

SOURCES AND METHODS

This item considers a range of sources and methods commonly used in local population history. These vary in sophistication and complexity, but are intended to be of benefit to the broad *LPS* readership, and are accompanied by worked examples. Each item is written by an experienced population history practitioner, and will usually address both the possibilities and the pitfalls of the respective sources and methods under discussion. The *LPS* Board are happy to enter into correspondence on this item, which should be addressed in the first instance to the *LPS* General Office.

CALCULATING CRUDE BIRTH AND DEATH RATES FOR LOCAL POPULATIONS DURING THE 'PARISH REGISTER ERA'

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The first article in this series explained that the size of the population of a given area can only change because of a small number of events, known as the components of population change.¹ When considering whole populations, there are three of these: births, deaths and migration. That article described population change in any given locality simply in terms of *numbers* of events. Although numbers of events can paint a coherent picture of the nature of population change in a single place, for comparative purposes measures of the intensity of the components of population change are needed. The observation that there were 30 births in a given year in a village of 500 people would indicate a truly remarkable level of fertility, whereas 30 births in a given year in a small town of 3,000 people would indicate a very low level indeed. Measures suitable for comparing the magnitude of the fertility, mortality and migration processes of which the observed births, deaths and moves are the outcome are provided by demographic *rates*.

Rates can be calculated for all three components of population change, but in this article I will consider only birth and death rates. The reason for this is that, for most populations, the data required for the calculation of migration rates are not directly available, so that migration rates are estimated indirectly using methods different from those used to calculate birth and death rates.

A demographic rate is simply the ratio of the number of events to the number of people exposed to the risk of experiencing those events. That is:

$$\text{rate} = \frac{\text{events}}{\text{population exposed to risk}}$$

When the events are births, and the population exposed to risk is the whole population, the relevant rate is called the *crude birth rate*; when the events are deaths and the population exposed to risk is the whole population, the relevant rate is called the *crude death rate*. Crude birth and death rates are often expressed per thousand of the population exposed to risk, so that:

$$\text{rate per thousand} = \frac{\text{events}}{\text{population exposed to risk}} \times 1,000$$

Many more complex rates can be calculated, such as rates specific to particular age groups, but this article will look only at crude birth and death rates.

A desirable feature of demographic rates is that the events *correspond* to the population exposed to risk. *Correspondence* may be illustrated with reference to the crude death rate. What it means is that if a person is included in the population exposed to risk then, were he or she to die within the specified period to which the rate applies, his or her death would be counted as an event; in addition, if a person is *not* included in the population exposed to risk, then were he or she to die within the specified period to which the rate applies, his or her death would *not* be counted as an event.

It is the need to ensure correspondence that can make the calculation of accurate rates for historical populations difficult and complex. The main problem arises because the sources of data for the events (births and deaths) are usually not the same as the sources of data for the population exposed to risk. This might mean, for example, that the geographical area covered by the 'events' data is larger than the area to which the population data relate. If this is the case, then some events might be included which happen to persons outside the geographical area to which the population data refer, leading to an over-estimation of the rate. It is therefore important to check the boundaries of the geographical units used in each source, to make sure that they correspond. In some cases, it might be necessary to combine data for several adjacent geographical units for either events or population data in order to obtain corresponding areas for calculating the rates.²

In the context of the historical population of England, then the relevant sources of data vary over time (Table 1). It turns out that the quality of the data on events and the population exposed to risk vary over time, but not in a systematic way. Before 1538 it is very difficult to obtain data on either. From 1538 onwards the advent of the Church of England parish registers of baptisms and burials makes data on the events (births and deaths) much more reliable than the data on the population exposed to risk, although the quality of the parish registers deteriorates during the eighteenth century and is questionable for the early nineteenth century. After 1801 the arrival of regular population

Table 1 Sources of data for the calculation of demographic rates for local populations in England and Wales

Period	Source of data on events	Source of data for population at risk
Before 1538	Various fragmentary sources	Domesday book; Poll Taxes; other taxation returns
1538–1800	Parish registers of baptism and burials	Various ecclesiastical and taxation returns
1800–1837	Parish registers of baptisms and burials	Census listings
1837 and later	Civil registration data on births and deaths	Census listings

censuses means that the population exposed to risk presents few problems; but until 1837 we are still reliant on (often rather defective) parish registers for the events data. Only with the introduction of civil registration in 1837 do we have reliable and consistent series of data for both the events and the population at risk.

The local geographical areas for which it is conveniently possible to calculate demographic rates also vary with time. Before 1837 reliance on the Church of England registers necessitates using the (ecclesiastical) parish as the geographical unit of analysis. After 1837, the quality of the parish registers is less reliable, and certainly inferior in coverage to the civil registers. Restricted access to the latter, however, means that historians must rely on the published birth and death statistics, and the smallest unit to which these relate is the registration sub-district. The sub-district typically comprises several parishes. This paper focuses on the calculation of demographic rates for the period between 1538 and 1837, sometimes called the ‘parish register era’ because of the availability of data on baptisms and burials from the parish registers.

The calculation of demographic rates for local areas during this period can be illustrated using a specific example, that of the parish of Odiham in Hampshire, which is noted for the high quality of its parish register. It is one of the 404 parishes used in Wrigley and Schofield’s reconstruction of the aggregate population of England, and is also one of the parishes for which a full family reconstitution has been undertaken.³ Monthly totals of baptisms and burials for the entire period between 1538 and 1837 are available on a CD-ROM.⁴

For the parish register era, the estimation of the population exposed to risk is the main problem. Sources which may be used to obtain such estimates have been discussed in the previous two articles in this series.⁵ In the case of Odiham it is possible to use the 1665 Hearth Tax assessment, which listed both chargeable and non-chargeable hearths, and the Bishop’s Visitations of 1725 and 1788.⁶ Multipliers for converting the assessments of the numbers of households listed in the Hearth Tax into population totals have been discussed by Tom Arkell, who suggested that a figure of 4.3 was a good working average for much of England, a figure rather lower than the mean household size of 4.5 suggested by Peter Laslett for England outside London in the late seventeenth

century.⁷ The 1665 Hearth Tax assessment was drawn up separately for the village of Odiham and the five tythings of North Warnborough, Murrell, Rye, Stapely and Hillside, all of which fall within the *parish* of Odiham.⁸ Summing the numbers of households in Odiham village and the five tythings produces 162 chargeable households and 83 non-chargeable households, or 245 households in all.⁹ Applying a multiplier of 4.3 to these 245 households produces 1,054 persons, while a multiplier of 4.5 produces 1,103. Taking the mean of these two figures produces an estimated population for the parish of Odiham in 1665 of 1,080.

The number of baptisms in 1665 in Odiham parish was 30 and the number of burials was 26. However, it is usually advisable not to use a single year's totals of births and deaths when estimating crude birth and death rates for local areas, as year-to-year fluctuations can be quite large, so that a single year's figures may be unrepresentative. Indeed, the numbers of baptisms in Odiham in 1663, 1664, 1666 and 1667 were 26, 58, 41 and 41 respectively, so that the 1665 figure of 30 seems rather below average. Taking the average of the number of baptisms in 1665 and the two years either side gives an average number of baptisms per year in Odiham at this time of 39. Taking a similar average of the numbers of burials in each of the years 1663-1667 gives an average annual total of 29. The estimated crude birth and death rates in Odiham in 1665 are therefore:

crude birth rate in 1665 = $39/1,080 \times 1,000 = 36.1$ per thousand

crude death rate in 1665 = $29/1,080 \times 1,000 = 26.9$ per thousand.

According to the reply made by James Finmore, vicar of Odiham and Greywell, to the Bishop's Visitation of 1725, the population of Odiham parish was about 1,230.¹⁰ In 1788 the then vicar, George Watkins, claimed that the population was '[a]bout 1,426 according to the account sent by Mr Howlett'.¹¹ These two figures seem mutually compatible given what is known about population growth in eighteenth-century rural England. Using a similar approach to the baptism and burial registers (that is, taking the average numbers of baptisms and burials in 1725 and 1788 and the two years either side of those dates) gives the following estimates of the crude birth and death rates:

crude birth rate in 1725 = $32/1,230 \times 1,000 = 26.0$ per thousand

crude birth rate in 1788 = $60/1,426 \times 1,000 = 42.1$ per thousand

crude death rate in 1725 = $24/1,230 \times 1,000 = 19.5$ per thousand

crude death rate in 1788 = $40/1,426 \times 1,000 = 28.1$ per thousand.

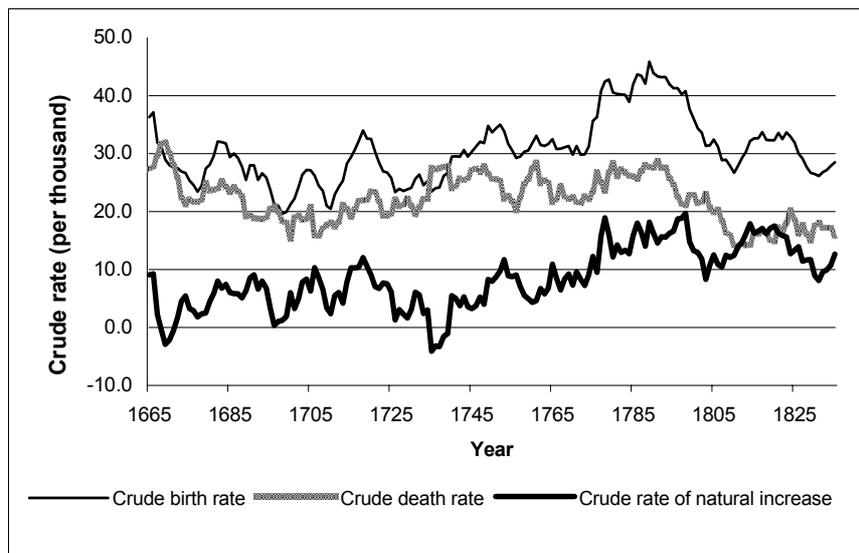
The 1801 census of population gives the population of Odiham 'town' as 1,058 and that of North Warnborough 'tything' as 427.¹² Totalling these gives a population for Odiham parish of 1,485, which is consistent with the total of 1,426 in the reply to the Bishop's Visitation 13 years earlier. Table 2 shows the population of Odiham in each of the first four population censuses, together with the average number of baptisms and burials reported in the parish register for each census year and the two years on either side, and the estimates of the crude birth and death rates.

Table 2 Estimation of crude birth and death rates, Odiham parish, 1801–1831

Census year	Recorded population	Average annual no. of baptisms	Average annual no. of burials	Estimated crude birth rate (per thousand)	Estimated crude death rate (per thousand)
1801	1,485	51.0	31.8	34.3	21.4
1811	2,048	57.2	28.6	27.9	14.0
1821	2,413	82.8	41.8	34.3	17.3
1831	2,647	69.2	47.8	26.1	18.1

Sources: Parish registers of Odiham, available on CD-ROM from the Local Population Studies General Office, Department of Humanities, University of Hertfordshire, College Lane, Hatfield, Hertfordshire AL10 9AB. E-mail: lps@herts.ac.uk; Census of Great Britain, 1851, *Population tables, I. Number of the inhabitants in 1801, 1811, 1821, 1831, 1841 and 1851. Vol. I*, BPP 1852-53 LXXXV [1631] 60 (available on-line from www.histpop.org).

Figure 1 Estimated crude birth and death rates, Odiham parish, 1665–1835



Sources: Parish registers of Odiham, available on CD-ROM from the Local Population Studies General Office, Department of Humanities, University of Hertfordshire, College Lane, Hatfield, Hertfordshire AL10 9AB. E-mail: lps@herts.ac.uk; E. Hughes and P. White eds, *The Hampshire Hearth Tax assessment, 1665, with the Southampton assessments for 1662 and 1670*, Hampshire Record Series, 11 (Winchester, 1991), 201-5; W.R. Ward ed., *Parson and parish ineighteenth-century Hampshire: replies to Bishop's Visitations*, Hampshire Record Series, 13 (Winchester, 1995), 99 and 309; Census of Great Britain, 1851, *Population tables, I. Number of the inhabitants in 1801, 1811, 1821, 1831, 1841 and 1851. Vol. I*, BPP 1852–53 LXXXV 1631] 60 (available on-line from www.histpop.org).

The analysis of the evolution of crude birth and death rates for the pre-1837 era can be taken somewhat further. Since we have data on baptisms and burials for all years between 1665 and 1837, then by interpolating between the population data for the time points 1665, 1725, 1788, 1801, 1811, 1821, 1831 and 1841 we can estimate population totals for each year between 1665 and 1835, and hence estimate crude birth and death rates for the parish for each year (Figure 1).¹³ For simplicity, we have used linear interpolation, although exponential interpolation could also be used.¹⁴

The crude birth rate fluctuated between about 20 per thousand and 35 per thousand between 1665 and 1770, but then increased to over 40 per thousand at the end of the eighteenth century. During the first decade of the nineteenth century it fell back to around 30 per thousand. The crude death rate was slightly below the crude birth rate in most years, and gradually fell further below after about 1770, leading to a rise in the *crude rate of natural increase* (the crude rate of natural increase is the difference between the crude birth rate and the crude death rate). Only in a few years around 1670 and during the 1730s did natural decrease occur. It is worth noting that the crude death rate actually rose gently during the eighteenth century, but that its rise was accompanied by a rise in the crude birth rate which was at least as rapid.

Crude birth and death rates can be calculated in this way for any parish with good quality parish registers. In this context, 'good quality' means that the baptisms and burials recorded in the registers comprise the vast majority of births and deaths which actually took place. It should be possible to use the data for any of the 404 parishes used in *The population history of England 1541–1871: a reconstruction*, though not all of these cover the whole 300 years of the 'parish register era'.¹⁵ It is also possible to compare the series of crude birth and death rates for any parish with the national series calculated by Wrigley and Schofield.¹⁶

NOTES

1. A. Hinde, 'The components of population change', *Local Population Studies*, 76 (2006), 90–5.
2. There are also various statistical procedures available for 'reallocating' events or, more usually, populations at risk from one set of geographical units to another overlapping set defined on the basis of different boundaries. See I.N. Gregory and P.S. Ell, 'Breaking the boundaries: geographical approaches to integrating 200 years of the census', *Journal of the Royal Statistical Society, series A*, 168 (2005), 419–37.
3. E.A. Wrigley and R.S. Schofield, *The population history of England, 1541–1871: a reconstruction* (London, 1981); E.A. Wrigley, R.S. Davies, J.E. Oeppen and R.S. Schofield, *English population history from family reconstitution, 1580–1837* (Cambridge, 1997). On the population history of Odiham, see also B. Stapleton, 'Family strategies: patterns of inheritance in Odiham, Hampshire, 1525–1850', *Continuity and Change*, 14 (1999), 385–402.
4. Obtainable for a nominal charge from the Local Population Studies General Office, Department of Humanities, University of Hertfordshire, College Lane, Hatfield, Hertfordshire AL10 9AB. E-mail: lps@herts.ac.uk.
5. N. Goose and A. Hinde, 'Estimating local population sizes at fixed points in time: part I – general principles', *Local Population Studies*, 77 (2006), 66–74; and N. Goose and A. Hinde, 'Estimating local population sizes at fixed points in time: part II – specific sources', *Local Population Studies*, 78 (2007), 74–88.

6. E. Hughes and P. White eds, *The Hampshire Hearth Tax assessment, 1665, with the Southampton assessments for 1662 and 1670*, Hampshire Record Series, **11** (Winchester, 1991); W.R. Ward ed., *Parson and parish in eighteenth-century Hampshire: replies to Bishop's Visitations*, Hampshire Record Series, **13** (Winchester, 1995), 99–101 and 308–9.
7. T. Arkell, 'Multiplying factors for estimating population totals from the Hearth Tax', *Local Population Studies*, **28** (1982), 55; P. Laslett, 'Mean household size in England since the sixteenth century', in P. Laslett and R. Wall eds, *Household and family in past time* (Cambridge, 1972), 138–9. Note that the commonly used multiplier of 4.75, often attributed to Laslett, arises from a rather superficial reading of his work which ignores warnings he gave about fixing on a single figure to use as multiplier for the whole of England throughout the early modern period, as Arkell, 'Multiplying factors', 52–3, explains.
8. See M. Smith ed., *Doing the duty of the parish: surveys of the Church in Hampshire, 1810*, Hampshire Record Series, **17** (Winchester, 2004), 87. In 1810 the vicar of Odiham was also responsible for the church at the nearby village of Greywell, but this was 'a distinct parish' according to a letter from Thomas Salmon, the then vicar, to J.H. Gell, dated 3 October 1810 (Smith, *Doing the duty of the parish*, 55).
9. Hughes and White, *Hampshire Hearth Tax assessment*, 201–5.
10. Ward, *Parson and parish*, 99.
11. Ward, *Parson and parish*, 309.
12. Census of Great Britain, 1801, *Abstract of the answers and returns made pursuant to an Act, passed in the forty-first year of His Majesty King George III. intituled 'An act for taking an account of the population of Great Britain, and the increase or diminution thereof'. Enumeration. Part I. England and Wales. Part II. Scotland*, BPP 1801–02, **VI** (9) 320. Obtainable online from www.histpop.org.
13. We do not have numbers of baptisms and burials for the years after 1837 in the machine-readable data base (though these would be available from the original registers). Because we use average numbers of events for the two years surrounding the year to which the crude birth and death rates relate, the last year for which we can compute the rates is 1835.
14. On exponential growth, see A. Hinde, *England's population: a history since the Domesday survey* (London, 2003), 24n and 88–9.
15. Wrigley and Schofield, *Population history of England*. Only a minority of parishes have data extending back to 1538. Many parishes have gaps in the series, especially around the time of the Civil War and the Commonwealth period.
16. Wrigley and Schofield, *Population history of England*, 528–35.