## 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.

## THE COMPONENTS OF POPULATION CHANGE

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Demography is the study of population structure and change, and the most fundamental quantity in demography is the total number of people living in a particular place. This number will typically change over time, and how and why it changes are often research questions of interest for local population studies. Consider an example. In eastern Hampshire lie the small market town of Alton and the neighbouring village of Holybourne.[1] In the first census of 1801, the population of Alton was 2,026 persons and that of Holybourne was 366 (Table 1). During the next century the population of Alton increased steadily so that by 1901 it was 5,479, more than two and half times what it was in 1801. The population of Holybourne also increased, but by the third quarter of the century the increase had stalled, and after 1871 its population began to fall. This pattern of a rise and subsequent fall in population was characteristic of many English villages during the nineteenth century.

Why did these two settlements have a different demographic history between 1801 and 1901? The ultimate answer lies in their different social and economic evolution, as shaped by local, regional, national and even international forces. Yet these forces can only act to change the population of a given place through three processes: fertility, mortality and migration. It is through these *components of population change*, and only through them, that the total number of people living in a defined locality can change. In seeking to understand the causes of population change, therefore, it is useful to try to measure how these

**Table 1    Population of the Hampshire parishes of Alton and Holybourne, 1801–1901**

| Census year | Alton | Holybourne |
|---|:---:|:---:|
| 1801 | 2,026 | 366 |
| 1811 | 2,316 | 384 |
| 1821 | 2,499 | 482 |
| 1831 | 2,742 | 487 |
| 1841 | 3,139 | 522 |
| 1851 | 3,538 | 497 |
| 1861 | 3,769 | 586 |
| 1871 | 4,092 | 618 |
| 1881 | 4,497 | 591 |
| 1891 | 4,671 | 587 |
| 1901 | 5,479 | 558 |

**Source:** G.S. Minchin, 'Table of population', in W. Page (ed.), *Victoria history of Hampshire and the Isle of Wight*, 5 vols (London, 1912), vol. 5, 437.

three components have combined to produce the observed growth or decline of the population.

The relationship between fertility, mortality and migration and population change is encapsulated in what is often termed the *demographic accounting equation*. If the population of a given place in a given census is denoted by the symbol $P_1$, and the population of the same place in the next census is denoted by the symbol $P_2$, then we can write down the following equation:

$P_1$ + births – deaths + in-migrants – out-migrants = $P_2$

where the 'births' and 'deaths', refer to the numbers of these events occurring in the period between the two censuses, and 'in-migrants' and 'out-migrants' are the numbers of persons arriving and leaving the place over the same period. The difference between births and deaths is called the *natural increase* of the population, and the difference between the number of in-migrants and the number of out-migrants is termed *net migration*. Since in the United Kingdom there is not, and never has been, compulsory registration of changes of place of residence, it is not normally possible to work out the numbers of in-migrants and out-migrants.[2] Therefore the demographic accounting equation is usually simplified to read

$P_1$ + births – deaths + net migration = $P_2$.

The equation makes one important assumption: that the boundaries of the place to which it is applied do not change between the two censuses. In other words, it is important that the geographical extent of the area to which it is

applied is identical throughout the period being studied.

Consider the application of the equation to population change in the parishes of Alton and Holybourne between 1871 and 1881. The population of Alton in 1871 was 4,092; by 1881 it had risen to 4,497 (Table 1). So we can write

4,092 + births – deaths + in-migrants – out-migrants = 4,497.

Similarly, for Holybourne (Table 1) we can write

618 + births – deaths + in-migrants – out-migrants = 591.

The next stage is to obtain the numbers of births and deaths. For certain geographical units, such as registration districts (RDs) or counties, the numbers of births and deaths in recent decades are published by the Registrar General.[3] There were roughly 600 RDs in Victorian England; their average population rose with the national population, but in 1881 it was about 20,000. For individual parishes or small groups of parishes, though, civil registration data on decadal numbers of births and deaths are not normally available.[4] If ecclesiastical registration is of good quality, the numbers of births and deaths might be estimated from the numbers of baptisms and burials in the parish registers. However, an alternative approach is to make the assumption that the birth rate in the parish or parishes being studied was the same as that prevailing in the RD in which the parish was situated. The annual number of births and deaths in each parish can then be worked out by applying the RD birth and death rates to the average population of the parish over the decade.

Both Alton and Holybourne were in the Alton RD, which during the 1870s had a birth rate of 32.3 per thousand and a death rate of 16.7 per thousand, and an average population of 15,098.[5] The average population of Alton parish during the decade 1871–1881 was (4,092 + 4,497)/2 which is 4,294.5. At a birth rate of 32.3 per thousand, 4,294.5 people will produce 4,294.5 x 0.0323 = 138.7 births per year. Over the ten years between the 1861 and 1871 censuses, therefore, we estimate that there were 1,387 births in Alton. Similarly, at a death rate of 16.7 per thousand, 4,294.5 people will generate an average of 71.7 deaths per year, so that over the decade we can expect a total of 717 deaths. The natural increase of the parish of Alton between 1871 and 1871 was therefore equal to the difference between the decadal numbers of births and deaths, which is 1,387-717 = 670.

A similar calculation for the parish of Holybourne during the same decade (average population 604.5), using the same birth and death rates, produces estimates of 195 births and 101 deaths, resulting in a natural increase over the decade of 94. Inserting these numbers into the demographic accounting equations for the two parishes produces:

for Alton: 4,092+1,387-717+net migration = 4,497,

and for Holybourne: 618+195-101+net migration = 591.

The estimated net migration during the decade is then simply the number

**Table 2    Components of population change in Alton and Holybourne, 1801–1901**

| Decade | Alton | | | Holybourne | | |
|---|---|---|---|---|---|---|
| | Population change | Natural increase | Net migration | Population change | Natural increase | Net migration |
| 1801–1811 | 290 | 274 | 16 | 18 | 47 | -29 |
| 1811–1821 | 183 | 349 | -166 | 98 | 63 | 35 |
| 1821–1831 | 243 | 377 | -134 | 5 | 70 | -65 |
| 1831–1841 | 397 | 362 | 35 | 35 | 62 | -27 |
| 1841–1851 | 399 | 387 | 12 | -25 | 59 | -84 |
| 1851–1861 | 231 | 460 | -288 | 89 | 77 | 12 |
| 1861–1871 | 323 | 499 | -192 | 32 | 79 | -47 |
| 1871–1881 | 405 | 670 | -265 | -27 | 94 | -121 |
| 1881–1891 | 174 | 619 | -445 | -4 | 80 | -84 |
| 1891–1901 | 808 | 406 | 301 | -29 | 57 | -86 |

**Notes:**    The natural increase figures in this table for decades before 1851 involve estimates of either or both of the crude birth and death rates (see endnote 7).

**Source:**    G.S. Minchin, 'Table of population', in W. Page (ed.), *Victoria history of Hampshire and the Isle of Wight*, 5 vols (London, 1912), vol. 5, 437.

required to make these equations balance. For Alton this is -265, and for Holybourne it is -121. We estimate, therefore, that during the decade 1871–1881, 265 more people left the parish of Alton to live elsewhere than arrived to reside in Alton: for Holybourne, there were 121 more out-migrants than in-migrants.[6]

The growth in the population of Alton during the decade 1871–1881, therefore, was produced by the natural increase of 670, but the effect of this was reduced by about 40 per cent by net out-migration. In Holybourne, despite the natural increase of 94, the population actually declined during the decade, because the natural increase was more than cancelled out by heavy net out-migration.

Similar calculations can be applied to the remaining decades of the nineteenth century for both parishes.[7] The results (Table 2) show that for most decades of the century out-migration exceeded in-migration in both parishes. Despite its urban character as a market town, Alton only gained population through migration in the decades 1801–1811, 1831–1841, 1841–1851 and 1891–1901, and only in the last decade of the century was the increase through net migration substantial. The village of Holybourne lost population quite heavily through net migration in all decades except 1811–1821 and 1851–1861, with the rate loss increasing during the last three decades of the century—a common pattern in the villages of southern England.

It is important to recognise that, because we have used the same RD birth rates and death rates to estimate the number of births in the two parishes, we have assumed that fertility and mortality were the same in both. While this is clearly

unlikely to have been exactly true, there is plenty of evidence that variation in fertility from place to place in nineteenth-century England was in general rather small, and that major variations over short distances were uncommon.[8] Local variations in mortality are more problematic, and it is probably not advisable to apply RD-based death rates to parishes which are known to be unrepresentative (for example, in their occupational structure) of the RDs in which they are situated. In small units such as parishes, there will, of course, also be random fluctuations in the numbers of births and deaths from year to year, but over a whole decade these will tend to cancel out, so that decadal totals of birth and deaths will exhibit much less random variation.

The demographic accounting equation can be applied at all geographical scales from the individual parish, to groups of parishes, through registration districts and counties to entire countries, provided that the boundaries of the units analyzed do not change during the period of investigation. Generally speaking, the reliability of the results increases with the size of the units, because accurate data on births and deaths are more likely to be available. Nevertheless, even at the parish level where the numbers of births and death must often be estimated using birth rates which apply to larger geographical units, the application of this method can provide useful estimates of the contribution of fertility, mortality and migration to the observed growth or decline of the population. This knowledge can then be related to what is known of changes in the social and economic situation to aid understanding of the causes of population change.

### NOTES

1. Alton and Holybourne are chosen here simply because the author resides close to the boundary separating their respective parishes. Both, however, have their place in the cultural history of England. It was in Alton on 24 August 1867 that an eight-year old girl called Fanny Adams was murdered and her body horribly mutilated; her grave is in the town's cemetery. Soon afterwards, the expression 'sweet Fanny Adams' was adopted by sailors to describe some of the food they were served at sea. Holybourne was the place where the novelist Elizabeth Gaskell, whose best known works include *Mary Barton: a tale of Manchester life* (1848), *North and south* (1855) and *Wives and daughters* (1866), died unexpectedly in 1865, in a house she had recently bought in the village.
2. Some progress in this direction can be made with nineteenth-century local data: see A. Hinde, 'The use of nineteenth-century census data to investigate local migration', *Local Population Studies*, **73** (2004), 8–28.
3. For the second half of the nineteenth century, for example, they are published in decennial S*upplements* to certain of the *Annual reports* of the Registrar General of births, deaths and marriages in England. These are in the British Parliamentary Papers (BPP) as follows: 1850s, BPP 1865/XIII [Cd. 3524]; 1860s, BPP 1875/XVIII, pt 2 [Cd. 1155–I]; 1870s, BPP 1884–5/XVII [Cd. 4564]; 1880s, BPP 1895/XXIII, pt 1 [Cd. 7769]; 1890s, BPP 1905/XVIII [Cd. 2619]. Death rates are available by registration district (RD) for decades from 1841 onwards, and births for decades from 1871 onwards. An alternative, more convenient, way to obtain RD births and deaths data together with base populations for the decades from 1851 onwards is to use H. Southall and I. Gregory, *Great Britain historical database: census data: inter-censal population change statistics, 1851–1961* [computer file], (London, 2004) which is available as study number 4556 from AHDS History at the University of Essex (see www.ahds.ac.uk/history). Users based in UK HE/FE institutions can download the tables from this study through the Collection of Historical and Contemporary Census Data and Related Materials (see http://ahds.ac.uk/history/collections/

chcc.htm). More details of electronic resources for the local population historians can be found in H. Southall, 'A vision of Britain through time: making sense of 200 years of census reports', in this issue of *LPS*, above, pp. 76–89.

4. It is possible to obtain totals of births and deaths for registration sub-districts (there were usually two, three or four sub-districts within any one registration district) from the *Annual reports* of the Registrar General. However, these are not presented on a decadal basis in the S*upplements* to the *Annual reports*, neither are they available in a convenient electronic format (so far as the author is aware), so using sub-districts involves a considerable amount of searching through the British Parliamentary Papers. They do, however, permit more localised analysis.

5. British Parliamentary Papers, 1884–5/XVII, *Registrar General of births, deaths and marriages in England: supplement to forty-fifth annual report*, 103.

6. It is important to recognise that knowing just the net migration, it is not possible to know exactly how many in-migrants and out-migrants there were. For example, in the case of Alton, there could have been 265 out-migrants and no in-migrants, or 965 out-migrants and 700 in-migrants, or any other combination that produces a net migration of -265.

7. So far as the method described in this paper is concerned, it matters not how the registration district (RD) birth and death rates are calculated, but simply that some birth and death rates representative of the parishes being studied can be estimated. For those readers who are interested however, the birth and death rates for the Alton RD in those decades when RD-specific figures are not available were estimated by deriving a comparability factor based on the relationship between the birth (or death) rate in the Alton RD and the national birth (or death) rate during the decades for which RD-specific birth (or death) rates were available. This comparability factor was used to adjust national rates for the decades before 1851 (in the case of birth rates) and before 1841 (in the case of death rates) to provide estimated rates for the Alton RD for those decades. The national birth and death rates were obtained from E.A. Wrigley and R. S. Schofield, *The population history of England 1541–1871: a reconstruction* (Cambridge, 1989).

8. See, for example, R. Woods, *The demography of Victorian England and Wales* (Cambridge, 2000), maps between pages 96–7.