The Growth of Population in Eighteenth-Century England: A Critical Reappraisal

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Population growth in eighteenth-century England was due mainly to a fall in mortality, which was particularly marked during the first half of the century. The fall affected all socioeconomic groups and does not appear to have occurred for primarily economic reasons. In addition to an explanation involving the introduction of smallpox inoculation, the major hypothesis considered in this article is that the significant improvement in domestic hygiene associated with the rebuilding of housing in brick and tile brought about a major reduction in mortality.

The growth of the English population in the eighteenth century has long interested economic historians and, since the time of Thomas Malthus, has provoked much debate about the relationship between population change and economic growth. In our own time, scholars have focused on the nature and chronology of change: whether economic development preceded and prompted population growth or vice versa. The structure of demographic change has, however, yet to be resolved. Prior to the nineteenth century, English demographic data are incomplete: there were no national censuses before 1801, and civil registration of births, marriages, and deaths did not begin until 1837. Demographic research on the pre-nineteenth-century period has relied mainly on parish registers, which list baptisms, marriages, and burials. The accuracy and coverage of these materials is uncertain, and their survival is uneven.

Despite these difficulties, all demographers have discerned a rise in the rate of English population increase in the second half of the eighteenth century, and many have emphasized fertility as the key mechanism of population growth. These ideas have received added

The Journal of Economic History, Vol. 53, No. 4 (Dec. 1993). © The Economic History Association. All rights reserved. ISSN 0022-0507.

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Several people commented on various drafts of this article, but I owe most to Dr. Ruth Richardson, who made a number of suggestions for rewriting sections of the paper, as well as providing invaluable encouragement and support. Peter Lindert made several useful critical comments on the structure of the paper, as did Pamela Evans and the referees who encouraged me to rewrite an earlier draft version. Jim Oeppen helped with a number of technical calculations, particularly the life expectancy figures in Table 10. Ros Davies of The Cambridge Group provided a printout of the Colyton reconstitution schedules that form the basis of Table 4. Frank Leeson supplied information on the tontines, Anthony Camp on various genealogical issues. I appreciate draft comments by Christopher Hill, John Habakkuk, Tony Wrigley, Keith Snell, Richard Wall, Richard Smith, Michael Anderson, and my brother, Edward Razzell.

weight from the ambitious program of research undertaken since the 1960s by The Cambridge Group for the History of Population and Social Structure. The Cambridge Group's demographic findings were presented in *The Population History of England*, written by two of the group's leading members, Tony Wrigley and Roger Schofield.[1] The authors argued that English population grew in the latter half of the eighteenth century mainly because of a rise in fertility. This rise, they hypothesized, was due to a reduction in the age at marriage, itself a consequence of rising real incomes caused by economic development. This article questions the validity of their conclusion and develops an alternative chronology and explanation of the demographic transition in England.

NUPTIALITY AND MARITAL FERTILITY

The Cambridge Group has used two methodologies in its demographic work: "back projection" and "family reconstitution." I will evaluate each in turn and offer evidence suggesting that the reliability of both methods as applied to the English data is open to question.

Back Projection

Back projection was a technique used by Wrigley and Schofield to estimate earlier population levels by retrospectively adding the number of deaths and net emigrants to the various age groups enumerated in the nineteenth-century censuses, extending this process back into the sixteenth century. They used records of baptisms, marriages, and burials from a sample of 404 parish registers, which in theory allowed them to reconstruct the numbers of people living at all periods, as well as to compute marriage, birth, and death rates. The method entails a number of assumptions of unknown reliability, with scope for the compounding of errors and assumptions over long periods of time. Although the technique was developed using a very sophisticated computer program, the unknown reliability of the raw data and the uncertain assumptions used in the program led Schofield himself to compare it with looking "through a glass darkly."[2]

Ronald Lee, an active associate of The Cambridge Group, expressed his own reservations about the method in the following terms: "Back projection attempts an impossible task, and can only arbitrarily select one demographic past from among an infinite set of equally plausible and acceptable ones, which are consistent with the input data."[3] Recognition of the method's problems led other scholars to propose adjustments to the technique. Lee advocated its replacement with what

[1] Wrigley and Schofield, *Population History*.
[2] Schofield, "Through a Glass Darkly."
[3] Lee, "Inverse Projection and Back Projection," p. 190.

TABLE 1
BIRTH RATES PER 1,000 POPULATION IN ENGLAND AND WALES

	1749–1753	1814–1818
Birth rate before inflation	29.70	27.99
Penultimate estimates (after inflating for nonconformity and delayed baptism)	32.14	32.69
Final estimates after "residual" inflations	33.76	41.92

Source: Lindert, "English Living Standards," p. 136.

he termed "inverse projection"; he claimed to have validated Wrigley and Schofield's findings by applying this new method to their basic data. More recently, Wrigley and Schofield have themselves advocated a variant of a method pioneered by Jim Oeppen, "generalized inverse projection."[4] However, such methods require reliable data on births, deaths, migration, age structure, and mortality by age for the appropriate period—though they differ in their exact demands for reliability. Lacking accurate source material, the advocates of these methods have had to adjust their back-projected data in various ways.

For example, to correct for the underregistration of births, Wrigley and Schofield inflated the number of baptisms by various ratios derived from a comparison of expected births with actual records of baptisms. The estimates of expected births were calculated by taking the various census age groups and adding the estimated number of those born into the groups who died or migrated in the period before the census. A crucial factor in this computation is the magnitude of the various age groups, because it is the starting point for the process of estimating expected births. A poor estimate of the number of people in each age group would affect the inflation ratios used to correct the figures for baptisms, and hence would affect back-projected estimates of birth rates.

Peter Lindert has argued that the Wrigley-Schofield findings were distorted by the changes they made to census age figures. He concluded that "life tables and nineteenth-century censuses suggest[s] that birth registration was worse before 1780 than after. Yet Wrigley and Schofield turn the suggestion upside down, arbitrarily revising the censuses instead."[5] Lindert has calculated the inflations they made to the birth rate in a tabular form, reproduced here in Table 1.

Lindert's disquiet at the transformation of the pattern of fertility through the use of these inflation ratios seems justified. The inflations adopted by Wrigley and Schofield progressively increase the birth rate, though the critical inflation is for "residual" nonregistration. This residual inflation increases the birth rate for the period of 1814 to 1818

[4] Wrigley and Schofield, *Population History*, p. xvii.
[5] Lindert, "English Living Standards," p. 138.

TABLE 2
INDIVIDUALS LISTED IN THE 1851 CENSUS BUT NOT FOUND IN THE BAPTISM REGISTER VERSUS THE CAMBRIDGE GROUP'S INFLATION RATIOS

Period	Percentage Not Found in Register (Razzell) (1)	Period	Wrigley & Schofield's Inflation Ratios (%) (2)
1761–1770	32.4	1760–1769	8.4
1771–1780	27.9	1770–1779	9.3
1781–1790	32.6	1780–1789	13.1
1791–1800	36.0	1790–1799	20.9
1801–1810	32.0	1800–1809	28.8
1811–1820	33.0	1810–1819	38.0
1821–1830	30.0	1820–1829	34.1
1831–1834	27.4	1830–1839	26.0

Sources: Razzell, "The Evaluation of Baptism," p. 129; and Wrigley and Schofield, *Population History*, p. 561.

from 32.69 to 41.92 per 1,000, transforming the pattern of fertility in the period. Before this residual adjustment Wrigley and Schofield's original data suggested a constant birth rate during the latter half of the eighteenth century; after it, a very significant increase was apparent. That increase was due entirely to the inflation ratios derived from their assumptions about the age structure of the population applied to the original data.

My own research also throws doubt upon those inflation ratios. I have compared census statements directly with the expected baptism register entries for individuals living in 45 parishes selected from all parts of England. Table 2 displays the two sets of figures. The figures in column 1 are based on direct empirical evidence; those in column 2 are derived from theoretical reconstruction.[6] The two series are radically different in their trends over time; the census–baptism register data show little or no change over the period, whereas Wrigley and Schofield's figures show a sharp deterioration in registration accuracy from 1781 onward.

The critical ingredient in the inflation ratios Wrigley and Schofield used was their adjustment of age structure data derived from the nineteenth-century censuses. They themselves pointed out that one of their major assumptions was "that the age data for the older age groups became progressively less trustworthy with rising age, until above the

[6] For column 1, I calculated the percentages that Wrigley and Schofield used to inflate baptisms in order to produce the number of births (excluding nonregistration due to delayed baptism). The census-parish comparison method has attracted criticism on three grounds: (1) the 1851 census misstated the birthplaces of individuals enumerated; (2) many parents had their children baptized in neighboring parishes; and (3) the 1851 census misstated names and ages. From unpublished research linking census, parish register, and civil registration data, it has been established that the "false negatives" arising from these three factors amounted to about 10 percent for the whole sample of 45 parishes. The "false negatives" were counterbalanced by "false positives" due to using overstrict criteria for successful matches and to infants dying before baptism. See Razzell, "Further Evaluation."

age of 70 very substantial corrections to the published totals are necessary."[7] This is not a minor step in their calculations. It is not only central to the question of baptism registration adequacy, but it can be crucial for estimates of population size using back projection. Older age groups in the nineteenth-century censuses form the starting point of back projection, and any change in their numbers makes a critical difference to estimates of population size because of the compounding of errors with each "pass" through the computer program. For example, Wrigley and Schofield reduced the size of the group aged 90 to 94 in 1871 by 44 percent; if they had chosen instead to reduce that age group by 40 percent, their estimate of the English population in 1541 would have been about 9 percent greater.[8]

How reasonable are Wrigley and Schofield's assumptions? When we examine age statements by comparing the census with baptism register entries, a very different picture emerges from that assumed for the back-projection program. For the census–parish register sample of 45 parishes, 88.8 percent of all adult ages in the 1851 census was accurate to within two years, 97.8 percent to within five years. Contrary to Wrigley and Schofield's assumptions, there was no deterioration in the accuracy of age statements above the age of 70; the reliability of age statements in the 70-to-80 age group was the same as for the total sample. Only in the 80-to-90 age group was there any decrease in accuracy. But even there, 74.5 percent of the ages were accurate to within two years, and 90.2 percent to within five years.[9] This conclusion is confirmed by Wrigley himself from his detailed work on the 1851 Colyton Census: "The generally high standards of statements of age is clear. Only a tiny percentage of ages were out by more than two years. . . . Even at advanced ages this holds true in general. . . . Only one of the 26 [cases aged over 70] mis-stated his age by more than three years."[10]

On the substantive issue of the increase of the eighteenth-century population, the evidence suggests no increase in the birth rate during the latter half of the century. Wrigley and Schofield, however, supported their argument about the central role of a rise in fertility by quoting data from their research on family reconstitution, which purports to show that a rise in fertility associated with a reduction in the age at marriage (rather than a fall in mortality) was responsible for eighteenth-century population growth. Although they expressed a caveat about the reliance on a very small number of parishes in their reconstitution work—about 13 from a total of about 10,000 have formed the basis of the sample to date—these scholars used their family reconstitution findings to under-

[7] Wrigley and Schofield, *Population History*, p. xiv.
[8] Lee and Lam, "Age Distribution Adjustments," p. 282.
[9] Razzell, "The Evaluation of Baptism," pp. 126, 127.
[10] Wrigley, "Baptism Coverage," p. 304.

pin the conclusions they reached from back projection. Yet there are also grounds for disquiet about the accuracy of their use of the reconstitution method. This is a theme of such importance as to deserve careful examination.

Family Reconstitution

Family reconstitution involves the detailed study of individual families at the parish level. Individuals are traced in the baptism, marriage, and burial registers, and certain assumptions are made to establish family links among the individuals traced. From those links data are generated on a range of demographic variables, including age at marriage, fertility, and mortality rates. Family reconstitution is only applicable to individuals who remained in their parish of origin, as those who left disappeared from local records. For example, in the case of marriage, those who migrated after baptism invariably married elsewhere and would be excluded from the age-at-marriage calculations. Wrigley and Schofield worked on the assumption that those who remained in a parish were representative of the whole population, including migrants.

Ever since Peter Laslett's well-known 1960s study of Clayworth and Cogenhoe, social historians have increasingly come to recognize just how mobile the English population was. A general study of migration in early modern England by Peter Clark and David Souden found that up to 80 percent of the population was mobile—the percentage varying by place and over time, with increased mobility during periods of population growth.[11] As migrants are excluded from reconstitution studies, these very high levels of migration mean that reconstitution cohorts include only minorities of the population.

Evidence suggests that, because of the association between migration and social status, these minorities were atypical. Clark and Souden found that "more respectable members of local society tended to be less mobile than small craftsmen, servants and labourers"—though this may have varied over time.[12] Most evidence on geographical mobility and social status shows that they were very strongly correlated. From his work with The Cambridge Group, Souden noted "the high mobility of labourers in the reconstitution material" and commented on the "high mobility of labourers and many craftworkers and the relative immobility of farmers and food retailers." He concluded that "the marked lifetime immobility of farmers—of yeomen and husbandmen—contrasted with labourers . . . would show the degree to which landholding, or its prospect, would condition movement."[13] Those included in the reconstitution cohorts—the stayers—were much more likely to be farmers

[11] Clark and Souden, *Migration and Society*, pp. 32, 122–23, 222.
[12] Ibid., pp. 122–23.
[13] Souden, *Pre-Industrial English Local Migration Fields*, pp. 250, 254, 310.

and other property owners, whereas the migrants were invariably laborers, servants, and other propertyless groups. Laborers, servants, and other impoverished groups formed a significant proportion of the population at this time, perhaps up to half the total. Their relative exclusion would raise major questions about the validity of reconstitution methodology.

Migration also serves to distort reconstitution calculations in a more technical way that can most easily be illustrated with respect to calculations of the average age at marriage. Wrigley's study of Colyton indicated that the proportion of women born and married in the parish fell from 43 percent in the period from 1560 to 1646 to 25 percent in 1720 to 1769 before rising to 31 percent between 1770 and 1837.[14] Such a significant shift in the amount of migration would affect calculations of age at marriage, if migration was not evenly distributed among the various age groups. For example, if for some reason a larger proportion of women in their late twenties migrated out of a parish, this would have the apparent effect of lowering the age at marriage: women marrying at older ages would have left the sample before they could be included in the reconstitution age-at-marriage calculations, and only the younger ones would be recorded. Thus, even where there were no real changes in the age at marriage, variations in migration patterns could create the illusion of change because of the calculation method used in reconstitution work. Without a detailed knowledge of migration, it is impossible to say precisely what effect it would have on age-at-marriage calculations. Clearly, the effect could be significant.

Various sources provide evidence that the number of widow and widower remarriages as a proportion of the total number of marriages fell from approximately 30 percent at the beginning of the eighteenth century to about 10 percent at the end.[15] Whether this reduction occurred as a result of falling mortality or of changes in the propensity to remarry is an open question, but the fall itself could influence the accuracy of reconstitution by reducing the number of older men and women marrying in a parish. Most parish registers do not give information on the marital status of the marrying parties; for men, this could lead to a systematic overstatement of first-marriage ages in the earlier period by accidentally including marriage ages of widowers. Large numbers of women of unknown marital status listed in the marriage

[14] Schofield, "Age-Specific Mobility," p. 262.

[15] Wrigley and Schofield, *Population History*, pp. 258–59. The parish registers of Stoke Poges, Eton, and Farnham Royal in Buckinghamshire; of St. Margaret's Rochester in Kent; and of Barnstable in Yorkshire give information on previous marital status during the civil registration period of 1653 to 1658. Total marriages of widows ranged between 25.7 and 37.0 percent. The marriage licenses of East Kent and West Sussex show a fall in the proportion of widows, from over 30 percent in the first half of the seventeenth century to approximately 10 percent in the early nineteenth century.

registers could also distort reconstitution findings, because of the greater likelihood of confused identity.

The problem of identity confusion also arises when parish register information is inadequate. The linking of baptism and marriage dates in reconstitution work is essentially speculative, based on the assumption that a similar name within a certain time period confers a common identity. Yet there are grounds for believing that this assumption is unjustified. As we will see, it was a widespread practice in England to give the name of a dead child to a subsequent sibling of the same sex, and many parish registers were defective in registering the baptism and burial of those subsequent siblings. The registration of burials—and possibly of baptisms—improved in at least some of the reconstitution parishes during the eighteenth and early nineteenth centuries, which might have affected calculations of the changing mean age at marriage. The Cambridge Group used identical names in the baptism and marriage registers as the basis for calculating marriage ages. The nonregistration of subsequent same-name siblings would inflate marriage ages by incorrectly linking the first dead sibling with the sibling of the same name listed in the marriage register. This would have been more significant in the earlier period, of course, because of the less adequate registration of same-name individuals.

There are therefore four serious grounds for questioning the validity of reconstitution methodology as it has been applied to English marriage data: (1) the sociologically unrepresentative nature of reconstituted cohorts due to the exclusion of migrants; (2) the technical distortion effects of migration on the calculation of reconstitution statistics; (3) the unknown effect of changes in the proportion of widows and widowers in the marriage registers; and (4) the effect of changing patterns of same-name sibling registration on the calculation of marriage ages.

Given the uncertain reliability of back projection and family reconstitution as they have been applied to English historical data, it is necessary to carefully examine other forms of demographic evidence for the seventeenth- and eighteenth-century period to see what they reveal.

Age at Marriage During the Seventeenth and Eighteenth Centuries

The mean age at first marriage for women in The Cambridge Group's reconstitution sample was at its highest for the period from 1650 to 1699—26.2 years.[16] In historical terms this is a high figure, and its magnitude is largely responsible for the subsequent fall in the age at marriage found by the group. It is therefore important to evaluate that mean carefully, as it represents the key element in the pattern of marriage ages generated by reconstitution.

Two forms of marriage were legal in England in the seventeenth and

[16] Wrigley and Schofield, "English Population History," p. 164.

eighteenth centuries: marriage by license and marriage by banns. Although both types were included in parish registers, marriage licenses were recorded separately by the ecclesiastical authorities and often contain a great deal more information (such as age at marriage) not found in parish registers. Marriage by license was marginally more expensive than marriage by banns, and therefore was more socially exclusive. In particular, laborers tended to marry by banns, though all other occupational groups appear to have been well represented by licenses.[17] However, the flexibility of marriage by license—it allowed marriage in any parish without having to call banns on three successive Sundays—meant that this type of marriage became very popular in the seventeenth and eighteenth centuries. For example, over 50 percent of all marriages in the Diocese of Canterbury were by license between 1677 and 1725.[18] Indeed, in some parishes in the Diocese of London at that time the proportion rose to over 80 percent.[19] For demographers licenses have the advantage of giving information on migrants as well as nonmigrants and of covering large groups of parishes; they therefore help overcome the problem of concentrating on individual, and possibly atypical, parishes.

The accuracy of age statements in marriage licenses seems to have been high. Vivien Elliott evaluated marriage ages in a sample of 69 cases of London licenses at the beginning of the seventeenth century: the averages were 23.47 years in the licenses and 23.50 years by reconstitution—that is, by comparing baptism and marriage dates in the parish register. A similar exercise for 50 Leicestershire marriages at the end of the same century yielded averages of 24.8 and 23.8 years, respectively, indicating a difference of about one year.[20] This may be due to inaccuracies in marriage license age statements or to a confusion of identities in the parish register as a consequence of same-name registration problems.

In the late seventeenth century, high-quality information is available from licenses taken from over 1,000 parishes in five counties in different regions of England: Kent, London, Nottinghamshire, Suffolk, and Yorkshire. Table 3 shows that the mean age at marriage in the four counties other than London lies within a narrow band of 23.60 to 24.44 years. The overall average age at first marriage for the five counties is 23.56 years, significantly lower than the mean age found in The Cambridge Group's reconstitution sample for the same period: 26.2

[17] Steel, *General Sources*, p. 227.

[18] The number of license marriages is listed in Cowper, *Canterbury Marriage Licenses* for 1894 and 1898. The total number of marriages in Kent is given in *Enumeration Abstract, 1841 Census*. The proportion marrying by license was 50.74 percent for the period between 1677 and 1725.

[19] See, for example, the St. Michael Cornhill, St. Mary Aldermary, and St. Helen's Bishopsgate marriage registers for this period.

[20] Elliott, *Mobility and Marriage*, pp. 291, 325.

TABLE 3
AGE AT FIRST MARRIAGE OF WOMEN LISTED IN LICENSES, 1660–1714

Period	Region	*N*	Mean Age at Marriage	Reconstitution Mean Age at Marriage, 1650–1699
1662–1714	Yorkshire	7,242	23.76	—
1660–1702	London	500	21.93	—
1661–1700	Kent	1,000	24.06	26.2
1670–1709	Nottinghamshire	3,284	24.44	—
1690–1709	Suffolk	356	23.60	—

Sources: For Yorkshire: Drake, "An Elementary Exercise," p. 444. For London: Armytage, *Allegations for . . . London* (selecting the first 100 cases from the beginning of each decade). For Kent: Cowper, *Canterbury Marriage Licenses*, 1876, 1898 (selecting the first 500 cases from each volume). For Nottinghamshire: Blagg and Wadsworth, *Abstracts of Nottinghamshire Marriage Licenses* (selecting all cases listed). For Suffolk: Bannerman, *Allegations for . . . Sudbury* (selecting all cases listed).

years. In the 1840s, the earliest years of civil registration, women's mean age at first marriage was about 25.[21] The data in Table 3 suggest, therefore, no fall in the mean age at first marriage, but on the contrary a long-term rise of about 1.5 years.

THE HISTORY OF MORTALITY

Because the evidence considered in the previous section offers no support for a decline in age at marriage—nor for a rise in fertility—it is necessary to look elsewhere to explain English eighteenth-century population growth. In this section I will argue that the key demographic change was a decline in mortality that was particularly marked in the first half of the eighteenth century.

Population studies covering the centuries prior to reliable civil registration largely depend on data derived from parish registers. These registers invariably include information on baptisms (not births), marriages, and burials (not deaths). The reliability of the burial registers is obviously crucial to the study of mortality. For their calculation of reconstitution mortality rates, Wrigley and Schofield assumed a burial registration accuracy of 100 percent. Yet evidence suggests that in certain respects burial registration was significantly more defective in the seventeenth and eighteenth centuries than at a later period.

I have developed a method for measuring the adequacy of burial registration that may be termed the "same-name evaluation technique." It is based on child-naming customs prevalent in early modern England. It was extremely rare to give two living children identical Christian names; for example, of 2,221 children named in sixteenth-century Essex

[21] *Registrar-General's Fifty-Eighth Annual Report*, p. ix; and *Registrar-General's Twenty-First Annual Report*, p. iii.

wills, only 0.5 percent of living siblings shared the same name. An examination of seventeenth-century census returns from different parts of the country revealed no clear cases of living brothers and sisters with the same names.[22] On the other hand, it was widely customary to pass a dead child's name on to the next-born sibling of the same sex.

A look at two parishes used intensively in reconstitution work, Hartland and Colyton, enables us to estimate the frequency with which this same-naming custom was observed. In Hartland in the period from 1725 to 1743, a sample was chosen from the parish register of 50 dead children whose parents bore subsequent children of the same sex. Thirty of the subsequent children—60 percent—were given the same name as their predeceased sibling.[23] In Colyton, a similar examination of the data has proved possible over a much longer period by means of a reanalysis of the reconstitution schedules from 1538 to 1851.[24] In 789 of the parish families, a child was baptized after the death of another of the same sex. Of those families, 508—64.4 percent—gave the name of a previously baptized dead child to a subsequent child. The changes over time in the proportion of same-named children were as follows: from 1538 to 1600, 54.9 percent; from 1601 to 1650, 55.5 percent; from 1651 to 1700, 76.9 percent; from 1701 to 1750, 70.0 percent; from 1751 to 1800, 73.5 percent; from 1801 to 1837, 63.4 percent; and from 1837 to 1851, 62.2 percent. These are sufficiently large proportions of the total number of families to form the basis of an evaluation of burial registration during the whole 400-year period covered by the reconstitution schedules.

The importance of same-naming to the study of burial register accuracy can be illustrated as follows. During the middle part of the eighteenth century, Thomas Turner, a Sussex shopkeeper, kept a detailed diary and compiled notes on his family's history.[25] He listed his children's births and deaths as follows:

Peter (born August 19, 1754; died January 16, 1755)
Margaret (born March 20, 1766)
Peter (born June 1, 1768)
Philip (born October 9, 1769)

[22] See Emmison, *Essex Wills, 1558–1565*. The censuses searched were the 1599 Ealing census, the Claywoth censuses for 1676 and 1688, and the 1695 Marriage Duty Act censuses for London, Bristol, Lyme Regis, Swindon, and Wanborough. The London census was published in Glass, *London Inhabitants Within the Walls*. The Bristol census is in Ralph and Williams, *The Inhabitants of Bristol in 1696*. Copies of the other censuses can be found in the library of The Cambridge Group.

[23] See the *Hartland Parish Register*.

[24] A computer printout of the reconstitution schedules of Colyton was kindly provided by Ros Davies of The Cambridge Group. The grouping of families is specified in that printout. Families with interpolated baptisms were not included in the sample because doing so would introduce bias into the analysis.

[25] See Jennings, *Diary of a Georgian Shopkeeper*, pp. 79–84.

Frederick (born December 8, 1771; died November 7, 1774)
Michael (born April 29, 1773)
Frederick (born May 3, 1775; died June 13, 1775)
Frederick (born December 17, 1776)

Turner's first wife died after the birth of his eldest son Peter, and he subsequently remarried. The list of his children reveals the pattern of same-naming: the first Peter and the first two Fredericks died, and the next child of the same sex was given the dead child's name. Thomas Turner had lived all his married life in the parish of East Hoathly, and it is instructive to compare this list of births and deaths with the record of baptisms and burials of his children in the East Hoathly parish register:[26]

Peter (baptized August 31, 1754)
Margaret (baptized April 23, 1766)
Peter (baptized June 28, 1768)
Philip (baptized November 5, 1769)
Frederick (baptized December 30, 1771)
Michael (baptized May 19, 1773)
Frederick (baptized May 14, 1775; buried June 13, 1775)
Frederick (baptized January 10, 1777)

All of Turner's children were baptized and registered in the parish, but only one of the three dead children was recorded in the burial register: the second Frederick, who died in 1775. Turner's diary reveals that Peter and the first Frederick were in fact buried in the neighboring parish of Framfield, where their grandparents had died and been interred.

The Cambridge Group's reconstitution rules work on the assumption that all family events occur within the parish of residence. Given this, the demographic history of the Turner family, in which two children were buried outside the parish, would be misrepresented. The group's reconstitution rules would generate a calculated child mortality rate of 12.5 percent (one out of eight children), whereas in fact the true mortality rate was 37.5 percent (three out of eight children).

The practice of same-naming, however, allows us to assess the adequacy of parish registers in registering the deaths of children. For example, though we would not know from the East Hoathly burial register what had happened to Peter and the first Frederick, the repetition of their names in the baptism register would tell us that they had died, even though no record of their burial was available. We can thus assess the reliability of burial registration of a particular parish

[26] I am grateful to the East Sussex Record Office for conducting a search of the East Hoathly parish register.

TABLE 4
ANALYSIS OF BURIAL REGISTRATION OF SAME-NAME SIBLINGS IN COLYTON, 1538–1837

Period	*N*	Number Found in Burial Register	Percentage of Cases Unregistered
1538–1600	95	62	34.7
1601–1650	121	71	41.3
1651–1700	114	86	24.6
1701–1750	84	54	35.7
1751–1800	94	60	36.2
1801–1837	77	64	16.5
1837–1851	38	34	10.5
Total	623	431	30.8

Note: All calculations were based on Colyton reconstitution schedules supplied by Ros Davies of The Cambridge Group. The identity of same names is specified in the schedules, and in every case those names were selected for analysis.

register by measuring the proportion of same-name baptisms against registered same-name burials.

Application of this technique to a sample of cases selected from the Hartland parish register reveals that the accuracy of burial registration varied over time. Two hundred children baptized with the same name as a subsequent sibling were selected in alphabetical sequence from the register index for the period of 1558 to 1837.[27] Sixty-three of them (31.5 percent) were missing from the burial register. The first 100 cases, in the period from 1558 to 1724, had an omission rate of 39 percent, whereas the second hundred cases, from 1725 to 1837, had a rate of only 24 percent. These provisional results suggest a significant improvement in burial registration in Hartland during the eighteenth century.

A similar analysis of the 508 families in the Colyton reconstitution schedules who gave two or more of their children the same name yields the results shown in Table 4. The omission rate for the whole Colyton sample—30.8 percent—is similar to that found in Hartland, and registration accuracy there also seems to have varied over time. The Colyton registers reveal a sharp improvement at the beginning of the nineteenth century, which is consistent with what is known generally about the relative accuracy of Anglican burial registration at the time of the introduction of civil registration.[28]

I have made a special study of the Colyton Anglican burial register between 1837 and 1851, the period immediately following the introduc-

[27] The initial identification of names was provided by the Hartland parish register index. In the earlier period only the father's name was available for establishing a correct identity, but when two or more families had the same name, place-names were used as an additional criterion.

[28] Glass estimated that about 20 percent of all deaths were omitted from Anglican burial registration in the early period of civil registration, but this figure was lower in rural parishes like Colyton. See Glass, "Population and Population Movements," p. 234.

tion of civil registration. The civil registration records there list the deaths of 199 children under the age of ten during this period. Of that number, 170 were registered in the Anglican burial register, giving an omission rate of 14.6 percent—slightly higher than the 10.5 percent figure found using the same-name technique for the same period. However, the civil registers included young infants who died before baptism and were therefore often denied full burial status by the church. If we exclude infants who died in less than 24 days—the approximate mean age of baptism in Colyton at the time—the burial omission rate declines to 10.8 percent.[29] We must not make too much of the almost identical findings of the same-name technique and the civil-Anglican burial register comparison method, as the sample in the former study is small. Nevertheless, the similarity in the results of these two methods indicates a degree of reliability.

There were a number of reasons why Anglican burial registration was so deficient before the nineteenth century. The major factor was probably the negligence of clerks and clergymen in registering burials that had occurred in their parish.[30] Of all the same-name cases in Colyton between 1538 and 1851, 30.8 percent were missing from the burial register. We can evaluate the accuracy of this figure by comparing it with the proportion of people dying in Colyton who left wills behind but whose names did not appear in the burial register. Information is available on 124 people who either lived in Colyton or specified burial in the parish churchyard there and who made wills between 1554 and 1797; of this number 35 (28.1 percent) were not recorded in the burial register.[31] The similarity between this and the same-name figure suggests a general underregistration of burials, of both adults and children, during the period.

We have seen, in the case of the Turner family, another reason for unrecorded burials: the interment of children in neighboring parishes—a practice described by Schofield as a "traffic in corpses."[32] This probably accounts for some of the missing burials in a parish like Colyton. In its reconstitution schedules, information is sometimes given on the residence of a family, and there is a correlation between place of residence and registration reliability between 1538 and 1837, the period covered by the schedules. Of 65 same-name cases in which the father was listed as living in the town of Colyton, 48 were found in the burial register, an omission rate of 26.2 percent. When families lived outside

[29] This analysis is based on a list of Anglican burials and civil registration deaths that took place in Colyton between 1837 and 1851. The list was kindly provided by Richard Wall of the Cambridge Group.

[30] See Tate, *The Parish Chest*, p. 49.

[31] See Smith, *Wills Proved in P.C.C. Relating to . . . Colyton*; Fry, *Calendars of Wills*, Vols. 1 and 2; and the *Colyton Parish Register*. Information is usually given on the dates of the making and proving of wills, which allows a precise check against the burial register.

[32] Schofield, "Traffic in Corpses."

the town, in hamlets and outlying farms, the omission rate was as high as 43.9 percent, only 83 out of 148 same-name cases being found in the burial register. Some of these missing cases were probably buried in neighboring parish churchyards that were closer to the outlying areas than was the Colyton parish churchyard. Children baptized in Colyton but buried in surrounding parishes would not appear in the reconstitution statistics of infant and child mortality, and their omission would lead to an understatement of mortality.

Wrigley and Schofield's assumption of the absolute accuracy of the parish registers used in their reconstitution work was based partly on their having carefully selected high-quality parish registers, eliminating those with obvious defects. In the case of baptism registration, their assumption may be justified—particularly as missing baptisms can be interpolated from information on child burials, and registers can be selected on the basis of having the right pattern of birth intervals (that is, baptisms of children in a particular family occurring approximately every two years).

No such interpolation or selection is possible with burial registers, however, and the evidence derived from the same-name technique as applied to Hartland and Colyton suggests that death registration was unreliable throughout the sixteenth- to eighteenth-century period. The deficiency was probably greater than that shown in Table 4. The same-name technique can only be applied to cases in which baptisms were accurately registered, and it is likely that children whose baptism registration was defective also had more deficient burial registration. As we have seen, neither does the technique allow for children who died before baptism, and many of them would not have appeared in the burial register.

The Cambridge Group's estimates of infant and child mortality rates for Hartland and Colyton in the seventeenth and eighteenth centuries are low by historical standards: in the range of 83 to 106 per 1,000 between 1600 and 1749, falling to 57 to 97 per 1,000 between 1750 and 1799.[33] The results of the same-name technique indicate higher rates for all periods. If we allow for the various factors just discussed, which would further inflate registration unreliability, it is likely that infant mortality in Hartland and Colyton in the seventeenth and eighteenth centuries has been underestimated by between 35 and 50 percent.

According to the group's figures, the average infant mortality rate for the 13-parish reconstitution sample for 1600 to 1749 was in the range of 161 to 169 per 1,000.[34] If we inflate this rate as indicated earlier, it would increase infant mortality to between 250 and 340 per 1,000. National infant mortality was about 150 per 1,000 under early civil registration in

[33] Wrigley and Schofield, "English Population History," p. 179.
[34] Ibid., p. 177.

the late 1830s, so it seems probable that infant mortality probably dropped significantly during the eighteenth and early nineteenth centuries. However, it is too early to reach firm conclusions about the overall direction of this type of mortality; further research is needed on the registration reliability of other reconstitution parish registers.

The uncertain reliability of parish registers increases the value of other forms of evidence on mortality during the seventeenth and eighteenth centuries. Nearly all of these data concern adult mortality. In a 1974 article on parental loss, Peter Laslett commented on an apparent decline in the number of orphans in the seventeenth and eighteenth centuries. Community surveys of eleven localities taken between 1500 and 1706 revealed a median of 25 percent (with a mean of 22.5 percent), whereas eight surveyed between 1724 and 1811 had a mean of 16.5 percent (with a mean of 15.9 percent). Laslett concluded that the decline in the number of orphans probably "arose because of shifts in demographic rates, particularly in mortality."[35]

Of the communities Laslett studied, perhaps the most famous is Clayworth, in Nottinghamshire. The disappearance of large numbers of people from this community between 1676 and 1688 was used to illustrate the high level of mobility at that time. What Laslett did not sufficiently stress is that, in the case of adult heads of household, most of them disappeared through death rather than migration. Of 95 heads of household living in Clayworth in 1676, 44 were no longer there in 1688; 10 may have left through migration, but the remaining 34 died between the two censuses.[36] Allowing for the effects of migration, those 34 deaths represent a mortality rate of 3.05 percent per annum, over twice the 1.39 percent adult mortality rate found in England under civil registration 150 years later.[37]

In his discussion of orphans, Laslett quoted the civil marriage returns for the Manchester area in the 1650s, which recorded the father's name, parish of residence, and father's mortality status. Using these data, it is possible to calculate the mortality rate of fathers. Of 380 spinsters married in the Manchester area between 1654 and 1660, the fathers of 226 were dead by the time of their marriage. That is, the fathers of 59.47 percent of these women were dead.[38] Assuming an average age at first marriage for women of about 23, this represents an annual mortality rate of fathers of 2.59 percent per annum, well above the figure found in early civil registration. The fathers of these women marrying in Manchester came from all parts of Lancashire as well as from other northern counties. There appears to have been little variation in mortality

[35] Laslett, "Parental Deprivation," p. 15.

[36] Laslett and Harrison, "Clayworth and Cogenhoe," p. 183.

[37] *Registrar-General's Ninth Annual Report, Appendix.*

[38] These figures were calculated from all marriages listed in the marriage register between 1654 and 1660. See the *Manchester Cathedral Parish Register.*

between different areas within Lancashire. Of the 49 fathers who came from Manchester itself, 61.22 percent were dead at the time of their daughter's marriage, a proportion close to that for the whole sample covering all areas. (Evidence from tontines, marriage licenses, and other material suggests that the urban-rural gradient postdates the seventeenth century.)

These data suggest a radical long-term decline in mortality between the seventeenth and nineteenth centuries. It also fits traditional ideas of a high mortality rate in the preindustrial era. However, it is at variance with The Cambridge Group's family reconstitution work on adult mortality, which found only a very modest rise of about three years in life expectancy for men at age 30 during the 250 years between 1550 and 1799.[39] Most of the problems associated with the reconstitution of marriage ages—unreliable parish registers, sociologically unrepresentative samples, and the technically distorting effects of migration—also apply to the study of adult mortality. With the adult mortality cohorts there is the additional problem of very small sample sizes. For example, approximately 21.5 percent of all females born in Colyton between 1560 and 1646 were included in the adult mortality cohort, with equivalent figures for 1720 to 1769 and 1770 to 1837 of 12.5 and 15.5 percent.[40] In other words, in some instances The Cambridge Group's mortality cohort was derived from only an eighth of the total population. Reliable conclusions about mortality cannot safely be based on such small samples.

There is, however, another source of information that allows a provisional assessment of adult mortality over the 300-year period between the sixteenth and eighteenth centuries: marriage licenses. The licenses issued in the Diocese of Canterbury are of particularly good quality and run continuously (except for the interregnum period of 1646 to 1660) from 1568 through to 1809 and beyond. The diocese covers the East Kent region and includes 289 parishes. Seventeenth-century marriage licenses record information on the parents of bachelors and spinsters at all ages, but particularly on those of young women. By canon law, the consent of parents or guardians was required before a marriage license could be granted; those marrying under 21 had to provide it in writing or in the form of a sworn affidavit.[41]

The allegations attached to the licenses issued from 1619 to 1646 and from 1661 to 1676 nearly always refer to parental consent, particularly for the former period: over 96 percent of licenses gave information on

[39] Wrigley and Schofield, *Population History*, p. 250.

[40] Insufficient evidence has been published to calculate exact figures, but for Colyton approximately half of the initial cohort of married women was included in the mortality sample: applying that ratio to the proportion of females included in the marriage sample yields the figure quoted in the text. See Wrigley, "Mortality in Pre-Industrial England."

[41] Steel, *General Sources*, pp. 226–68.

TABLE 5
PARENTAL MORTALITY BY AGE OF DAUGHTER IN EAST KENT, 1619–1646

Age of Daughter	Number in Sample	Father Alive, Consenting (%)	Father Dead, Mother Consenting (%)	Both Parents Dead (%)
16–20	280	58.2	23.2	18.6
21–25	484	42.1	23.1	34.7
26–30+	236	26.7	25.0	48.3
Total	1,000	43.0	23.6	33.4

Sources: Cowper, *Canterbury Marriage Licenses*, 1892, 1894, 1896, 1905, 1906; and Willis, *Canterbury Marriage Licenses*, 1967, 1969, 1971.

parental consent between 1619 and 1646. The richness of this information allows us to examine whether fathers or parents were alive or dead for virtually all those marrying by license in that period: 42.36 percent of the total population. The licenses give information on age and occupation, which allows a study of both of those variables.

Table 5 summarizes an analysis of parental mortality by age for a sample of 1,000 individuals.[42] It reveals a high level of parental mortality: one-third of these women had lost both parents by the time of their marriage, a proportion that increased to 48.3 percent for those 26 and older. So nearly one-half of women had lost both parents by their late twenties. In seventeenth-century Kent, only a minority of women—43 percent—had two living parents at the time of their marriage. These figures speak for themselves: adult mortality was very high in this period.

We can calculate the adult mortality rate of fathers by dividing the numbers dead by the average age of their daughters. Fully 57 percent of all fathers were dead at the time of their daughter's marriage, and they had died during a 23-year period (the average age at marriage of their daughters). This yields an annual mortality rate of 2.48 percent per annum, almost identical to that found from the Manchester marriage register for the period of 1654 to 1660. These fathers probably died over a fairly even period between the birth and marriage of their daughters: a small sample of 35 cases in which the date of death was given indicates that on the average fathers died 10.64 years before their daughter's marriage.

The long-term change in mortality can be measured by comparing

[42] In preparing Table 5, I adopted the following rules: (1) if a father was listed as giving his consent, he was assumed to be alive; (2) if a father was not mentioned, and a mother was stated as giving her consent, the father was assumed to be dead and the mother to be alive; and (3) if a guardian was listed as giving consent, both parents were assumed to be dead. In the majority of cases, particularly during the earlier periods, information is given directly on the mortality status of parents—for example, a mother giving consent is recorded as a widow of a lately deceased husband, or both parents are recorded as being dead. However, these rules should be checked through further research.

TABLE 6
MORTALITY AMONG PARENTS OF SPINSTERS UNDER AGE OF 21 MARRYING BY LICENSE IN EAST KENT

Period	Father Alive, Consenting (%)	Father Dead, Mother Consenting (%)	Both Parents Dead (%)	Total Number in Cohort
1619–1646	53.33	27.06	19.61	1,275
1661–1676	55.70	25.23	19.07	515
1677–1700	58.86	19.82	21.32	333
1751–1779	74.29	21.00	4.29	700
1780–1809	76.89	17.68	5.43	1,233

Sources: Cowper, *Canterbury Marriage Licenses*, 1892, 1894, 1896, 1898, 1905, 1906; and Willis, *Canterbury Marriage Licenses*, 1967, 1969, 1971.

these figures with those compiled under civil registration 200 years later. Among men living in Kent of roughly the equivalent age group (between 30 and 55), mortality was virtually halved between the early seventeenth and early nineteenth centuries: from 2.48 percent in 1619 to 1646 down to 1.31 in 1838 to 1844.[43]

The chronology of change in the pattern of mortality among the marriage license population can be traced through an analysis of the marriages of all women marrying under the age of 21. This information is available in the Diocese of Canterbury for all periods except 1701 to 1750. Table 6 depicts the exact chronology of decline in mortality. This table suggests a marked reduction in adult mortality from the mid-seventeenth to the mid-eighteenth century. The proportion of cases in which both parents were dead dropped particularly sharply: from 21.32 percent in 1677 to 1700 to 4.29 percent in 1751 to 1779. This was matched by the fall in the percentage of fathers dead—from 46.67 to 25.71 percent—representing a fall in mortality, all else being equal, of 44.91 percent. The reduction in mortality seems to have commenced after the 1660s, though the changes in the late seventeenth century appear to have been relatively slight. The main fall in mortality seems to have occurred between the end of the seventeenth and the middle of the eighteenth century.

For the earlier periods, information is invariably given in the Kent licenses on the occupation of both husbands and living fathers, though not usually for fathers already dead. This allows an occupational analysis of mortality, and Table 7 illustrates what is possible in this respect. Overall there is little correlation between the husband's occupation and parental mortality—except in the earlier period, which shows a lower rate for gentlemen and higher one for husbandmen, with a slightly higher mortality for gentlemen in the later period.

Although laborers and the unemployed are not covered by Table 7, groups such as husbandmen and fishermen were characterized by a

[43] See *Registrar-General's Ninth Annual Report, Appendix*, pp. 17–20.

TABLE 7
MORTALITY AMONG PARENTS OF SPINSTERS MARRYING UNDER 21 BY OCCUPATION OF HUSBAND IN EAST KENT, 1619–1809

Occupation, by Period	Father Alive, Consenting (%)	Father Dead, Mother Consenting (%)	Both Parents Dead (%)	Number in Cohort
Gentlemen and professionals				
1619–1646	60.49	16.10	23.41	205
1661–1700	61.83	19.85	18.31	131
1751–1809	72.33	20.12	7.55	159
Total	64.65	18.38	16.97	495
Yeomen and farmers				
1619–1646	58.76	25.18	16.06	274
1661–1700	57.99	15.98	26.03	169
1751–1809	84.54	12.08	3.08	207
Total	66.77	18.62	14.62	650
Husbandmen				
1619–1646	49.77	29.58	20.66	213
1661–1700	60.66	22.95	16.30	122
1751–1809	80.56	16.67	2.78	108
Total	60.27	24.60	15.12	443
Artisans and tradesmen				
1619–1646	54.18	28.48	17.92	491
1661–1700	50.61	29.45	19.94	326
1751–1809	74.31	20.40	5.29	397
Total	59.80	25.86	14.33	1,214
Mariners and fishermen				
1619–1646	58.33	25.69	15.97	144
1661–1700	55.34	29.13	15.53	103
1751–1809	75.95	22.15	1.90	158
Total	64.44	25.19	10.37	405

Sources: See sources for Table 6.

similar level of income and were certainly very much poorer than gentlemen and yeomen farmers.[44] The higher mortality among husbandmen indicates that economic forces may have been a factor in shaping mortality patterns in the earlier period. However, the fact that there were very substantial increases in life expectancy among all occupational groups during the eighteenth century suggests that economic factors were not primarily responsible for the reduction in mortality. For the later period we have information on a number of laboring families: of 91 women under the age of 21 marrying laborers in East

[44] Gregory King estimated that the average income of "common seamen" was £20 per annum, not significantly greater than the estimated income of "labouring people and out servants" (£15 per annum). See King, *Natural and Political Observations*, pp. 48, 49.

TABLE 8
AVERAGE NUMBER OF YEARS LIVED, MEMBERS OF PARLIAMENT, 1660–1820, BY AGE AT FIRST ENTRY

Date at First Entry	Average Number of Years Lived After Entry		
	Aged Under 29	30–39	40+
1660–1690	25.71 (429)	22.58 (458)	17.87 (633)
1715–1754	30.83 (541)	28.17 (422)	18.52 (347)
1755–1789	37.13 (480)	29.86 (354)	21.16 (431)
1790–1820	38.06 (571)	32.04 (432)	22.40 (572)

Notes: Calculations are to the nearest year and include only cases with full information on date of birth, first entry, and death. Figures in parentheses indicate numbers of cases.
Sources: Henning, *House of Commons 1660–1690*; Sedgwick, *House of Commons 1715–1754*; Namier and Brooke, *House of Commons 1754–1790*; and Thorne, *House of Commons 1790–1820*.

Kent from 1751 to 1809, 83.52 percent had fathers living at the time of their marriage—a figure second only to that for yeomen in the proportion of fathers still living. This finding is consistent with those on occupational mortality in the nineteenth century: laborers in agricultural counties in the post-1860 period had one of the lowest mortality rates recorded.[45]

Although no other reliable evidence covering the general population exists, a variety of information is available on special groups, which allows a supplemental assessment of changing mortality. One of the most accurate forms of data available is on Members of Parliament. Biographical information on M.P.s exists for the period from 1660 to 1820, except for 1691 to 1714. Date of birth, entry, and death to the nearest year is known for 94.58 percent of the 5,995 M.P.s who first entered Parliament in 1660 to 1690 and 1715 to 1820—an unrivaled level of demographic accuracy for the period.[46] A special study of these data is in process, but the preliminary findings are presented in Table 8.

There were sharp gains in life expectancy between 1660 to 1690 and 1715 to 1754, particularly for the younger age groups (under the age of 39). Mortality continued to fall from the period 1715/54 to 1755/89, though only among M.P.s under the age of 29.

The finding of a significant fall in mortality during the first half of the eighteenth century is supported by a number of studies. Perhaps the most important (and most neglected) is a study of government annuitants made by John Finlaison, the actuary to the National Debt Office, which was published in 1829. Finlaison's data derived from four

[45] See Haines, "Conditions of Work and Mortality Decline," p. 183. According to the East Kent license data, all rural occupational groups—yeomen, husbandmen, and laborers—had a lower parental mortality than the more urban ones in the late eighteenth century.

[46] See Henning, *House of Commons 1660–1690*; Sedgwick, *House of Commons 1715–1754*; Namier and Brooke, *House of Commons 1754–1790*; and Thorne, *House of Commons 1790–1820*. The proportion of total cases with information on birth, entry, and death by period are as follows: for 1660–1690, 95.72 percent; for 1715–1754, 89.42 percent; for 1755–1789, 95.76 percent; and for 1790–1820, 98.19 percent.

TABLE 9
MORTALITY RATES PER 1,000 OF ALL NOMINEES TO BRITISH TONTINES, 1693–1789

Age Group	Date of Tontine			
	1693	1745+	1773	1789
5–15	9.12	5.65	5.75	6.75
16–30	18.44	9.27	10.32	10.14
31–45	20.21	12.61	11.88	11.05
46–60	31.57	22.93	17.09	18.57
61–75	66.09	66.81	51.89	77.39

Source: Finlaison, *Report on Life Annuities*, pp. 66, 67.

tontines run by the British government in the eighteenth century. A tontine was a device to raise revenue; it involved the payment of annuities to subscribers based on the survival of their nominees. Subscribers buying tontine shares were allowed to nominate whomever they wished. Most of them nominated themselves or, more frequently, their children. The annuity paid out by the government depended on the survival of individual nominees—survivors shared a fixed annuity sum among themselves—and their deaths were monitored by the Exchequer until the last nominee died, in very old age. For example, the last survivor of the 1693 tontine died in 1783.

Although a self-selected group, the subscribers came from all parts of the country, and there is evidence that they were demographically representative of the social groups from which they originated.[47] The subscribers to the tontines were a mixture of aristocracy, gentry, merchants, and professional people, and though this was a limited social range, the precision and accuracy of the data helps counterbalance that limitation.[48] The smallest number of nominees was for the 1693 tontine (just over 1,000), but the numbers grew progressively throughout the eighteenth century. Table 9 summarizes the mortality experience of the four tontines.

There were marked falls in mortality among all age groups under the age of 60, most of which occurred between the first two tontines. For example, mortality among the 16-to-30 age group almost exactly halved between the 1693 and 1745 tontines. A majority of the nominees entered the tontines as children, though the survivors went on to be included in mortality calculations for the later age groups. The pattern of mortality revealed by the tontine data indicates that most of the reduction in mortality occurred in the first half of the eighteenth century.

[47] In the 1789 tontine, the government nominated over half of the nominees by lot, and their mortality rates were similar to that of the nominees of the subscribers. See Finlaison, *Report on Life Annuities*, pp. 7, 66, 67.

[48] In 1693 the proportion of subscribers listed as gentlemen (including aristocrats) was 59.1 percent; professionals, 11.2 percent; and merchants and others, 29.7 percent. The equivalent proportions in 1745 were 56.8, 10.5, and 32.7 percent, respectively. See *The British State Tontine of 1693*; and Leeson, *Guide to . . . British State Tontines*, p. 7.

TABLE 10
LIFE EXPECTANCY (IN YEARS) OF MALES AGED 25 YEARS

Social Group	Approximate Period				
	1600–1649	1650–1699	1700–1749	1750–1800	1800–1824
Tontine nominees	—	28.0	34.5	36.4	—
Aristocracy	25.4	26.9	31.8	36.4	37.2
Reconstitution sample	32.9	31.4	33.6	35.4	—
South-of-England Quakers	26.1	27.6	31.7	31.5	—
Scottish advocates	28.8	31.1	38.0	38.1	—
Fathers listed in marriage licenses	26.9	28.6	—	37.9	—
Members of Parliament	—	25.7	30.8	37.1	38.0

Notes: These figures were prepared with the help of Jim Oeppen. In the case of the marriage licenses, it was assumed that (1) the average newborn had a mother aged 32 and a father aged 35; and (2) the average child was 20 years old at marriage. Model North in Coale and Demeny was used for translating survivorship between the ages of 32 and 52 for women (35 and 55 for men) into life expectancy at age 25. For the reconstitution sample and the Quakers, conversion was made to life expectancy at age 25 by using the relationship between life expectancy at ages 25 and 30 in the Coale and Demeny Model North life tables. More details can be obtained from Jim Oeppen at The Cambridge Group.

Sources: The figures for tontines are from Finlaison, *Report on Life Annuities*; for the aristocracy, from Hollingsworth, "The Demography of the English Peerage," p. 56; for the reconstitution sample (men aged 30), from Wrigley and Schofield, *Population History*, p. 250; for the Southern Quakers (men aged 25–30), from Vann and Eversley, *Friends in Life and Death*, p. 229; for Scottish advocates, from Houston, "Mortality in Early Modern Scotland," p. 51; for fathers in marriage licenses, from data in this article. For Members of Parliament the figures used are those listed in Table 8 of this article; they include M.P.s younger than 29 when entering Parliament.

A number of more recent studies confirm this conclusion. Table 10 brings together all the available evidence, expressed in the form of male life expectancy at 25 years of age. The data are arranged in the sequence in which they were published. The overall finding is that, with the exception of the reconstitution sample and South-of-England Quakers, there was an increase of about ten years in adult life expectancy between the seventeenth and eighteenth centuries. Table 10 shows that the increase occurred throughout the whole eighteenth century, though more detailed analysis reveals particularly sharp gains at its beginning. Whether this fall in mortality was sufficient to account for the whole of population growth is a question that can only be answered by further research.[49]

[49] A ten-year increase in life expectancy at birth would more than adequately explain population growth between 1695 and 1841, assuming that fertility was high during the eighteenth century. Given that the marriage licenses indicate a low age at first marriage of women in the late

EXPLANATIONS FOR THE FALL IN MORTALITY

What were the reasons for this radical decline in adult mortality? I have previously argued that smallpox inoculation made a significant impact on mortality in the late eighteenth century. In rural areas, where the majority of the population lived, this would have led to a reduction in adult mortality as well as child mortality, in spite of a gradual increase in the virulence of the disease.[50] The data for Members of Parliament, the aristocracy, and the Quakers indicate a pronounced increase in life expectancy after 1750, which could be accounted for by the practice of inoculation during that time. However, smallpox inoculation was not practiced on any scale in the first half of the eighteenth century so cannot account for the marked fall in mortality found then. It is therefore necessary to consider other explanations for that period.

Real incomes probably rose for most of the population during the first half of the eighteenth century.[51] It is thus possible that this improvement played a part in reducing mortality. Certainly the evidence of higher mortality among husbandmen in the early seventeenth century would suggest that economic factors were important during this early period, but the weight of evidence suggests that they were not central in bringing about the overall fall in mortality. The substantial mortality gains among all the socioeconomic groups discussed in this article indicate that noneconomic forces were of primary importance. Only further research will definitively settle this issue.

It is possible that there was a spontaneous decline in the severity of various diseases at the end of the seventeenth century. However, there is no evidence for this; smallpox, for example, was increasing in virulence throughout the eighteenth century. Certain changes in the environment associated with economic development may have played a role in reducing mortality; for example, there is good evidence that malaria was present in the marshlands of southeastern England, and the draining and enclosure of those areas may have reduced mortality.[52] However, the disease was probably confined to restricted areas of the country.

We can provisionally explore one hypothesis that fits all the known evidence: that the main fall in mortality during the early eighteenth century occurred because of the marked improvement in domestic hygiene associated with the rebuilding of English housing at that time.

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seventeenth century, this assumption is not unrealistic. Developing a model of population change that reflects the mortality changes discussed in this paper is a priority for future research. I am grateful to Jim Oeppen for commenting on the implication of the changes in mortality for population growth.

[50] Razzell, *The Conquest of Smallpox*.

[51] Wrigley and Schofield, *Population History*, p. 643.

[52] Dobson, "The Last Hiccup of the Old Demographic Regime," p. 413.

It was linked with a move away from older building materials—in particular, earthen floors, which had been commonplace since medieval times in the houses of rich and poor alike. In the seventeenth century, according to M. W. Barley, even among the clergy, "Earth floors were almost universal; even if suitable stone was available locally for flagging the hall, the service rooms still had earth floors throughout this period . . . The use of brick for paving, as for infilling, belongs to the period after 1660."[53] In their history of English housing Bill Breckon and Jeffrey Parker draw attention to a neglected, if colorful, area of social history:

> Up to the 18th century . . . the ground floor of the house was simply beaten earth . . . dusty and strewn with straw, rushes or grasses . . . [with] some nastiness seeping into the floors, not only from dog and cat excrement but from human urine as well, for our ancestors were not too bothered about sanitation. Whatever its source, the result was that the floors soaked up material rich in nitre—the "saltpetre" used in making gunpowder. Since this was scarce, the Crown turned to floors as a rich source of much-needed war material, and empowered "saltpetre men" to enter people's homes, dig up and take away their floors.[54]

The demand for saltpeter for the manufacture of gunpowder was of such critical importance that these men were allowed to dig up the floors of bedrooms, halls, butteries, and other rooms in houses as well as the floors of churches, town halls, pigeon lofts, and stables.[55] This activity created passionate opposition, particularly when it involved the digging up of earth under the beds of invalids, pregnant women, and old people.[56] Some householders managed to avoid having their houses disturbed by bribing the government's men. However, the importance of this extraction from our point of view is that it indicates the highly unhygienic state of many English houses' floors in the seventeenth century. The "powers of seisin" of the saltpeter men were revoked in 1656, though the practice of using house floors as a source of saltpeter seems to have continued until the end of the seventeenth century, when its importation by the East India Company made the practice redundant.[57]

Barley gives a detailed account of the history of farmhouses and cottages, in which earthen floors persisted until the early eighteenth century. Church records for Lincolnshire and Bedfordshire reveal that in parsons' houses during Queen Anne's reign,

> Earthen floors were still very much the rule rather than the exception . . . some houses could be found with nothing else. . . . The next best thing was brick, and about half of the Lincolnshire houses had one room so paved . . . usually the hall.

[53] Barley, "Rural Housing in England," p. 727.

[54] Breckon and Parker, *Tracing the History of Houses*, pp. 135–36.

[55] Hodgetts, *The Rise and Progress of the British Explosives Industry*, pp. 12–28, 213–300.

[56] Ibid.

[57] See Clarke, *The Natural History of Nitre*, p. 21, for a reference to the continuation of the practice after the 1656 legislation.

> In Bedfordshire the majority of halls were paved, and so were about half the kitchens.[58]

The persistence of earthen floors into the late seventeenth century perhaps explains some unsanitary practices of the aristocracy during this period. When Charles II and his court spent the summer of 1665 in Oxford to escape the plague, they were castigated by the diarist Anthony Wood: "Though they were neat and gay in their apparell, yet they were very nasty and beastly, leaving at their departure their excrements in every corner, in chimneys, studies, colehouses, cellars."[59] That such unhygienic practices were commonplace is suggested by Pepys's diary; he himself used a chimney for not dissimilar purposes.[60] This behavior was probably due to the absence of toilets in most houses, even those of the rich, until the eighteenth century.[61]

Barley's work suggests that earthen floors were gradually replaced as brick was widely introduced for domestic house building, a process triggered by the great town fires that swept through England during the late seventeenth and early eighteenth centuries. The timing of the process of rebuilding in brick and tile coincides with the early-eighteenth-century decline of adult mortality previously discussed.[62] This rebuilding of houses appears to have enabled a revolution in domestic hygiene to take place. As early as 1727 De Saussure could write,

> The amount of water English people employ is inconceivable, especially for the cleansing of their houses. Though they are not slaves to cleanliness, like the Dutch, still they are very remarkable for this virtue. Not a week passes by but well-kept houses are washed twice in every seven days, and that from top to bottom; and every morning most kitchens, staircase, and entrance are scrubbed. All furniture, and especially all kitchen utensils, are kept with the greatest cleanliness.[63]

Whether this account was true of just London or the whole country is open to question, but certainly the eighteenth-century English acquired a reputation for domestic cleanliness that was reflected in the writings of other foreign visitors.[64]

CONCLUSION

The growth of population in eighteenth-century England was primarily due to a fall in mortality, which was particularly marked during the first half of the century. As the fall appears to have affected all

[58] Barley, *The English Farmhouse and Cottage*, p. 258.
[59] Quoted in Wright, *Clean and Decent*, p. 76.
[60] Hibbert, *The English*, p. 335.
[61] Ibid., pp. 196, 335.
[62] Jones and Falkus, "Urban Improvement and the English Economy," pp. 120, 145, 146.
[63] De Saussure, *A Foreign View of England*, p. 157.
[64] Wilson, *Strange Island*, pp. 119, 125, 129.

socioeconomic groups, it does not seem to be explained by economic improvements. The introduction of smallpox inoculation made a major contribution to the phenomenon, but the major hypothesis considered here is that there was a very significant improvement in domestic hygiene linked with the rebuilding of housing in brick and stone. This was triggered by the great town fires that swept England in the late seventeenth and early eighteenth centuries, but was also associated with a general shift in attitude toward hygiene.

This article poses major questions about population, economy, and society. More research is required before authoritative conclusions can be reached, particularly about the causes of population growth. Research using local censuses, parish registers, and marriage licenses will allow an analysis of variations in mortality by town and region and of changes over time. Additionally, detailed work will have to be undertaken on the history of hygiene and its impact on health and illness. Only when this research has been undertaken—which is likely to constitute a major project over a number of years—will it be possible definitively to explain population growth in eighteenth-century England.

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