

HOW RELIABLE IS OUR KNOWLEDGE OF THE DEMOGRAPHIC CHARACTERISTICS OF THE ENGLISH POPULATION IN THE EARLY MODERN PERIOD?

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ABSTRACT. *Anglican parish registers have been the basis for most studies of population trends and characteristics in early modern England, and one of the most important of the techniques used in analysing them has been family reconstitution. But Anglican registers at all times were an incomplete and inaccurate record of vital events, and their defects tended to become more pronounced in the later part of the period during which they afford the chief source of empirical information about population behaviour. And there are inherent limitations and biases in the results that can be obtained by family reconstitution. This article attempts to describe the range of difficulties and dilemmas involved in studying the demography of populations in the past when using this source of data and this technique of analysis. A variety of tests is deployed to establish the degree of reliability attaching to the results obtained in a recent exercise based on the family reconstitution of 26 parishes, and more generally to assess the opportunities open to scholarship in this area and the pitfalls associated with such work. The conclusion is that reliable results can be obtained but that great care is needed in the selection of suitable registers, and that a number of tests should be employed to monitor the internal consistency and the demographic plausibility of any findings.*

It is not difficult to make large claims for the progress in historical population studies which has taken place in England in the last thirty years. In the 1960s, despite the attention which had been given to the subject by scholars such as Finlaison, Farr, Brownlee, and Griffith in earlier years, and the contemporary research and reflections of Habakkuk, Hajnal, Glass, Flinn, Eversley, Krause, Ohlin, Chambers, Cornwall, and Drake, which had added substantially to earlier knowledge and had helped to identify the major issues most in need of resolution, it is no great exaggeration to argue that knowledge of early modern English population history was still recognizably in the same state as it had been left by Rickman.¹ Rickman had overseen the first four English censuses

¹ The writings of the scholars whose names are mentioned here were, of course, extensive. Among the more important publications of the first group were the following: W. Farr, *Vital statistics* (London, 1885), G. T. Griffith, *Population problems of the age of Malthus* (Cambridge, 1926); J. Brownlee, 'The history of birth and death rates in England and Wales taken as a whole, from 1570 to the present', *Public Health*, xxix (1915–16), 211–22, 228–38. Farr's book is a testimony

and had prepared much of the groundwork for the fifth, though he died before it was carried out. The information about baptisms, burials, and marriages from the whole sweep of the parish register period, which he sought from the incumbents of the ten thousand individual parishes in England on several occasions, remained the prime empirical basis for later work, and the inferences which he drew from these data about the size of the population of the country at intervals from the mid-sixteenth century onwards were the starting point for all later work on the topic.²

Those who were best placed to judge expressed disillusionment about the future for further work in this mode. Flinn, in reviewing the attempts made to construct reliable estimates of national population trends from the returns made to Rickman, described the results as ‘unacceptable for the purposes of modern scholarship’,³ while Glass had concluded a few years earlier that ‘any further serious attempt to investigate population growth during the eighteenth century on the basis of parish register material must break away from

to the range of his interests. Much of his historical work was published in official sources. Although the introductory report to the 1851 census appeared over the names of Graham, Farr and Mann, for example, it was undoubtedly Farr who carried out a new exercise in estimating population totals back to 1700. *1851 census* (Parl. Papers, 1852–3, LXXXVIII, pt. 1), Report, tabs. 21 and 22, p. lxxviii. Similarly, Finlaison’s comparable earlier estimates were published by Rickman in the 1831 census: *1831 census* (Parl. Papers, 1833, xxxvi), Enumeration abstract, vol.1, Preface, p. xlv. Examples of the writings of the later group include the following (in a few instances the date of publication falls in the early 1970s rather than earlier): H. J. Habakkuk, ‘English population in the eighteenth century’, *Economic History Review*, 2nd ser., vi (1953), 117–33; D. V. Glass, ‘Population and population movements in England and Wales, 1700–1850’, in D. V. Glass and D. E. C. Eversley, eds., *Population in history* (London, 1965), pp. 221–46; idem, *Numbering the people. The eighteenth-century population controversy and the development of census and vital statistics in Britain* (Farnborough, 1973); M. W. Flinn, *British population growth 1700–1850* (London, 1970); idem, ‘The stabilization of mortality in pre-industrial western Europe’, *Journal of European Economic History*, III (1974), 285–318; J. D. Chambers, ‘The vale of Trent 1670–1800: a regional study of economic change’, *Economic History Review*, supp. III (1957); idem, *Population, economy and society in pre-industrial England* (Oxford, 1972); J. Cornwall, ‘English population in the early sixteenth century’, *Economic History Review*, 2nd ser., xxiii (1970), 32–44; M. Drake, ‘An elementary exercise in parish register demography’, *Economic History Review*, 2nd ser., xiv (1962), 427–45; G. Ohlin, *The positive and the preventive check. A study of the rate of growth of pre-industrial populations* (Harvard Univ. Ph.D. thesis, 1955; pub. in book form, New York, 1981); idem, ‘No safety in numbers: some pitfalls in historical statistics’, in H. Rosovsky, ed., *Industrialization in two systems: essays in honor of Alexander Gerschenkron* (New York, 1966), pp. 68–90; J. Hajnal, ‘European marriage patterns in perspective’, in D. V. Glass and D. E. C. Eversley, eds., *Population in history* (London, 1965), pp. 101–43; J. T. Krause, ‘Changes in English fertility and mortality, 1780–1850’, *Economic History Review*, 2nd ser., xi (1958), 52–70; idem, ‘Some aspects of population change, 1690–1790’, in E. L. Jones and G. E. Mingay, eds. *Land, labour and population in the industrial revolution* (London, 1967), pp. 187–205; D. E. C. Eversley, ‘A survey of population in an area of Worcestershire from 1660–1850 on the basis of parish registers’, in D. V. Glass and D. E. C. Eversley, eds., *Population in history* (London, 1965), pp. 394–419.

² Rickman’s final thoughts on English population trends in the past are reflected in the material published in the 1841 census; *1841 Census*, Enumeration abstract, Preface, Parl. Papers, 1843, xxxii, 34–7. There is a much fuller discussion of these issues in E. A. Wrigley and R. S. Schofield, *The population history of England* (London, 1981), pp. 572–87.

³ Flinn, *British population growth*, p. 20

Rickman's series and begin with a new compilation'.⁴ A first step in a new direction had already been taken by Hollingsworth, whose study of the demography of the British peerage was a breakthrough, both in technique and in making available for the first time far more detailed information about fertility, mortality, and nuptiality than had been provided by any previous analysis of British historical data.⁵

Affairs in France at this period represented a great contrast with those in England, since the 1950s, 1960s, and 1970s were a golden age of historical population studies in France with striking advances occurring both in empirical work, in matters of technique, and in the testing of models of the relationship between economic, social, environmental, and demographic variables. The writings of Meuvret, Bourgeois-Pichat, Ariès, Goubert, Sauvy, Le Roy Ladurie, Dupâquier, Biraben, Blayo and Henry constituted an admirable and formidable demonstration of the range and intellectual strength of French scholarship in historical demography.⁶ The elegant and fastidious precision of Henry's methodological advances was matched by the way in which scholars such as Goubert and Le Roy Ladurie, less adept in matters technical than he, understood and made manifest the central importance of an understanding of the demography of communities in the past to the investigation of their functioning as economic and social entities.

Over the past thirty years much has changed. The call made by Glass for the creation of a new body of data to replace the returns made to Rickman has been answered.⁷ The technique of family reconstitution, pioneered by Henry in France, has been shown to be applicable to English parish registers, and another technique, generalized inverse projection, has been developed by the Cambridge Group.⁸ Generalized inverse projection complements family

⁴ D. V. Glass, 'Introduction', in Glass and Eversley, eds., *Population in history*, p. 9.

⁵ T. H. Hollingsworth, 'The demography of the British peerage', supp. to *Population Studies*, xviii, no. 2 (1964).

⁶ See for example L. Henry, *Anciennes familles genevoises* (Paris, 1956); idem, *Manuel de démographie historique* (Geneva and Paris, 1967); E. Gautier and L. Henry, *La population de Crulai* (Paris, 1958); J. Meuvret, 'Les crises de subsistance et la démographie de la France de l'Ancien Régime', *Population*, 1 (1946), 643-50; J. Bourgeois-Pichat, 'Évolution générale de la population française depuis le XVIIIe siècle', *Population*, vi (1951), 635-62; P. Ariès, *Histoire des populations françaises et de leurs attitudes devant la vie depuis le XVIIIe siècle* (Paris, 1948); A. Sauvy, *Théorie générale de la population* (2 vols., Paris, 1956-9); J.-N. Biraben, *Les hommes et la peste en France et dans les pays européens et méditerranéens* (2 vols., Paris and the Hague, 1975-6); P. Goubert, *Beauvais et le Beauvaisis de 1600 à 1730* (2 vols., Paris, 1960); E. Le Roy Ladurie, *Les paysans de Languedoc* (2 vols., Paris, 1966); J. Dupâquier, *La population rurale du bassin parisien à l'époque de Louis XIV* (Paris and Lille, 1979); Y. Blayo, 'Mouvement naturel de la population française de 1740 à 1829' *Population*, xxx (1975), 15-64.

⁷ By the assembly of a data set drawn from the monthly totals of baptisms, burials, and marriages from a total of 404 parishes covering the whole parish register period from 1538 to 1837: for details see Wrigley and Schofield, *Population history of England*, esp. chs. 1 and 2.

⁸ The first steps towards the development of the methods used in generalized inverse projection (GIP) were taken by Lee in a pioneering article: R. Lee, 'Estimating series of vital rates and age structures from baptisms and burials: a new technique, with applications to pre-industrial England', *Population Studies*, xxviii (1974), 495-512. GIP in its present form is described in

reconstitution neatly in that it uses aggregative rather than nominative data. It is based on counting events rather than linking them, but, like family reconstitution, it permits estimates of fertility and mortality rates to be made when using information drawn solely from registers of vital events even in the absence of any censuses. Both techniques, therefore, can overcome what had for so long been the bugbear of work on historical populations, namely that, since estimating a rate conventionally depended upon a knowledge of both stock (population totals) and flow (totals of vital events), but parish registers gave information only about the flow of events, it had seemed impossible to produce for past populations measures comparable to those routinely published for populations in the modern era when the state conducts censuses and records births, deaths, and marriages. Meanwhile the flowering of French scholarship in population history drew to a close, symbolized by the way in which the Institut National d'Études Démographiques, graced for many years by Henry's presence, turned away from historical investigations to concentrate more exclusively on contemporary issues.

I

Anglican parish registers proved to have greater attractions for the study of population change in the past than it was once customary to accord them. Their lack of detail compared with the more informative of continental registers, and the problems associated with the rising proportion of non-conformists in the population have often been remarked. On the other hand, no other country possesses a large number of registers which are continuously available from the mid-sixteenth century until the inception of civil registration in the nineteenth century, and which record the burials of all members of the parish, including young children, from the beginning of registration, which in England occurred in 1538.⁹ Elsewhere either registration began much later, as, for example, in Sweden, where register-based description and analysis is possible only from 1686, or the recording of the burials of children beneath the age of communion was largely neglected until well into the eighteenth century, as in France and many other catholic countries.¹⁰

J. E. Oeppen, 'Back projection and inverse projection: members of a wider class of constrained projection models', *Population Studies*, XLVII (1993), 245–67; and idem, 'Generalized inverse projection', in D. S. Reher and R. Schofield, eds., *Old and new methods in historical demography* (Oxford, 1993), pp. 29–39.

⁹ The classic description of Anglican parish registers and their characteristics is to be found in J. C. Cox, *The parish registers of England* (London, 1910). See also J. S. Burn, *The history of parish registers in England* (London, 1829); and, for a more recent survey, D. J. Steel, *Sources of births, marriages and deaths before 1837* (I), *National index of parish registers*, 1 (London, 1968).

¹⁰ L. Widén, 'A retrojection back to 1700', app. 2 in E. Hofsten and H. Lundström, *Swedish population history: main trends from 1750 to 1970*, Urval no. 8, Skriftserie utgiven av statistiska centralbyrån (Stockholm, 1976), p. 169; M. Fleury and L. Henry, *Nouveau manuel de dépouillement et d'exploitation de l'état civil ancien* (3rd edn, Paris, 1985), p. 18.

The distinctive strengths of Anglican registration have made it possible to produce a coherent series of estimates of population totals, birth, death, and marriage rates, and estimates of such measures as the gross reproduction rate and expectation of life at birth, from the mid-sixteenth century onwards, using generalized inverse projection.¹¹ Using family reconstitution, the alternative method based on nominal record linkage, much greater detail concerning many aspects of the demography of the English population in the early modern period can be secured. Reconstitution provides not only standard measures, such as, for example, age-specific fertility and mortality rates; information about birth intervals by age of mother; or age at marriage by the several marriage rank combinations, but also less commonly calculated variables, such as the level of fecundity at the time that marriage took place (that is of the proportion of couples capable of bearing children), and of its subsequent decline with age; the effect of the early death of an infant on the subsequent birth interval; the characteristic length of the period of breastfeeding; the seasonality of death by age; the relationship between birth parity and age at marriage (whether, for example, oldest sons marry earlier or later than others); a widow's chances of remarrying according to her age and the number of her surviving children; and so on almost endlessly.

Since a book embodying the findings of reconstitution work has recently been published to complement the earlier volume which described the findings of inverse projection, this is an appropriate time to pose a fundamental question.¹² Are findings of this type to be trusted? Is the technical sophistication displayed no more than a smokescreen concealing basic weaknesses? Is the house, however painstakingly constructed, built upon sand? In view of the recent publication of the reconstitution-based book, it seems appropriate to concentrate mainly upon the reliability of the data published in that volume in this discussion, though, *mutatis mutandis*, much of what follows is applicable to parish-register based studies of all types.

There is a very large volume of published work that demonstrates the frailty of Anglican parish registers as an information source.¹³ At best the

¹¹ The results published in Wrigley and Schofield, *Population history of England*, were derived by the use of a technique which was called back projection. Back projection is a particular and undeveloped form of the technique now called generalized inverse projection (see above n. 8).

¹² E. A. Wrigley, R. S. Davies, J. E. Oeppen and R. S. Schofield, *English population history from family reconstitution* (Cambridge, 1997).

¹³ The relevant literature is very extensive, ranging from the anecdotal to more or less systematic attempts to measure the scale of omission, inaccuracy, duplication and distortion. As examples of the kinds of approaches that have been used the following may be noted: P. E. Razzell, 'The evaluation of baptisms as a form of birth registration through cross-matching census and parish register data', *Population Studies*, xxvi (1972), 121–46; E. A. Wrigley, 'Baptism coverage in early nineteenth-century England: the Colyton area', *Population Studies*, xxix (1975), 299–316; D. Levine, 'The reliability of parochial registration and the representativeness of family reconstitution', *Population Studies*, xxx (1976), 107–22; P. Sharpe, 'Locating the "missing marryers" in Colyton, 1660–1750', *Local Population Studies*, xlviii (1992), 49–59; L. Boothman, 'On the accuracy of a late sixteenth-century parish register', *Local Population Studies*, xlix (1992), 62–6; D. Ashurst, 'St Mary's Church, Worsborough, South Yorkshire: a review of the accuracy of a parish register', *Local Population Studies*, lv (1995), 46–57. The nature and scale of one aspect of

Anglican registers were intended only as registers of events solemnized by an Anglican ceremony and not as a complete record of births, deaths, and marriages taking place in a parish. The registers themselves were usually made up periodically from information recorded by the minister or his parish clerk in notebooks or on scraps of paper. It is possible to show that the process frequently led to error in that names and dates were mistranscribed or events omitted altogether. This appears from a comparison of registers with bishops' transcripts and in other ways.¹⁴ As time went on, the increasing delay between birth and baptism enhanced the risk that a child who died young might escape all notice in the register.¹⁵ Registers were subject to well known hazards associated with damp, the presence of vermin, theft, malicious damage, neglect, loss and disordering in the course of rebinding, and so on. It is incontestably true that the totals of events recorded in the registers normally fell short, and often well short, of the total of vital events taking place in a parish. Moreover, even when an event is recorded, the entry may contain inaccuracies relating to name and date, which increase the risk of mislinkage or of failure to link in nominative work such as family reconstitution.

In assessing the implications of these registration deficiencies, it is vital to distinguish between the average and the extremes. If a random sample of parish registers were drawn and their various shortcomings and strengths were conflated to form an average case, the resulting artificial 'source' would show that deficiencies were common. It does not follow, however, that the same is true of all individual parish registers. The best are far better than the average. In seeking to make good the claim that some reconstitution data may be regarded as reliable, however, it is not enough to show that the best registers pass tests that other registers would fail. A more positive endorsement is needed. It is not enough to report rates and other demographic indices that are not demonstrably defective in some way: it is essential to try to show that the derived statistics match reality closely.

In considering this issue, it makes sense to begin by remarking that no demographic statistics are flawless. Modern censuses in advanced, industrialized countries, for example, are not comprehensive. Many individuals are missed, and the failures are selective, which aggravates the problem. In the United States today poor, young black males are far more likely to be absent

the problem is readily visible when parish register entries are collated with comparable data from the bishops' transcripts. The two should, in principle, of course, be identical. The volumes of *Bedfordshire parish registers*, ed. F. G. Emmison, published by the Bedfordshire Parish Register Society, provide a large quantity of such comparative data.

¹⁴ A careful local study which illustrates this point is to be found in Ashurst, 'St Mary's Church'.

¹⁵ The increasing delay between birth and baptism is described in B. M. Berry and R. S. Schofield, 'Age at baptism in pre-industrial England', *Population Studies*, xxv (1971), 453–63. The effect of the increasing delay is discussed in E. A. Wrigley, 'Births and baptisms: the use of Anglican baptism registers as a source of information about the number of births in England before the beginning of civil registration', *Population Studies*, xxxi (1977), 281–312; and in Wrigley, Davies, Oeppen, and Schofield, *English population history*, pp. 53–4, 87, 90, 110–15, 228–30.

from the count than, say, wealthy, middle aged, white women.¹⁶ Similarly, neither registers of births nor of deaths are ever fully comprehensive. And the further processing of the information, whose original recension is in the form of a birth certificate or a census return, is always liable to introduce new errors or inaccuracies. The relative scale of the errors in much modern data, however, is so modest that for most purposes the tabulated fertility, mortality, and nuptiality rates may be regarded as accurate. If the results of parish-register based reconstitution can fairly lay claim to a similar degree of reliability, they will be adequate for most purposes.

II

The reservations that have been expressed about parish-register based reconstitution studies may be divided under two main heads: those to do with the understatement of the true level of a particular demographic variable due to underregistration, and those that are concerned with the danger that, even though events may be fully registered, there is an inherent bias in the resulting tabulations because of the nature of the process of reconstitution. It is convenient to consider the second question first, both because it helps to make clear the nature of reconstitution as a technique and because it is a good starting point from which to discuss the question of underregistration.

Family reconstitution is so called because the scattered events relating to the history of a given family, which are recorded as baptisms, burials, and marriages over a period that may extend to several decades, are articulated together as a single complex record, a process which has come to be known as nominal record linkage. Originally, this was done laboriously by copying across the information for each separate entry in a register onto extraction slips, which were then sorted in such a way as to bring together all the information about a given family so that the information on the slips could be transferred in turn onto a family reconstitution form, or FRF.¹⁷ Now the process has been computerized, but the logic remains the same.¹⁸ If ancient English parishes had been closed communities into which an individual was born and in which he or she then stayed until overtaken by death, and if the recording of events were complete, the reconstituted population would be the whole population. But English parishes were very far from being closed communities. In all parishes both in- and out-migration was frequent, though in some the movement was more frenetic than in others. This in turn implies that, no matter how excellent

¹⁶ For example, in the 1970 census it has been estimated that the black male population aged 25–34 was undercounted by 18.5 per cent, compared with 2.4 per cent for white females in the same age group, while among white females aged 45–54 the undercount was only 0.1 per cent: J. S. Siegel, 'Estimates of coverage of the population by sex, race, and age in the 1970 census', *Demography*, xi (1974), tab. 6, p. 17. See also M. A. Conk, 'The 1980 census in historical perspective', in W. Alonso and P. Starr, eds., *The politics of numbers* (New York, 1987).

¹⁷ The process of family reconstitution is described in E. A. Wrigley, 'Family reconstitution', in E. A. Wrigley, ed., *An introduction to English historical demography* (London, 1966), pp. 96–159.

¹⁸ There is a brief description of computerised family reconstitution in R. Schofield, 'Automated family reconstitution: the Cambridge experience', *Historical Methods*, xxv (1992), 75–9.

the register, reconstitution based on a single parish register will yield a very large number of partial life histories and only a minority of complete ones.

The problems associated with using information about the reconstitutable minority are several and complex. In considering them, a first point to note is that their potential seriousness differs greatly between different kinds of demographic measurement. A measure like that of completed family size, which depends upon having information about a woman from her birth to her fiftieth birthday, will necessarily be based on a small fraction only of the women who reached the age of fifty. At the other extreme, when measuring infant mortality, where it is only necessary that the family should continue to be present in the parish for a year after the birth of the child, a very high proportion of the universe of possible cases will prove to be available.

Since families which did not move are disproportionately strongly represented in reconstitution tabulations, one issue that has attracted much comment is the question of whether mobile families displayed the same demographic characteristics as immobile families. If they did, it may be a matter for regret that so many FRFs are unusable for many purposes, but the picture obtained from the remainder will still be representative of the whole community. The immobile, in all but their immobility, would in this case represent a random sample of the whole. If they did not, the results obtained from family reconstitution might still be of great interest, but they could not be taken as representative of the population as a whole.

Where comparison can be made, the outcome suggests that the mobile and the immobile were usually very similar to one another demographically. For some measures comparison is possible between those in a given parish who were born there, and those in the same parish who were born elsewhere, that is between non-migrant and migrant families. The levels of infant and child mortality in these two groups were virtually identical in the twenty-six parishes contributing data to the reconstitution study. Similarly, the average interval between births in the two groups was almost identical.¹⁹ If mortality in the first fifteen years of life and marital fertility were effectively the same in the two groups, it is probable that they were little different in other respects, since these are two of the most important measures helping to define their demography generally. Evidence of this sort suggests that reconstitution data are likely to be a reliable guide to the demographic history of a given parish whose population consisted both of 'stayers' and of 'incomers'. It does not, of course, show that 'leavers', migrants from a parish who went to live elsewhere, sometimes at a considerable distance, would share the characteristics of the 'stayers', and indeed, at least in the case of long-distance migrants, few would expect this to be the case. Nor does evidence of the close similarity of the demographic characteristics of 'stayers' and of those who migrated into a parish, of course, show whether the immigrants were similar *ab initio* or whether they rapidly acquired the characteristics of the parish into which they moved. But this issue,

¹⁹ Wrigley, Davies, Oeppen, and Schofield, *English population history*, tab. 7:35, pp. 438–9.

though of great interest, need not be addressed in this context. It suffices that, if the two groups display similar characteristics, an accurate picture of the local demography can be obtained from the 'stayers' alone, or from them principally.

It is not surprising that the mobile and the immobile living in the same parish should have been similar to one another, when, as was normally the case in rural areas at least, migration took place only over short distances and between similar settlements. The parish, at least in many parts of the country, was not as dominant a unit of social or economic life as might be supposed from its centrality in local administration. Children went out into service in households in neighbouring parishes as readily as into their home parish.²⁰ Many men held or worked land in more than one parish. Close relatives were scattered across several parishes. An acquaintance first made while in service was the beginning of many marriages, so that every register contains innumerable instances of marriages contracted between a bride from one parish and a groom from another. In such circumstances, it is not surprising, for example, that the lives of two sisters, one of whom married a man from her native parish while the other married a man from a nearby parish, should have been essentially similar.

There is, however, a related problem associated with migration which should cause greater concern about the representativeness of measures derived from family reconstitution. The issue was explored very effectively by Ruggles in a recent article.²¹ The basic issue is simple. It is the problem of competing risks and the selective effect engendered by them. Take, first, the measurement of age at marriage. Marriage and migration were competing risks in the lives of individual men and women in early modern England. As Ruggles put the issue, 'The odds of migrating before marriage are greater for those who marry late than for those who marry early, just because they are at risk of migrating for longer. Thus, late marriages tend to take place after migration and are systematically excluded from analysis.'²² Since age at marriage in reconstitution studies is calculated exclusively from 'stayers', the average age at marriage will be understated.²³ Ruggles not only pinpointed the logical problem but went on to quantify its possible importance. This varies according to the assumptions made about the relative scale of migration and some of its other characteristics, but he showed by a microsimulation exercise that a mean age at marriage calculated solely from 'stayers' could understate the mean age of marriage of 'stayers' and 'leavers' combined by two to four years, in the case of women, a very substantial error.²⁴

There appears no reason to doubt the validity of Ruggles's argument, given

²⁰ A. Kussmaul, *Servants in husbandry in early modern England* (Cambridge, 1981), ch. 4.

²¹ S. Ruggles, 'Migration, marriage, and mortality: correcting sources of bias in English family reconstitution', *Population Studies*, XLVI (1992), 507–22.

²² *Ibid.* p. 508.

²³ In countries in which the parish registers routinely record the age of both bride and groom this problem, of course, does not exist (provided that age at marriage can be shown to be stated accurately). It is only where age at marriage is calculated by subtracting a date of birth (baptism) from a date of marriage that this problem obtrudes.

²⁴ *Ibid.* tab. 4, p. 512.

the assumptions that he made about the nature of the competing risks involved. It will always be important to take into account the problem that he identified when estimating age at marriage from reconstitution material. There is, however, reason to doubt whether the problem is as serious as he supposed in the case of English reconstitution data. There are two principal reasons for this. First, Ruggles assumed that migration and marriage were independent risks. This is unlikely to be true in any population, and was clearly not the case in early modern England, where migration and marriage were often closely related events. Second, only migration that takes place over the span of years in which marriage is taking place will have any effect on the estimated mean age at marriage. In England a very large proportion of those who left their parish of birth did so in their middle teens on entering service, at a point in the life course well before the years during which young men and young women were apt to marry. In these circumstances their departure can have had no impact of the kind that interested Ruggles.

Empirical investigation of this issue, using English data, shows that the mean age at marriage calculated from parish 'stayers' was virtually identical to the age of all those marrying, including 'leavers' as well as 'stayers'.²⁵ Furthermore, a similar exercise using data for the population of French Canada in the seventeenth and eighteenth centuries resulted in the same conclusion. The French Canadian data at the disposal of Desjardins are particularly comprehensive and reliable. It is possible, therefore, that, in general, the problem identified by Ruggles may be less serious than he supposed.²⁶ It may even prove to be the case that his assumption about the independence of the competing risks is so seldom true that his argument, though it points to a difficulty that is potentially very serious, is not commonly of major practical significance.

Ruggles made a similar point in relation to the measurement of adult mortality, focusing particularly on the work of Blum, who had made some very fruitful suggestions about ways in which the techniques previously in use might be improved upon.²⁷ Adult men and women are at risk both to migrate and to die, and very careful provision must be made to offset the problems which this poses, if estimates of adult mortality are not to exaggerate its level, a bias that is likely to be present since those who live longest, *ceteris paribus*, are more likely to have migrated before death than those who die young. The issues involved are complex and any solution is likely to be intricate, but it seems fair to state that ways of overcoming the problem are available and effective, and that the scale of any potential distortion is unlikely to be great, provided that appropriate methods are used.²⁸

²⁵ E. A. Wrigley, 'The effect of migration on the estimation of marriage age in family reconstitution studies', *Population Studies*, XLVIII (1994), 81–97.

²⁶ B. Desjardins, 'Bias in age at marriage in family reconstitutions: evidence from French Canadian data', *Population Studies*, XLIX (1995), 165–9.

²⁷ A. Blum, 'Estimation de la mortalité locale des adultes à partir des fiches de familles', *Population*, XLII (1987), 39–56.

²⁸ Some solutions are offered by Ruggles himself: Ruggles, 'Migration, marriage and mortality', pp. 517–21. The issues and a feasible solution are also described in Wrigley, Davies,

III

There remains the question of underregistration. It would not suffice to show that reconstitution data were largely free from problems springing from the fact that they are drawn from the families of 'stayers', if any findings were vitiated by pervasive underregistration. There are many thousands of local historians who have had experience of using parish registers. Most are able to quote examples of births, deaths and marriages known to have taken place within the parish which have left no record in the parish register, even though the families were Anglican. In some instances the scale of omission is very substantial, especially in the eighteenth and early nineteenth centuries.²⁹ Local historians have, however, in the main worked on parishes in their immediate vicinity. The registers on which they have worked, therefore, constitute something approaching a random sample of all registers, and represent a wide spread of completeness of registration. But the critical issue is the quality of the best parish registers and not that of the average. It is convenient to test this point by attempting to determine how serious were the losses from underregistration in the case of the twenty-six parishes that provided the data for *English population history from family reconstitution*, since these were all registers of good apparent quality.

To be selected for reconstitution each parish had first to pass a number of simple tests, such as the absence of periods of deficient or defective registration of the kind that is evident from aggregative tabulations.³⁰ Further tests were then made after the reconstitution had been carried out which resulted in 6 parishes being removed from the initial set of 32, and the same tests resulted in the period of reconstitution being curtailed in 14 of the remaining 26 parishes.³¹ This initial screening was intended to remove material that was readily identifiable as defective, or about which there was reasonable ground for doubt. However, to remove what is demonstrably or probably defective, though essential, is no guarantee that what remains is free from defect. The further testing took several forms, which are described and illustrated in turn.

The test which is perhaps most obviously appropriate is that which sets the results from reconstitution against some other source of information about the demography of the population which may be regarded as authoritative. For most of the parish register period, the Anglican registers, whatever their shortcomings, are clearly superior to any other source of information, and no

Oeppen and Schofield, *English population history*, app. 6. On the general issue of the reliability of reconstitution as a demographic technique, see J. Rogers, *Family reconstitution: new information or misinformation?* Reports from the Family History Group, Department of History, Uppsala Univ., no. 7 (Uppsala, 1988).

²⁹ See above, n. 13

³⁰ The method of detecting periods of defective registration is described in Wrigley and Schofield, *Population history of England*, app. 12.

³¹ The overall effect of these decisions was to reduce the total number of years of usable data in the 26 parishes by 19 per cent: Wrigley, Davies, Oeppen and Schofield, *English population history*, p. 91.

such test can therefore be carried out. Towards its end, however, a test of this kind is possible. Civil registration began in England in 1837. It was itself subject to underregistration in its early years. Moreover, the Registrar-General tended to neglect the tabulation and analysis of fertility and nuptiality data throughout the nineteenth century and beyond in favour of the exhaustive analysis of many aspects of mortality experience, which is unfortunate in the present context. The data published in the Registrar-General's *Annual reports*, however, do enable some tests of the accuracy of reconstitution tabulations to be made.

In the following comparisons the demographic information for the reconstitution parishes is pooled data obtained from all the reconstituted parishes. Fortuitously, the 26 parishes can be shown to mirror very closely the economic and demographic characteristics of the country as a whole.³² A comparison between the reconstitution data and the national data collected by the Registrar-General is therefore appropriate.

The Registrar-General interested himself so little in fertility that, although totals of births were published, his returns do not contain breakdowns that enable age-specific marital fertility rates to be calculated. At first sight this might seem to prohibit an effective comparison of the fertility patterns found by family reconstitution with those derived from data collected by the state's new vital registration system. However, it is feasible to combine vital registration material with census data to enable an indirect comparison to be made. The 1851 census tabulates the population by sex, age and marital status. Therefore, it is possible to estimate the number of legitimate children who would have been born to married women at that time if the levels of marital fertility found in the reconstitution populations had prevailed nationally.

Table 1 (Column 1) lists the annual totals of births in England in 1849–53, and their average number centring on the census year, 1851. Column 2 shows the totals of married women in each five-year age group in 1851, while columns 3 and 4 show the age-specific marital fertility rates derived from reconstitution data for the two periods 1700–49 and 1780–1829. Since the coverage of events in parish registers declined with the advent of civil registration, it is not possible to make a meaningful comparison of data from the two sources for exactly the same period. The parish register estimates necessarily refer to an earlier period than that covered by the recording system created by the state. The half-century 1780–1829 is separated on average by 45 years from 1851, but represents the closest comparison period which is conveniently possible. Since it was a period of high marital fertility, an earlier half-century period, when marital fertility was somewhat lower, is also used for comparison. Applying the rates for these two periods to the totals of married women, totals of births can then be calculated which may be compared with the average number registered nationally in the years centring on 1851. The birth totals resulting from the use

³² The evidence for this assertion may be found in *ibid.* pp. 41–70. It should be noted that, because reconstitution began and ended at differing dates in the 26 parishes, there was only a limited period during which data were drawn from all the 26. The methods used to overcome any difficulties arising from this inconvenient fact are described in *ibid.*, especially pp. 24–8 and app. 7.

Table 1. *Totals of births obtained by applying the age-specific marital fertility rates derived from reconstitution data to census totals of married women in 1851 compared with birth totals recorded by the Registrar-General in 1849–53*

	Legitimate Births	1851 Census: married women		Reconstitution ASMFRs (per 1,000 woman-years lived)			
				1700–49	1780–1829		
	(1)	(2)		(3)	(4)		
1849	505,167	15–9	21,301	15–9	323	532	
1850	518,718	20–4	253,996	20–4	419	429	
1851	538,971	25–9	424,004	25–9	374	390	
1852	546,227	30–4	439,820	30–4	320	312	
1853	537,275	35–9	394,793	35–9	249	255	
Total	2,646,358	40–4	350,088	40–4	127	148	
1849–53 average	529,272	45–9	280,632	45–9	23	23	
Average annual total of legitimate births 1849–53						529,272 (a)	
Total of births if 1700–49 reconstitution ASMFRs had prevailed among married women in 1851						561,843 (b)	
Total of births if 1780–1829 reconstitution ASMFRs had prevailed among married women in 1851						581,822 (c)	
Ratio (b)/(a) = 1.062						Ratio (c)/(a) = 1.099	

The totals of births recorded by the Registrar-General and the census totals refer to England only, rather than to England and Wales.

Source: Wrigley, Davies, Oeppen and Schofield, *English population history*, tab. 7.38, p. 463.

of reconstitution-based age-specific marital fertility rates exceed those recorded by the new civil registration system by 10 per cent (1780–1829), and by 6 per cent (1700–49).

The difference between the observed and calculated totals may in principle be attributable to a fall in marital fertility occurring in the early decades of the nineteenth century, to the early deficiencies in civil registration, to the reconstitution parishes having fortuitously high marital fertility, or to a combination of these possible causes.³³ It is plain, however, that this test counts against the view that there was a significant and universal underregistration of births in parish registers.

³³ The question of the scale of underregistration of births in the early years of civil registration has been investigated by several scholars. The estimates made by Farr, Glass, Teitelbaum, and Wrigley and Schofield are set out in Wrigley and Schofield, *Population history of England*, tab. A8.4, p. 635. In these four exercises, the estimated true totals for the decade 1841–51 exceed the registered totals by between 6.1 and 7.8 per cent, while for 1851–61 the differences range between 2.8 and 4.9 per cent. At the midpoint of the two decades, therefore, it might be expected that the true total would exceed the registered total by about 5 per cent.

Table 2. *Mean age at marriage for bachelors, widowers, spinsters and widows from reconstitution data and from the Registrar-General's returns (years)*

	Bachelors	Widowers	Spinsters	Widows
R.-G.'s returns 1839-41	25.5	40.1	24.5	38.9
R.-G.'s returns 1846-8	25.8	40.9	24.7	38.5
Reconstitution 1800-37	25.3	42.3	24.2	38.7

Sources: Wrigley, Davies, Oeppen and Schofield, *English population history*, tab. 5.10, p. 159.

The Registrar-General was equally cavalier about the collection of information about marriage age. It was not obligatory to state age at marriage and initially only a minority of brides and grooms did so, though the percentage rose steadily during the Victorian period.³⁴ The validity of using national returns of age at marriage for comparative purposes, therefore, depends upon the assumption that those who chose to record their age at marriage constituted a random sample of the whole marrying population, a dubious assumption taken in isolation. An alternative comparison is also, however, feasible, since in the earliest years of civil registration the Registrar-General succeeded in securing age information for all marriages in a small number of registration districts. The districts in question were not named and it is, therefore, impossible to decide how representative or otherwise they were of the country as a whole. Nevertheless, the Registrar-General's published returns allow reconstitution data to be compared both with national data which may be subject to a selective bias of one sort and with data from a limited number of registration districts which may be subject to a different kind of bias.

The result of the two comparisons is shown in Table 2, and proves to be reassuring. The mean age at marriage for bachelors and spinsters in the reconstitution parishes for the period 1800-37 was 25.3 and 24.2 years respectively, compared with 25.8 and 24.7 years for bachelors and spinsters in the years 1846-8 in the Registrar-General's returns for the whole country, and 25.5 and 24.5 years in the period 1839-41 for the small sample of registration districts from which the Registrar-General obtained complete data about marriage age. Comparing the reconstitution data with the first type of national data the difference in marriage age was 0.5 years for both bachelors and spinsters: a comparison with the second type of data collected by the Registrar-General reveals differences of 0.2 and 0.3 years for bachelors and spinsters respectively. In each case, the reconstitution mean was lower than the national mean by the margin indicated. These differences are quite small, but are slightly exaggerated because the latest age at first marriage allowed in family

³⁴ In the first year in which marriage age was tabulated, 1846, in only 16.7 per cent of marriages did both partners to the marriage state their age. By 1851 this percentage had risen to 36.5. Subsequent percentages were as follows: 1860, 62.5; 1870, 69.9; 1880, 81.8; 1890, 96.7; 1900, 98.6. Wrigley, Davies, Oeppen and Schofield, *English population history*, p.154, n.37.

Table 3. *Comparison of reconstitution mortality estimates with the third English life table (1,000 q_x)*

	Third English life table, 1838–54	Reconstitution data, 1825–37
1 q_0	149.5	151.7
4 q_1	133.7	98.3
5 q_5	46.6	34.7
5 q_{10}	25.6	34.7
10 q_5	71.0	68.2
15 q_0	315.4	287.2

The reconstitution mortality rate $1q_0$ is an overall rate including illegitimate children.

Sources: Wrigley, Davies, Oeppen and Schofield, *English population history*, tabs. 6.2 and 6.10, pp. 219 and 250–1. The q_x s of the third English life table were calculated from the l_x s in Registrar-General, *Supplement to sixty-fifth annual report*, pt 1, tab. H and I, pp. xlvi–li.

reconstitution is 50 years, but in a small number of cases first marriages recorded by the Registrar-General occurred at a higher age. A comparison made on a strictly comparable basis would, therefore, reduce the apparent differences slightly.³⁵ Table 2 also shows that the mean ages at marriage of widowers and widows were similar if comparison is made between civil registration data and estimates derived from parish register material.

Comparisons of mean ages at marriage for particular marriage rank combinations, bachelor/spinster, bachelor/widow, widower/spinster, and widower/widow, are also possible. They confirm the close similarity between the reconstitution findings and those based on the early returns of the Registrar-General.³⁶ Given the uncertainties that are inevitable when data from somewhat different time periods are compared, and the additional uncertainties imposed by the deficiencies in the Registrar-General's returns, these comparisons may also be said to support the reliability of reconstitution-derived data.

A similar comparison of reconstitution and national civil registration data is possible in the case of mortality, and is shown in Table 3. The infant mortality rate derived from the pooled data of the reconstitution parishes for 1825–37 is slightly higher than that in the third English life table, generally regarded as the most authoritative source of mortality estimates for the mid nineteenth century. This life table was based on national data for the period 1838–54. The

³⁵ This issue is discussed in *ibid.* pp. 155–7.

³⁶ *Ibid.* tab. 5.9, p. 156. A much fuller discussion of the information to be gleaned from a comparison of reconstitution data with the Registrar-General's returns may be found in *ibid.* pp. 154–60.

childhood mortality rates for the age range between the first and fifteenth birthday ($_{14}q_1$) in contrast, were 18 per cent lower in the reconstitution data for 1825–37 than in the national data for 1838–54. The two rates were 195.2 and 159.8 per 1,000. This difference was principally due to the much higher rate in the age group 1–4 in the third English life table. There is, however, strong evidence that early childhood mortality was rising in the early decades of the nineteenth century so that the implication of this finding is unclear.³⁷

Adult mortality rates derived from the pooled data of the reconstitution parishes can also be compared with the third English life table. For technical reasons, the parish register data can only be used down to 1809.³⁸ A comparison of the age-specific mortality rates for the 5-year age groups from 25–9 to 80–4 for the period 1750–1809 obtained by reconstitution with the comparable rates in the third English life table reveals that the late eighteenth-century rates were on average 4 per cent higher than the national rates in the period 1838–54 until the age of 75. Above that age the third ELT rates were the higher. The two sets of rates are shown in Table 4. The periods covered are too widely spaced for this to constitute decisive evidence of registration completeness, but, once more, the outcome does not suggest concern.

Reconstitution data, therefore, survive without difficulty the test of such comparisons with national data as are possible given the limitations of the Registrar-General's early returns. But what might be termed 'internal' tests should, in my view, carry as much or more weight as those that involve external comparators. This is a large topic whose full exploration would require an extensive canvas, but its nature can be conveyed by some selected examples.

Consider first the comparison of reconstitution findings with those based on aggregative data using generalized inverse projection (GIP). The demographic accounting system embedded in GIP does not guarantee that the results obtained by its use accurately mirror the empirical reality of past demographic

³⁷ Ibid. pp. 158–60. It is noteworthy that one-to-one comparisons of individual parishes and their respective registration districts also show strong similarities in infant and child mortality rates. These rates can be calculated for registration districts for a few years in the 1840s and compared with the reconstitution rates for 1825–37. The registration district was, of course, a much bigger unit than the parish, but, perhaps surprisingly, the comparison reveals that in most cases there is a close agreement between the pattern of infant and child rates in individual parishes and those in the registration districts in which they were situated. Ibid. pp. 93–7.

A similar exercise was carried out by Huck using infant mortality data from nine industrial parishes in the midlands and the north (Walsall, Handsworth, West Bromwich, Sedgely, Armley, Wigan, Great Harwood and Denton) for the period 1831–6 and comparing the resulting infant mortality rates calculated from parish register data with those for 1839–46 taken from the Registrar-General's returns for the five registration districts in which the parishes were situated. In general, and perhaps rather surprisingly, the parish register-based rates agreed well with the civil registration data. The former had been corrected where the level of endogenous mortality seemed suspiciously low, but the scale of the correction was modest, averaging only 15 per 1,000 over the nine parishes. P. Huck, 'Infant mortality in nine industrial parishes in northern England, 1813–1836', *Population Studies*, XLVIII (1994), 513–26.

³⁸ The reasons for this restriction are described in Wrigley, Davies, Oeppen and Schofield, *English population history*, app. 6.

Table 4. *Adult mortality (sexes combined): reconstitution data and the third English life table compared (1,000 q_x)*

	Reconstitution data, 1750–1809 (1)	Third English life table extended, 1838–54 (2)	(1)/(2)
25–9	49.4	47.8	1.033
30–4	53.7	52.5	1.022
35–9	62.4	58.4	1.069
40–4	68.3	66.2	1.031
45–9	88.4	76.8	1.150
50–4	99.9	94.1	1.062
55–9	123.0	123.3	0.998
60–4	171.3	171.2	1.000
65–9	238.5	243.8	0.978
70–4	376.4	352.1	1.069
75–9	438.2	483.1	0.907
80–4	598.2	620.9	0.964

The rates in col. 1 were derived from the male and female rates given in Wrigley, Davies, Oeppen and Schofield, *English population history*, tab. 6.26, p. 303, on the assumption that the ratio of the l_x s for each sex in each age group was the same as in the third English life table, and assuming a sex ratio at birth of 105.

Sources: Col. 1: Cambridge Group reconstitutions. Col. 2: from 25–9 to 45–9, taken from the third ELT, Wrigley and Schofield, *Population history of England*, tab. A14.1, p. 709; from 50–4 to 80–4 extended from Princeton model North tables in the manner described in *ibid.* pp. 711–3.

situations, but it does guarantee internal consistency. For example, the fertility and mortality estimates which it produces have to be consistent with the estimates of population size, population growth rates, and net migration which are also generated by the technique, and therefore also with each other. As a result a comparison of reconstitution and GIP results serves a double purpose. A good agreement not only lends support to empirical findings, but also, in the case of the reconstitution data, indirectly confirms the consistency and compatibility of the fertility and mortality estimates.³⁹

The demographic estimates produced by family reconstitution and those derived from GIP are not constrained to resemble each other because both are

³⁹ The most persistent sceptic concerning the possibility of obtaining reliable and representative results from parish register data has been Razzell. His views have been set out recently in two publications: P. Razzell, 'The growth of population in eighteenth-century England: a critical reappraisal', *Journal of Economic History*, LIII (1993), 743–71; and *idem*, *Essays in English population history* (London, 1994). For a discussion of the difficulty in accepting his views and a critique of some of his methods, see Wrigley, Davies, Oeppen and Schofield, *English population history*, pp. 98–100, 107.

drawn from the same data source. Only 14 out of the 26 reconstitution parishes were among the 404 parishes used in the GIP exercise, a tiny fraction of the total. If one were to draw a series of samples of parishes at random from the 404, each consisting of 14 parishes, and then add 12 others from outside the 404 to each set to create groups of 26 parishes, many of the resulting groups of parishes would diverge widely in character and in demographic history from the national aggregative sample of 404 parishes.

Direct comparison of reconstitution and GIP results is easiest in the case of mortality since both methods yield estimates of expectation of life at birth and also partial life expectancies. The three panels of figure 1 give a visual impression of the similarity of the estimates derived from reconstitution and by GIP. The top panel presents estimates of expectation of life at birth (e_0); the middle panel the partial life expectancy from birth to age 15 (${}_{15}e_0$); and the bottom panel a series of partial life expectancies between 25 and 45, 45 and 65, and 65 and 85 (${}_{20}e_{25}$, ${}_{20}e_{45}$, and ${}_{20}e_{65}$). The broken lines in the top panel indicate that direct data for some age groups were not available and that some age-specific rates were obtained by estimation.⁴⁰ The agreement in secular trend between the two series is close in all three panels, though one prominent feature of the GIP estimates, the very marked deterioration in mortality in the late 1720s is absent from the reconstitution data. It would seem that, fortuitously, the reconstitution parishes escaped the heavy mortality that affected a substantial proportion of all English parishes in this period.⁴¹ However, it should be noted that the GIP estimates are plotted from quinquennial data, whereas the reconstitution estimates of ${}_{15}e_0$ refer to decennial periods and the partial life expectancies for the later age group to 25-year periods. Thus the GIP lines may be expected to behave in a more hectic manner. Short-term variation would be more marked in the reconstitution data if they were sufficiently abundant to allow estimates to be made for each quinquennium.

The fact that the mortality history of England revealed by GIP and that obtained by reconstitution resemble each other is reassuring to both exercises. It is highly improbable that they would agree closely by chance. From the viewpoint of reconstitution the agreement is doubly welcome. Not only are the empirical findings alike, but their agreement implies that the reconstitution mortality results are consistent with what is known generally about the population history of the country.⁴² Similar comparisons of fertility and nuptiality estimates produced by reconstitution and GIP are not feasible

⁴⁰ For a description of the methods used in deriving estimated rates, see *ibid.* pp. 281–2 and app. 6.

⁴¹ In 1727/8 and 1728/9, the two years when mortality rates were highest during the crisis of the late 1720s, the proportion of parishes in which there was a detectable local crisis was 28.2 and 28.5 per cent respectively. Wrigley and Schofield, *Population history of England*, tab. A10.2, p. 653. The years in question run from July to June. The definition of a local ‘crisis’ is described in *ibid.* pp. 646–9.

⁴² Wrigley, Davies, Oeppen and Schofield, *English population history*, ch. 8 is devoted to this topic.

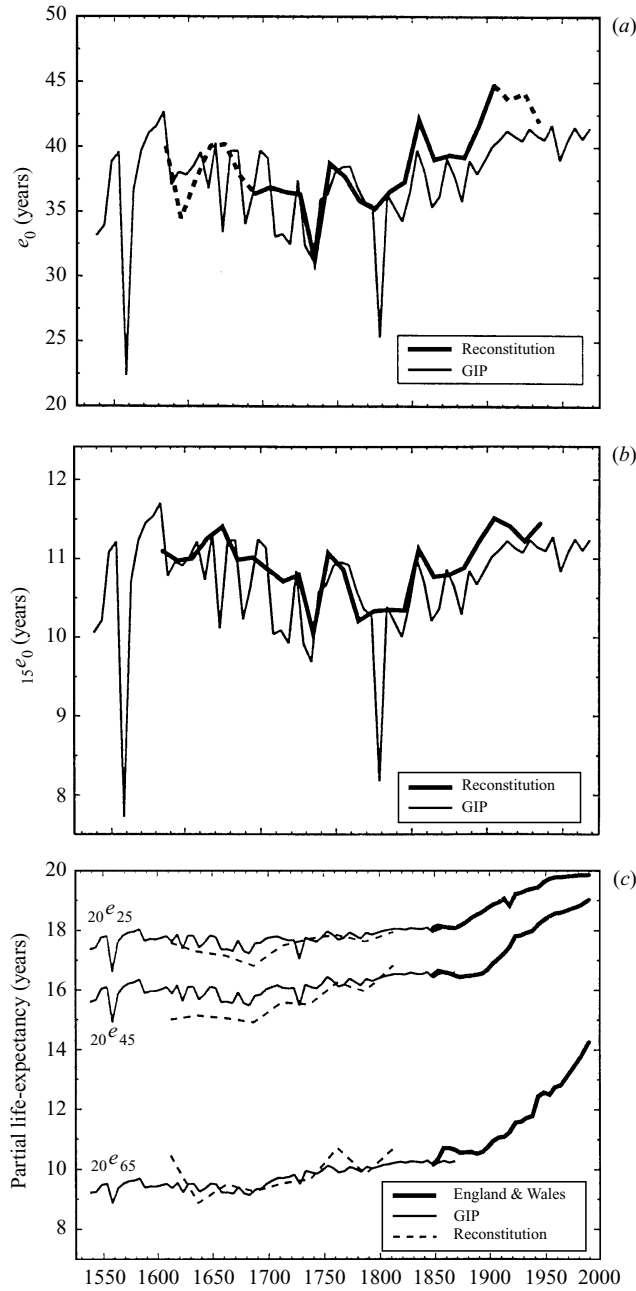


Fig. 1. Estimates of expectation of life at birth and of partial life expectancies from family reconstitution and by generalised inverse projection (e_0 , ${}_{15}e_0$, ${}_{20}e_{25}$, ${}_{20}e_{45}$, ${}_{20}e_{65}$). Source: Wrigley, Davies, Oeppen and Schofield, *English population history*, figs. 8·3 and 8·4, pp. 541, 543.

because the types of information arising from the use of the two techniques are not directly comparable. For example, all GIP-generated fertility rates refer to the whole female population, both married and unmarried, whereas family reconstitution only yields estimates of fertility within marriage.

Other kinds of 'internal' tests are also possible. A full treatment of this topic would take up much space, but an example may serve to indicate their range and nature. The example is both intriguing as a matter of logic and exceptionally significant as a test of register quality. Since it is widely supposed that the registration of the burials of infants who died soon after birth was particularly likely to be neglected, any effective test of the recording of infant deaths constitutes a critical test of coverage generally. Such a test is possible where baptisms can be divided into three categories according to the subsequent fate of the child, provided that the number of cases is large. The three categories in question are as follows: that the child is known to have died before his or her first birthday; that the child is known to have survived his or her first birthday; and that the fate of the child is unknown. Reconstitution data can readily be divided in this fashion, and tens of thousands of baptisms were recorded on the reconstitution FRFs; thus, the data base is of a satisfactory size.

The argument is this. In a parish in which registration was complete, all the 'fate unknown' cases would relate to children who survived infancy but who subsequently emigrated from the parish before their marriage or death, events which would have given rise to an entry in the register if they had occurred locally. Therefore, the birth intervals following such baptisms should resemble the birth intervals following a birth where the child is known to have survived infancy because of a later event linked to the baptism. If, however, in a proportion of cases, the child in question had died in infancy but without any record of the burial surviving, the mean and distribution of the birth intervals in the case of 'fate unknown' children would differ from the mean and distribution of those 'known to have survived'. The birth intervals following the 'fate unknown' children would then represent a mixture of the characteristics of the 'known to have survived' and the 'known to have died' categories. In early modern England, when an infant died young the interval to the next birth was about 8 months shorter on average than when he or she survived.⁴³ The cessation of breast feeding brought about by the infant death made the mother likely to conceive again much sooner than when she was still breastfeeding. Birth intervals in the 'known to have died' category therefore have a very different distribution from those in the 'known to have survived' group. Formal statistical testing using the Kolmogorov–Smirnov test makes it possible to establish whether or not the 'fate unknown' and the 'known to have survived' categories of birth intervals differ from one another. If they do, there will be reason to doubt the completeness of coverage of infant burials: if they

⁴³ *Ibid.* tab. 7:35, pp. 438–9 The interval was a little shorter in the case of parity 1 births and a little longer for all higher parities, with the overall average difference about 8.4 months.

do not, it is likely that registration was effectively complete. Figure 2 shows the data in question.

The four panels of figure 2 display the frequency distribution of birth intervals of varying lengths for the three types of birth interval. The first panel covers the parish register period as a whole, while the other three panels deal with sub-periods. The whole period is not an appropriate time period over which to test this issue because in the three sub-periods the proportion of birth intervals in the 'fate unknown' category changed, while mean birth intervals in the three categories were also changing. By the end of the parish register period birth intervals were significantly shorter than at its beginning. This in turn implies that comparing means in the three categories over the period as a whole will tend to produce a misleading result. The 'fate unknown' category was a substantially larger fraction of the total of cases at the end of the period than at its beginning, and, since birth intervals in general were shorter in the late eighteenth and early nineteenth centuries, this tends to reduce the mean length of the 'fate unknown' category relative to the 'known to have survived' category over the 250-year period as a whole.

Sub-periods were, therefore, chosen within which the characteristics of the birth interval distribution appear to have been relatively homogeneous and the relative size of each category was relatively stable. The mean birth interval in 1550–99 for the two types of birth interval whose comparison provides evidence about the extent of underregistration, if any, were: 30·41 (died over 1 year), and 30·51 months (age at death unknown). The comparable means for 1600–1749 were 30·46 and 30·45 months; and for 1750–1837 29·14 and 29·23 months. Kolmogorov–Smirnov shows that there is no reason to reject the null hypothesis that the birth intervals in the two categories were drawn from the same population in the two later sub-periods. The issue is more open for the earliest period and it is possible, though not certain, that in the sixteenth century some infant deaths went unregistered.⁴⁴

This test firmly supports other evidence underwriting the completeness of burial registration. It does not directly test the reliability of the coverage of births through the recording of baptisms, though evidence of good registration in relation to one class of event tends to increase confidence in relation to other classes. It is worth noting, however, that a broadly comparable test of the coverage of births is feasible. The test rests upon what is known about the determinants of the characteristic distribution of the length of time elapsing between exposure to the risk of conception and the occurrence of a live birth. There is, of course, a minimum possible such interval, though no equivalent maximum of comparable precision. However, in the absence of any widespread practice of control of conception, the relative frequency of intervals of different lengths conforms to patterns which have been much studied, using data relating to the interval between marriage and first birth, which have been the

⁴⁴ The nature of the problem and the inferences to be drawn from the available data, together with details of the Kolmogorov–Smirnov tests, are described and discussed at greater length in *ibid.* pp. 102–6.

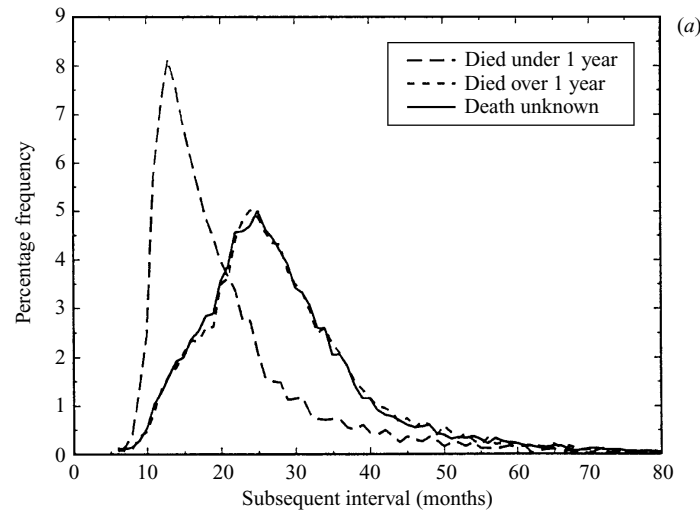


Fig. 2. For legend see facing page.

basis of many examinations of fecundability. An innovatory aspect of the treatment of this topic in the case of the 26 reconstitution parishes was the use of birth intervals following an infant death to extend the analysis of fecundability later in marriage. Where underregistration was present, long intervals would be disproportionately common since some intervals that were apparently between marriage and a first birth or between successive births, would actually refer not to intervals between a and b but to intervals between a and c , b representing a birth missing from the record.

This is a complex question which does not lend itself to brief summary, but the birth interval distributions were such as to suggest that few births were missing in the reconstitution data set.⁴⁵ Thus the reconstitution data are once again reassuring in this regard, especially as it is possible to test reliability not only by using birth intervals from marriage to first birth, but also throughout marriage.

Finally, there is other evidence which lends credence to the main findings of the reconstitution exercise. To be epigrammatic, one might say that parish register-based studies should be careful to avoid being parochial. There is a wealth of data from reconstitution studies in other countries with which to compare English results. No source is entirely free from evidential problems, but in several countries problems which occur in England are largely absent, because there were no significant religious minorities, because of different baptism customs, because migration was a far less prominent feature of local life, or for other reasons. It is, therefore, important to discover whether, in cases where there is every reason to believe that the data are sound and that underregistration was absent or minimal, the prevailing patterns of fertility

⁴⁵ This emerges from the discussion of fecundability in *ibid.* pp. 464–92.

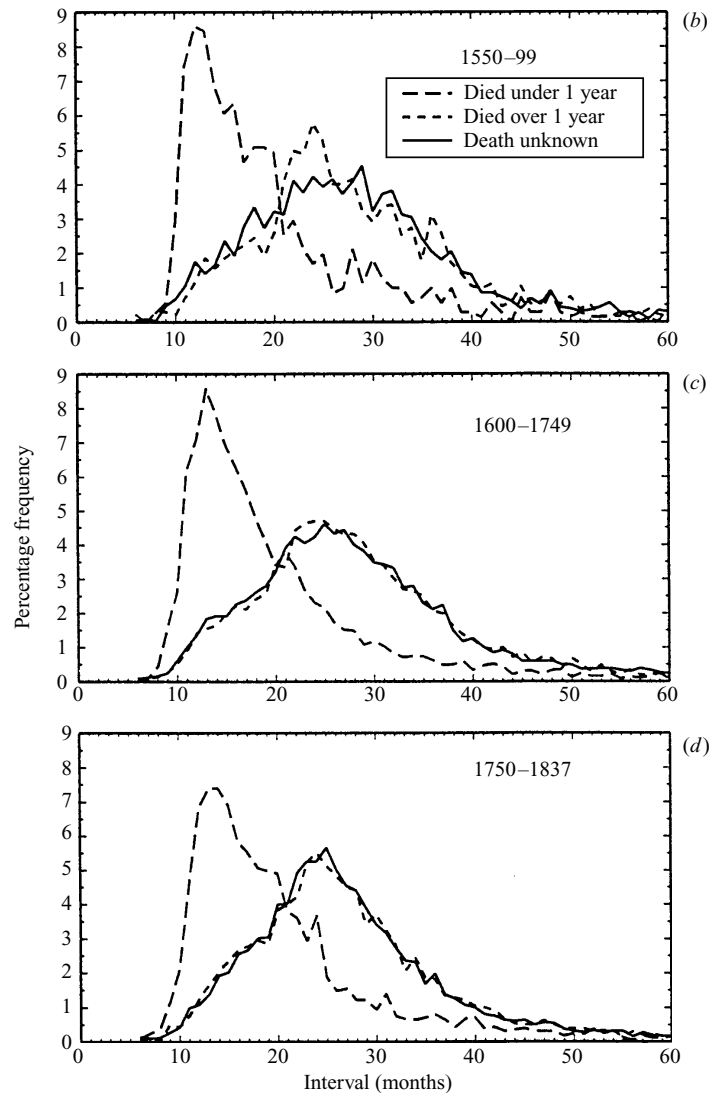


Fig. 2. The distribution of birth intervals where the previous child died under one, where the previous child survived, and where the fate of the previous child is unknown. *Source:* Wrigley, Davies, Oeppen and Schofield, *English population history*, figs. 4.1 and 4.2, pp. 102, 104.

and mortality were similar to those found in England. A particularly interesting issue which has a bearing on this question is that of communities possessing what are sometimes called 'low-pressure' demographic characteristics. In general where fertility was high, mortality was also high, and, equally, low fertility and mortality were frequently found in association. Rural England consisted predominantly of low-pressure parishes. To someone accustomed to the generally higher fertility and mortality found in eighteenth-century France,

English rates are apt to appear surprisingly low. But other parts of Europe were very 'English' in this respect. For example, the fertility and mortality rates found in England closely resemble those found in German Ost Friesland, another area where a 'low-pressure' regime prevailed.⁴⁶

A definitive confirmation of the reliability of reconstitution results when using suitable registers is beyond reach. But such matters should not be regarded starkly in black and white terms. Verification is rather a matter of establishing a location on a spectrum of possibilities running from incontrovertible certainty at one extreme to inveterate doubt at the other. What serves to increase the apparent reliability of a body of findings constitutes a move in one direction along the spectrum: what tends to induce greater doubt, a movement in the opposite direction. There is an abundance of evidence demonstrating that Anglican parish registers were often gravely at fault in their coverage even of the events which they should in principle have recorded, and still more, therefore, in their coverage of all the births, deaths, and marriages taking place in a given parish. So much is not in question. The crucial issue is whether the deficiencies which can so easily be uncovered were omnipresent to a degree which renders parish registers universally unserviceable as a source of reliable information about the demography of communities in the past.

It is my contention that in a small proportion of cases parochial registration was sufficiently complete to allow the fertility, nuptiality and mortality characteristics of past populations to be recovered with only a small margin of

⁴⁶ In Germany in the eighteenth and nineteenth centuries both high- and low-pressure regimes were to be found. For example, in the two Bavarian villages of Anhausen and Gabelbach in the period 1750–1849 the average level of ${}_5q_0$ (that is, the number dying before their fifth birthday from a birth cohort of 1,000) was 416 per 1,000, whereas in the Frisian villages of Middels and Werdum ${}_5q_0$ was only 217 per 1,000. Similarly, I_g , a standard measure of marital fertility, was at the very high level of 0.95 in the Bavarian villages, but no more than 0.67 in the Frisian villages (I_g measures marital fertility relative to that of the Hutterites, a group with exceptionally high marital fertility whose I_g is taken as 1.00). Over the same period in England ${}_5q_0$ was 245 per 1,000 and I_g was 0.71. The German data are taken from J. Knodel, *Demographic behaviour in the past: a study of fourteen German village populations in the eighteenth and nineteenth centuries* (Cambridge, 1988), tab. 3.1, p. 44 and tab. 10.1, p. 250. The fertility and mortality data for the German villages are given by Knodel for 1750–99, 1800–24, and 1825–49. The fertility and mortality data quoted were averages of the individual readings for each time period with 1750–99 counted as of double weight. The combined averages for the pairs of villages were obtained by giving equal weight to each village, except that the fertility data for the Bavarian villages had already been consolidated into a single figure by Knodel (and his figure included data from the very small village of Kreuth as well as Anhausen and Gabelbach). The English figures were derived from data for four periods, 1750–74, 1775–99, 1800–24, and 1825–37. The first three periods were given unit weights with the last period half weight: Wrigley, Davies, Oeppen and Schofield, *English population history*, tabs. 6.14, p. 262 and 7.1, p. 355 (in the latter case with reconstitution data for 1825–37 added). The English I_g figure is slightly higher than that given by Wilson and Woods for the same period (0.67). Their estimates were made indirectly from the output of back projection and from family reconstitution data taken from a set of parishes which differed from that used in *English population history* and included some parishes which were later rejected as not demonstrably reliable. In these circumstances, the small difference in the estimated figures should occasion no surprise: C. Wilson and R. Woods, 'Fertility in England: a long-term perspective', *Population Studies*, XLV (1991), tab. 1, p. 403. Scandinavian countries afford many examples of low-pressure regimes similar to that found in Werdum and Middels.

error. Indeed, it could be argued that the nature both of the source used and of the technique of reconstruction and analysis employed make it easier to be confident of the nature and scale of deficiencies in the parochial record than is usually possible with materials collected and published by the state, especially when, as in this country, access to the original records of birth, death and marriage is still denied by the state.⁴⁷ Henry set an admirable precedent in his original reconstitution study of the Norman parish of Crulai, setting out in an appendix in summary form all the data that he had used to produce the demographic tabulations printed in the main text of the volume. The sceptic was provided with all the information which had been at Henry's disposal.⁴⁸ It is a tradition to be fostered. The scale of the data used in *English population history from family reconstitution* prohibits following Henry's precedent in full, though there are in total 10 appendices which are intended to do honour to this precedent, but the advent of electronic forms of data storage and retrieval will make it easy for others to satisfy themselves by a variety of tests if they so wish.

IV

The continuance of human society from generation to generation depends jointly upon production and reproduction. Life cannot be sustained in the absence of certain material necessities, food, shelter, clothing and fuel; nor can it be continued unless the processes which bring every individual to his or her death in due course are balanced by the creation of new life. Economic and demographic history jointly attempt to make plain how production and reproduction took place in the past and how they were interrelated. The developments of the last thirty years have transformed historical population studies. If it is safe to assume that the results obtained by applying new methods to familiar sources are dependable, a range of topics fundamental to the understanding of the functioning of societies in the past can be addressed with confidence. The question at issue is whether the results obtained from recent demographic research, using methods such as family reconstitution or generalized inverse projection, are necessarily a sort of fool's gold because of the inherent defects either of the methods used or of the source materials employed; or whether, if care is taken to exclude defective source material and to choose appropriate techniques, the results can survive the acid test and provide a valuable addition to the treasure chest of historical knowledge.

⁴⁷ The rather tortuous recent history of this issue may be followed from material published in *Local Population Studies* over recent years, usually in the form of editorials or letters: see especially *Local Population Studies*, xi (1973), 6–7, 64; xiv (1975), 6–8; xvi (1976), 54–5; xxix (1982), 4–7; L (1993), 76–8. The last reference contains a statement of government intention by Mr William Waldegrave.

⁴⁸ Gautier and Henry, *Crulai*, esp. tab. 7–13, pp. 249–69.