).

[36] Razzell and Spence, 'The Hazards of Wealth', op. cit., 59, 60. See also Table 9.

[37] Ibid.

[38] Finlay and Shearer have put forward a set of alternative population figures, but these are partly based on inflation ratios applied to parish register data. These ratios are significantly different from those used in the present paper, highlighting the uncertain nature of all population estimates before the advent of the national census registration in 1801. See R. Finlay and B. Shearer, 'Population Growth and Suburban Expansion', in A.L. Beier and R. Finlay (eds.), *London 1500–1700: The Making of the Metropolis* (Harlow, 1986).

[39] For a discussion of the role of mortality in shaping population growth for the period 1650–1750, see E.A. Wrigley, 'A Simple Model', op. cit.

[40] For confirmation of the very high proportion of migrants in the early seventeenth century, see Elliott, op. cit., 84. An analysis of the records of the apprentices who acquired the freedom of the City of London indicates that the proportion of fathers living outside London fell from 77 per cent in 1673–74 (N = 200) to 14 per cent in 1822–24 (N = 99). See 'City of London Freedom Certificates', Guildhall Library, Corporation Record Office, Ref CF1.

[41] The first 200 marriages were selected for analysis in each of the periods 1583–86, 1601–05 and 1630–40 from Armytage, *Allegations for Marriage Licences Issued by the Bishop of London 1611–1828,* op. cit.

[42] See T.R. Forbes, *Chronicle from Aldgate* (New Haven, 1971); R. Hovenden, *The Register of Christenings, Marriages and Burials of the Parish of Allhallow London Wall, 1559–1675* (1878); J. Landers, 'Age Patterns of Mortality in London During the Long Eighteenth Century: a Test of the High Potential Model of Metropolitan Mortality', *Social History of Medicine*, 3, (1990), 53.

[43] Forbes found in his study of the parish of Aldgate that there were 117 deaths from smallpox out of a total of 5,309 — 2.2. per cent — during 1583–99. 83 of the 117 deaths — 71 per cent — were under the age of ten and there were 3236 baptisms in the parish during this period, indicating a case-fatality rate of about 4 per cent. See T.R. Forbes, *Chronicle from Aldgate* (New Haven, 1971). There were 12 deaths from smallpox in Allhallows London Wall during 1574–98, 10 of which were under the age of 7, and 442 baptisms in the parish during this period, indicating a case-fatality rate of under 5 per cent. See R. Hovenden, *The Register of Christenings, Marriages and Burials of the Parish of Allhallow London Wall, 1559–1675* (1878).

[44] P. Razzell, *The Conquest of Smallpox* (2003), 168, 177.

[45] Ibid. 166–78.

[46] Ibid. 74, 96, 97.

[47] H. Zinsser, *Rats, Lice and History* (New York, 1963), 279.

[48] A.J. Saah, 'Rickettsia prowazekii (Epidemic Louse-borne Typhus)', in G.L. Mandell, J.E. Bennett and R. Dolin (eds.), *Principles and Practice of Infectious Diseases,* 2, (2000), 2051; C. Creighton, *A History of Epidemics in Britain,* 2, (Cambridge, 1965), 47.

[49] Creighton, *A History*, 2, 30–33. The environmental conditions favourable to the spread of typhus appear to have been present in England well before the sixteenth century. Body lice continued to be prevalent in both town and countryside into the eighteenth and nineteenth centuries.

[50] Forbes, *Chronicle.*

[51] Vann and Eversley, *Friends*, 212–15, 234.

[52] Vann and Eversley, *Friends*, 234. Schwarz has noted the decline of mortality from fever, smallpox, consumption and the diseases of infancy in London in the eighteenth century. See L. Schwarz, 'Review Article: Death in the Eighteenth Century', *Continuity and Change*, 11, (1996), 300.

[53] Creighton, *A History*, 14.

[54] T.R. Forbes, 'Births and Deaths in a London Parish: the Record from the Registers', *Bulletin of the History of Medicine,* 55, (1981), 390; Vann & Eversley, *Friends,* 218; J. Landers and A. Mouzas, 'Burial Seasonality and Causes of Death in London 1670–1819', *Population Studies*, 42, (1988), 64.

[55] R. Porter, 'Cleaning up the Great Wen: Public Health in Eighteenth Century London', *Medical History*, Supplement No. 11, (1991), 61–75.

[56] See F.J. Fisher, *London and the English Economy, 1500–1700* (1990); E.A. Wrigley, 'A Simple Model of London's Importance in Changing English Society and Economy 1650–1750', *Past and Present,* 37, (1967), 44–70; A.L. Beier and R. Finlay (eds.), *London 1500–1700: the Making of the Metropolis* (Basingstoke, 1986).

[57] See J.A. Chartres, 'Food Consumption and Internal Trade', in Beier and Finlay, op. cit.; A.L. Beier, 'Engine of Manufacture: the Trades of London', in Beier and Finlay, op. cit.

[58] Wrigley, 'A Simple Model' op. cit.; Beier and Finlay, op. cit. Not only did the population increase in London during the sixteenth and early seventeenth centuries have economic and social consequences for the country at large, but it probably had a significant influence on political developments in the mid-seventeenth century. The City of London provided critical financial and military support for the Parliamentary cause — the City's trained bands constituted the core of the early Parliamentary army. See S. Porter (ed.), *London and the Civil War* (Basingstoke, 1996).

[59] There is evidence that the cyclical fluctuations in mortality in London were also found in the country at large. See P. Razzell, 'Population, Poverty and Wealth: The History of Mortality and Fertility in England, 1550–1850', *Population and Disease: Transforming English Society, 1550–1850* (London, 2007).

[60] For a discussion of the role of wealth in shaping adult mortality, see Razzell and Spence, 'The Hazards of Wealth', op. cit.

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