# PARISH POPULATION RECONSTRUCTION IN STONEHOUSE, GLOUCESTERSHIRE: AN EXPERIMENT USING WRIGLEY AND SCHOFIELD'S CORRECTION FACTORS

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## Introduction

Local historians working on the early modern period, before the introduction of a national census in 1801, have usually had to derive population estimates from such occasional sources as may survive for their locality. The Cambridge Group for the History of Population and Social Structure has developed a technique of 'back projection' (or 'generalised inverse projection') from the 1871 census to produce a model of national population change after 1541, described by Wrigley and Schofield. That model is the product of many complex interactions and assumptions, which are subject to continued debate, and which appear to make a local approach untenable.[1] The Group introduced weightings to parish registration for population size, differences in period covered, and the influence of London, which must distort any attempt to recover local data.[2] Further work on family reconstitution was intended to examine regional variation, but instead came to deal with national themes.[3] This article describes an experiment to see how far Wrigley and Schofield's national correction factors may be applied to parish registration, without additional weighting, in order to produce local population estimates from 1563 to 1811.

Anglican parish registers are the main source of population information for early modern England. They have been used to produce totals from numbers of families and from the analysis of life expectancy.[4] However, parishioners may be registered elsewhere, or nowhere, for reasons of religion, family, work or travel, while temporary residents may leave no record at all.[5] Correction factors are therefore required to convert the totals of baptisms, burials and marriages recorded in parish registers into a full record of vital events, and vital rates are needed to convert this data into population estimates. The factors and rates developed by the Cambridge Group are based on balances of probabilities, and may be, to some extent, arbitrary. However, they are part of a balanced template, and are therefore best used as they stand. A model based on a different balance might be constructed, but would have to demonstrate a similar internal integrity.

Stonehouse lies nine miles south of Gloucester, in the former cloth-producing district around the river Frome.[6] The early modern parish virtually corresponded to the area covered by the early national censuses, beginning in 1801.[7] The second census, taken in 1811, may be more reliable than the first, although all early census totals require augmentation for unlisted infants and members of the armed forces.[8] The parish records survive from 1558, and continuous registration, which is desirable for the calculation of averages, runs from 1564, but data can also be constructed for 1563. The study limits have therefore been set at 1563–1811. There are four stages to the process: first, to build a description of the parish population trend from registration; secondly, to identify a reliable set of sources; thirdly, to compare the sources to the trend; and lastly, to construct an estimate. This model, if supported by further evaluation, could offer a self-reliant method of making local population estimates without depending on occasional sources.

**Building a population trend**

Annual change in a population could be observed by completing the 'demographic accounting equation'.[9] The natural increase, births minus deaths, would be added to the previous year's total, and the net migration, the balance of all other gains and losses, taken into account. The following method proposes that the population at the start of a year may be regarded as the solution to this equation for the previous year. Parish registrations of baptisms and burials are inflated into births and deaths, and then used to estimate the starting population for each year from national rates. Marriages are not included in the calculations, as they have a looser connection to residence. These annual figures will be used to assess the population trend.

The parish registers are first examined for continuity. Those for Stonehouse begin on 25 March 1558, although until 1598 the surviving record is a transcript of that date of the original register, now lost. There are gaps in baptisms 25 March 1560 – 24 March 1564, marriages 25 March 1560 – 5 February 1566, and burials 25 March 1560–24 March 1564, apart from one important burial in July 1560. Some later gaps can be filled in from surviving bishops' transcripts to give an almost continuous record from 25 March 1564, except for the year from 25 March 1669 to 24 March 1670.[10] Accurate counts of baptisms and burials are taken, if possible from the original registers. The year began on 25 March until 1752, but Wrigley and Schofield's national rates and correction factors are structured to apply to the January of each calendar year throughout the period.[11] Totals are therefore gathered by calendar year, 1 January to 31 December. The counts for the incomplete calendar years 1669 and 1670 are amended to the annual average of the ten years 1664–1668 and 1671–1675, except for burials in 1670, which already total more than this average from nine months. The counts for the calendar years 1558 and 1564 are also incomplete, but there is insufficient data to amend them. There are no entries for January–March in the calendar year 1560, which is regarded as a gap in spite of the lone burial. In 1837 a district Anglican church was dedicated at Cainscross to serve the eastern part of the parish, with separate

registration, which is included in the counts for the whole parish, 1837–1842.[12] The following method will require moving averages, running back as closely as possible to 1563, two from 1837 based on a period of 11 years, and another from 1811 based on a period of 51 years. The counts for Stonehouse therefore include 1558 and 1559, and extend to 1842. These averages will be explained as the method is developed.

The annual baptism and burial totals are next examined for deficient registration, that is, for years falling below normal levels. Wrigley and Schofield's test for this may be summarised as comparing a forward search to a past reference period, derived from the average number of months generating 100 events in a parish. The length of the forward search period varies according to how many months might be expected to produce 20 events at the average monthly rate of the reference period. If the total in the search period falls below a threshold of 6.5 for baptisms, and 5.5 for burials, the registration is regarded as deficient, provided that the deficiency occurs in both baptisms and burials. Deficient months are identified and omitted from the reference calculations, and afterwards made up using values derived from surrounding months.[13] However, because smaller parishes may provide low levels of monthly data, this study adopts a simplified form of the test, using whole calendar years. The search period is fixed at one year, and the total from it is assessed proportionally. The threshold minimum is expected for each set of 20 events found within the annual average of the reference period. The expected minimum for baptisms in a search year, for example, would be that average, divided by 20, and the result multiplied by 6.5. Each deficient year would be made up to the average of the previous and following five years in each series. This test is cruder than the original, but it observes the underlying rules, and should detect abnormal years.[14] In Stonehouse, a few years fall below the expected minimum in either baptisms or burials, but none are deficient in both.[15]

The totals are next augmented to compensate for three causes of under registration, that is, for events normally omitted from the registers. These are nonconformity, delayed baptism, and an assemblage of other residual factors such as absence or evasion. In each case, the annual totals are multiplied by the correction factor for that year, found by interpolation from the values supplied. Adjacent years are allowed the same value where necessary, and values for 1835 are assumed to continue until 1842. The correction factors for nonconformity remain very low between 1640 and 1685, reflecting the rarity of separate nonconformist registers before the Toleration Act of 1689.[16] Nonconformists in Stonehouse probably attended nearby meeting houses, as there were no licensed chapels serving the parish before 1798. There are some nonconformist registers for Stonehouse dated before 1842 which could offer a partial local test of the national correction factors, but for this experiment these are used as given.[17]

The totals reflecting the general effects of nonconformity are further adjusted to compensate for late baptism, as a child might die before baptism and

**Table 1 Compensation for under registration, calendar year 1676**

| Stage | CF/B | B | CF/D | D |
|---|---|---|---|---|
| Baptisms/burials | | 17 | | 10 |
| Nonconformity | 1.009 | 17.153 | 1.009 | 10.094 |
| Late baptism | 1.041 | 17.862 | 1.001 | 10.101 |
| Other causes | 1.022 | 18.249 | 1.009 | 10.187 |
| Births/deaths | | 18.249 | | 10.187 |

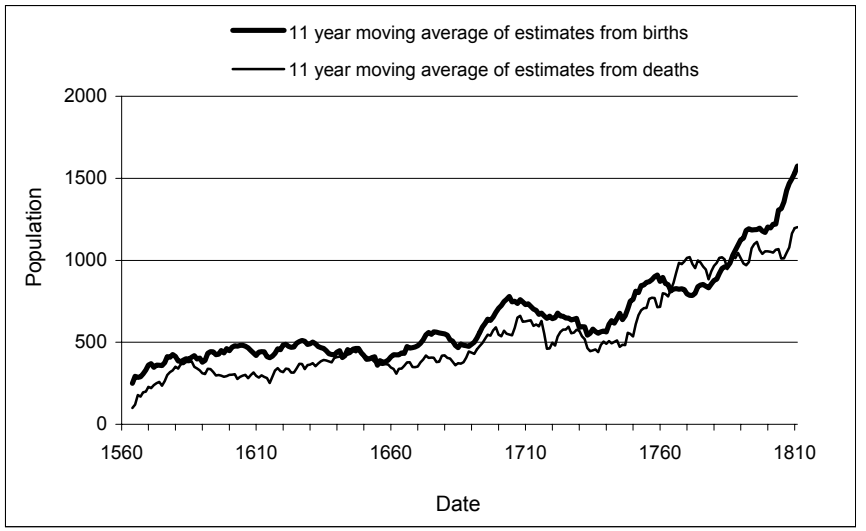
**Note:** CF = correction factor, B = baptisms to births, D = burials to deaths.
**Sources:** See text.

therefore be unrecorded in either baptism or burial registers. The risk increased as the length of the birth to baptism interval rose, and affected all religious persuasions except the Quakers.[18] These results are then cumulatively raised to represent all residual causes of non-registration, converting baptisms and burials into an estimate of births and deaths.[19] The correction factors are themselves estimates, and some births and deaths predating 31 December will be registered as baptisms and burials in the following year. The birth and death totals produced should therefore be regarded as elements in a series, not precise numbers of whole people. As an example, the figures for the year 1676 are as shown in Table 1. The correction factors and results are given to three decimal places as, when differences are small, too much rounding can remove them.

Taking the birth and death totals for each available year from 1558 to 1842, two population series are then calculated, from the national crude birth and death rates. These represent the populations required to generate the observed events during the year. These series will both show fluctuations, which can be extreme, although they usually become less so after 1750. The causes are very complex, and the two patterns will not be identical, although they may at times shadow or reflect each other.[20] In order to respect the different fluctuation patterns an 11–year moving average is taken from each series separately. This strategy will retain trends, while reducing the impact of unusually high or low births or deaths. Averages for the years 1564–1568 are worked round the gap of 1560–1563 to include 1558–1559 in as many of 11 years as possible, although this is reduced to five years (1558–1559, 1564–1566) by 1564. The relative behaviour of these two series, from 1564 to 1811, is shown in Figure 1. It will be seen that the average from births is normally higher than that from deaths. The two averages are extended up to 1837, using the counts up to 1842, to provide data for the next stage.

These two series are next compared, and the higher figure for each year is taken to be the population required for the observed events to be generated at national rates. The smaller requirement, normally arising from the deaths, is contained within the larger, normally arising from the births. As the national birth and death rates are designed to apply in January, it is assumed that the

**Figure 1 Eleven-year averages of estimates from births and deaths, 1564–1811**




**Source:** See text.

generating population is present in the January of the calendar year, and may be termed the 'starting population' for the year. The demographic accounting equation for the year should next be completed, by adding the natural increase, and taking net migration into account. A net migration figure could be calculated from the starting population by using the national rate, but the net national movement has been found to be always outwards, and is unlikely to reflect local complexities.[21] Alternatively, the net migration during the year might be taken to be the difference between the starting population, plus the natural increase, and the starting population for the following year. This approach may be expressed more simply by assuming that all amendments to one year's total produce that for the next.[22] The starting population, rounded to the nearest person, is taken to be the solution to the equation for the previous calendar year, without any need to differentiate either the natural increase or the net migration. The starting population for 1677, for example, is 561.4, and therefore the population for December 1676 is taken to be 561. The December of a calendar year will end the third quarter of the old-style year before 1752, offering a reasonable comparison with sources compiled for years ending in March. These estimates for December of each calendar year from 1563 to 1836, which are the transferred starting populations for the calendar years 1564 to 1837, will be referred to as the population base series, or PB series.

The PB series offers estimated solutions to the annual population equations, but its fluctuations may represent discrepancies between national correction

factors, and vital rates, and their real local values, rather than population change. However, the series could indicate a trend, which might be seen more clearly from a long average. Extension of the population base series up to 1836 allows a 51–year average to be calculated back from 1811 to 26 years after 1563, which is 1588. Before this date the line is continued back with diminishing averages, 49 years for 1587, 47 years for 1586, and so on until an average of 11 years for 1568. For 1563–7 the population base figures are used directly. The long average is extended beyond 1811 in the same way as in the period before 1589, in order to allow comparison with the national censuses up to 1831. An average of 49 years is taken for 1812, 47 years for 1813, and so on up to an average of 11 years for 1831. These two forms of the PB series will next be compared to other sources.

**Population sources**

There are a number of sources giving population information for Stonehouse before the national censuses begin. Ecclesiastical records provide visitations, surveys and censuses in 1551, 1563, 1603, 1650, 1676, 1680, 1709, 1735 and 1743.[23] There is a muster roll for 1608, and one intact Hearth Tax return for Michaelmas 1672.[24] Two county histories, published in 1712 and 1779, give parish totals.[25] However, there are no surviving Protestation Returns, Marriage Duty Act censuses or nominal poll tax lists.[26] The sources earlier than 1801 do not describe the whole population, but they can be made to do so by using multipliers. Men and women over 16 may constitute about 65 per cent of the total population, and their total should produce 100 per cent from a multiplier of 1.54. Schürer and Arkell suggest a range of 27 to 36 per cent for the proportion of men over 16. Equal proportions of men and women might be 32.5 per cent each, but adult populations tend to be female dominated. The average of the suggested range for adult men of 31.5 per cent is therefore adopted, represented by a multiplier of 3.17. As the age of confirmation for Anglican communicants was perhaps as low as 10 before 1600, although about 16 thereafter, and people over 10 may be about 75 per cent of the population, a multiplier of 1.33 is appropriate in 1551. A multiplier of 4.5 to estimate population from heads of household has been found to be applicable in Gloucestershire, and will be used throughout.[27]

Estimates from almost all the available sources are compared in Table 2 to the two forms of the PB series, with ratios given between the sources and the long average. The diocesan survey of 1735, which notes 'about 1,000' inhabitants for Stonehouse, is omitted as being too vague to provide a useful estimate. Annual figures in the PB series should not be regarded as individually accurate, but smoothing with an 11-year average would reduce the distinction between them and the long average. As a compromise, five-year averages are taken for each spot check in the PB series, except for 1563, when the annual PB value is used.

The same comparison is made in Figure 2, where the annual PB series is shown directly. The closest conjunctions are in 1563, 1603, 1650, 1676, 1680, 1709, and 1743, all resulting from ecclesiastical sources.

**Table 2 Population sources**

| Date | Source and calculation | Number | PB5 | PA | R/PA |
|---|---|---|---|---|---|
| 1551 | Diocesan visitation: 280 communicants (x 1.33) | 372 | | | |
| 1563 | Diocesan return: 52 households (x 4.5) | 234 | 250 | 250 | 0.94 |
| 1603 | Diocesan return: 284 communicants (x 1.54) | 437 | 478 | 443 | 0.99 |
| 1608 | Muster Roll: 97 men (x 3.17) | 307 | 442 | 451 | 0.68 |
| 1650 | Survey of church livings: 90 families (x 4.5) | 405 | 415 | 454 | 0.89 |
| 1672 | Michaelmas Hearth Tax: 65 households (x 4.5) | 293 | 532 | 487 | 0.60 |
| 1676 | Compton Census: total 384 (x 1.54) | 591 | 557 | 509 | 1.16 |
| 1680 | Parochial visitation: 120 families (x 4.5) | 540 | 534 | 538 | 1.00 |
| 1709 | Parish tithe census: 148 households (x 4.5) | 666 | 737 | 639 | 1.04 |
| 1712 | Atkyns, *Ancient History*: 'about 500' | 500 | 704 | 644 | 0.78 |
| 1743 | Diocesan survey | 759 | 642 | 724 | 1.05 |
| 1779 | Rudder, *New History* | 759 | 956 | 1,029 | 0.74 |
| 1801 | Census: 1,412 published, augmented | 1,475 | 1,230 | 1,372 | 1.08 |
| 1811 | Census: 1,711 published, augmented | 1,782 | 1,578 | 1,672 | 1.07 |
| 1821 | Census: 2,126 published, augmented | 2,183 | 1,888 | 1,985 | 1.10 |
| 1831 | Census: 2,469 published, augmented | 2,527 | 2,504 | 2,474 | 1.02 |

**Notes:** PB5 = five-year average of PB series, PA = long average of PB series, R = ratio of source to PA.

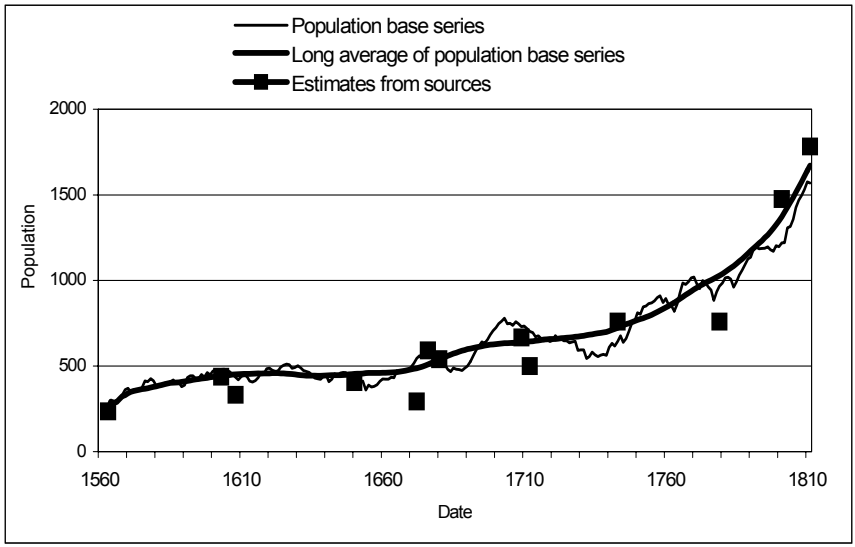
**Sources:** See text.

The next step should be to review the sources between 1563 and 1801, and to take out of consideration any which may give defective information. Comparative studies have done much to assess their various merits, but their differing structures make their relative accuracy hard to judge. In Stonehouse, however, manorial records can help to overcome this problem. In 1608 they provide valuable information, and after 1620 they contain an unusually long range of 'resiant' (or residents) lists, which can help to provide a comparative series.

**Resiant lists analysis**

The authority of the medieval English crown was expressed locally through the hierarchy of the shire, the hundred, and the tithing. A manor might contain several tithings under the supervision of a petty constable, who had to submit resiant lists to the hundred court. These were intended to include all the adult men expected to attend the manor court, to ensure that all were enrolled in a tithing. They have sometimes survived among the records, either of hundred courts, or of manors which had a court leet, where the lord exercised the hundred police authority through his own court in a 'view of frankpledge'.[28] The resiants had to have lived within the manor for a year. All males over the age of fealty, which by 1600 was generally 16, up to the age of

**Figure 2 Population base series and population sources, 1563–1811**




**Sources:** Table 2, and see text.

60, were intended to be included. Where a manor coincided with a parish, the lists might therefore be expected to describe all but the most transient and aged adult male parishioners at each court date.

Stonehouse manor had a court leet, and its residents were those of the early modern parish. The view of frankpledge was normally held once a year, in October. Lists exist for 1622, 1632, 1657–1659 annually, 1661, 1663–1667 annually, 1675, 1676 (for one 'leete', or half the parish), 1683, 1685, 1691, 1709, 1714–1727 annually, 1729–1734 annually, 1736–1741 annually, 1743–1752 annually (one undated list attributed to 1745 or 1746), then 1772, 1784, 1788, 1793 and 1799.[29] These lists have been analysed in a nominal record study of the parish, 1558–1804.[30] Although they purport to include all adult men between certain age limits, the Stonehouse lists are too variable in coverage to be used directly as a demographic source. Their great merit, however, is that the men are listed according to an underlying geographical order of the houses they occupy. Comparative analysis, using many other types of local record, makes it possible to relate families to properties, and to assign households to parts of houses, including allowances for those headed by women. As a result, the population can be estimated, at various dates between 1620 and 1784, from calculated household numbers. These estimates will be referred to as the resiant lists analysis, or RLA. They cannot be continued beyond 1784, as the later lists lose track of increasing subdivision and subtenancy of properties.

**Identifying a source series**

Most of the sources described in Table 2 can be reassessed against the manorial sources. In 1558, the manorial survey and other documents suggest that there were 59 households, which when multiplied by 4.5 produces a population of 266, falling from 372 in 1551 towards an estimated 234 in 1563.[31] This drop may be related to epidemics, which caused high mortality throughout England in the later 1550s and early 1560s. The reduced figure of 52 households in 1563 may reflect some undercounting, and the resulting population estimate may therefore be at an extreme low.[32] However, a reduction from 372 to 234 in Stonehouse, a fall of 37.1 per cent, is not unduly high in Stonehouse deanery, where the impact of the epidemics was especially severe.[33] Unfortunately almost all the burial entries for 1560–1563 are missing for the parish, but the gap in all the registers indicates a general disruption. The depth of this crisis may be unclear, but the diocesan return of 1563 does appear to reflect a genuine drop in population at this time.

The muster roll of 1608 was a Gloucestershire initiative at a time when the national militia was in abeyance, and not all may have felt obliged to attend. In theory the muster included all able-bodied men aged 16 to 60 below the rank of baron, but had always had to deal with defaulters and refusals.[34] The 1608 roll contains 97 male entries and three widows providing arms. After evidence from other documents has been considered it appears to give representatives for 54 of the 71 properties operational at that date. The manorial papers for 1608 include a default list, naming those who failed to attend the court, which has a geographical order similar to a resiant list. This adds 19 names, and other documents add 20. The total of adult men in this combined list is 136 (97 + 19 + 20), giving a population of 431 in 1608, using the multiplier of 3.17. This estimate indicates that the muster roll is indeed incomplete, but supports the proposed population for 1603.

It might be expected that the results from the survey of church livings of 1650 would reflect an uncertain situation after the civil wars, although Stonehouse suffered little physical disturbance, and local authorities, including the parish clergy, were encouraged to continue working as efficiently as local rivalries allowed.[35] The RLA for 1632 suggests 96 households at that date, which give a total population of 432. Another two households are detectable before 1650, and these 98 would give 441 in 1650. If families are to be regarded as households, the source estimate for 1650 is indeed lower than the RLA result.[36] The resiant list for 1657 indicates 90 households, echoing the 90 families mentioned in 1650, but the RLA suggests another 19 households in properties where there is documentary evidence of multiple occupation, and one in the vicarage shown by baptisms. These 110 households (90 + 19 + 1) would give a population of 495 in 1657.

The Michaelmas 1672 Hearth Tax return, with 65 entries, appears to be deficient, the RLA indicating 86 properties inhabited at this date. Those properties not connected to names on the tax list are all small, and probably exempt, although there are no exemption certificates either with the returns or

in the separate exemption sequence.[37] There are 124 households in the RLA for 1672, giving a population of 558. The Compton Census in Gloucestershire is considered fairly certain to give a realistic figure for men and women over 16 for 1676 from the total of all categories, and this is supported by comparisons with the RLA estimate for the hearth tax year.[38] The census estimate is 591, as compared to 126 households in the RLA for 1676, giving a population of 567. Richard Parsons, who became diocesan chancellor in 1677, included Stonehouse in his 'parochial visitation' in about 1680, and noted 'about 120 families', giving a population of 540. The RLA still suggests 567 in 1680, but there are 132 households by 1685, giving a population of 594.

The parish list drawn up by the new vicar in 1709 identifies 148 tithe-payers. Some are listed with households, and some alone, 18 are women, and some are known to be sharing houses. If they are all regarded as heads of households, although a few may not be so independent, they suggest a population of 666, as against 143 households in the RLA for 1709, giving a population of 644. The same RLA estimate applies in 1712, when Atkyns proposed a population of 500, in 110 houses. He is known to have used Parsons' notes of 30 years earlier, and for some parishes he revised the population figures, but apparently not for Stonehouse.[39]

The bishop required constant revisions of the 1735 diocesan survey from 1738 onwards, and in 1743 the 1735 figure of 1,000 was amended to 759, which was repeated in 1750 and 1752.[40] The RLA for 1743 shows 168 households, giving a population of 756, and this pattern remained stable for 1752. Rudder took his total for Stonehouse of 759 in 1779 from 'an accurate survey, taken a few years ago', apparently this same document of 1743–52. It seems from subscription records that his book was 20 years in preparation, so he would have been collecting information from the 1750s onwards.[41] By the time of publication in 1779 the RLA indicates 207 households, giving a population of 932.

The ratio of each source in Table 2, dated between 1608 and 1784, to a corresponding estimate developed from manorial records, is presented in Table 3 in descending order of ratio. The 1603 ecclesiastical return and the extended default list for 1608 are not exactly contemporary, but they are close enough in date for the ratio between them to be a useful addition.

Six of the ten ratios lie within a range of 0.9 to 1.1. The other four apply to the original 1608 muster roll, the 1672 Hearth Tax return, and the books of 1712 and 1779 by Atkyns and Rudder. These four have already been found likely to be deficient in terms of population information. The comparatively large divergence between these four and a coherent series strengthens this view, and they are therefore removed from the source list. The sources selected from Table 2 are now joined with the RLA to form a source series, which is strengthened by the close ratios seen in Table 3.

**Comparing the sources to the population base series**

The sources are next compared to five-year spot averages of the PB series, and to its long average. The form of the PB series which is most closely related to

**Table 3 Estimates from sources compared to manorial records**

| Date | Source | Number | Manorial record | Number | Ratio |
|---|---|---|---|---|---|
| 1676 | Compton Census | 591 | RLA | 567 | 1.04 |
| 1709 | Parish tithe census | 666 | RLA | 644 | 1.03 |
| 1603 | Diocesan return | 437 | Default list 1608 etc. | 431 | 1.01 |
| 1743 | Diocesan survey | 759 | RLA | 756 | 1.00 |
| 1680 | Parochial visitation | 540 | RLA | 567 | 0.95 |
| 1650 | Survey of church livings | 405 | RLA | 441 | 0.92 |
| 1779 | Rudder, *New History* | 759 | RLA | 932 | 0.81 |
| 1712 | Atkyns, *Ancient History* | 500 | RLA | 644 | 0.78 |
| 1608 | Muster roll | 315 | Default list etc. | 431 | 0.73 |
| 1672 | Michaelmas Hearth Tax | 293 | RLA | 558 | 0.53 |

**Sources:** Table 2, and see text.

the source series should be the one most likely to indicate the population trend. The comparisons are set out in Table 4, and in Figure 3, where the annual PB series is shown directly. Both forms of the PB series approach the sources, but the long average form has closer ratios.

**Finding the range for a parish estimate**

The long average of a PB series can only describe a trend within a range, not a set of specific values. As can be seen in Figure 3, the annual PB figures fluctuate about the long average, at a ratio range of between 0.79 and 1.23. The causes of variation in parish registration involve many environmental and seasonal factors, and will not be attributed here. The need is rather to assess how the data reflect different situations.

There are periods when the sources and the long average approach each other, but do not follow a PB series fluctuation. If the sources are reliable, it may be that the real local vital rates, and perhaps the local correction factors, differ from the national ones used to calculate the PB series.[42] However, the effect may not be so severe that the long average of the PB series cannot correct for it. National vital rates, for example, reflect the impact of successive national mortality crises after 1586, yet the Stonehouse area apparently suffered only lightly.[43] During the epidemic year of 1742, the vicar of Stonehouse wrote in his burial register, 'this year out of Three or Four and Thirty persons who had the Small Pox in the parish but one dyed'.[44] Burials do not rise in that year, but baptisms are the lowest of the decade. The long average of the PB series for 1742 approaches the population level in the diocesan survey of 1743, but the five-year average of the PB series for 1742 falls below both. The discrepancy with the source implies that the national vital rates used in the PB series may

**Table 4 Estimates from the source series compared to the population base series**

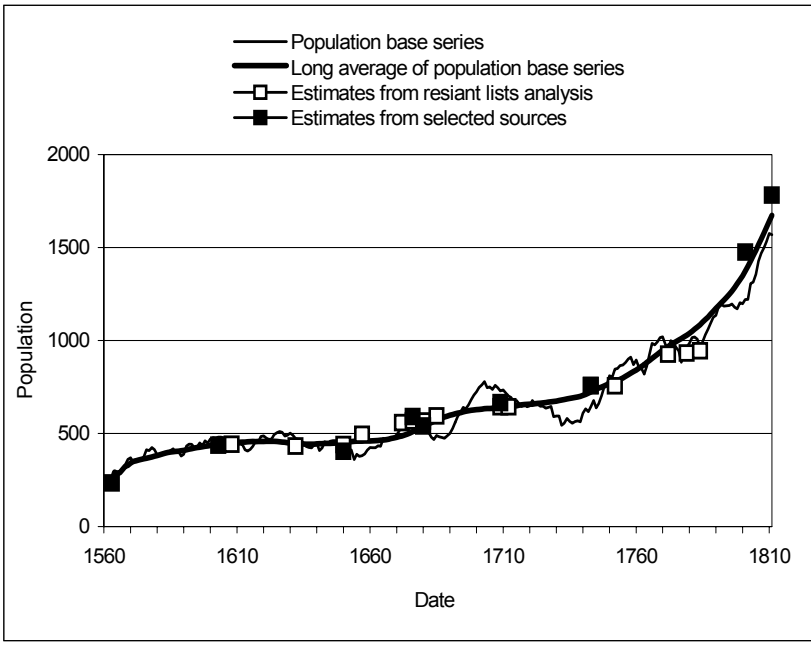
| Date | Source | Number | PB5 | R/PB5 | PA | R/PA |
|---|---|---|---|---|---|---|
| 1551 | Visitation of Diocese of Gloucester | 372 | | | | |
| 1563 | Return of Diocesan population | 234 | 250 | 0.94 | 250 | 0.94 |
| 1603 | Return to Archbishop Whitgift | 437 | 478 | 0.91 | 443 | 0.99 |
| 1608 | Muster roll plus default list | 431 | 442 | 0.98 | 451 | 0.96 |
| 1632 | RLA | 432 | 479 | 0.90 | 445 | 0.97 |
| 1650 | Survey of church livings | 405 | 415 | 0.98 | 454 | 0.89 |
| 1650 | RLA | 441 | 415 | 1.06 | 454 | 0.97 |
| 1657 | RLA | 495 | 390 | 1.27 | 459 | 1.08 |
| 1672 | RLA | 558 | 532 | 1.05 | 487 | 1.15 |
| 1676 | Compton Census | 591 | 557 | 1.06 | 509 | 1.16 |
| 1676 | RLA | 567 | 557 | 1.02 | 509 | 1.11 |
| 1680 | Parsons | 540 | 534 | 1.01 | 538 | 1.00 |
| 1680 | RLA | 567 | 534 | 1.06 | 538 | 1.05 |
| 1685 | RLA | 594 | 480 | 1.24 | 572 | 1.04 |
| 1709 | Parish tithe census | 666 | 737 | 0.90 | 639 | 1.04 |
| 1709 | RLA | 644 | 737 | 0.87 | 639 | 1.01 |
| 1712 | RLA | 644 | 704 | 0.92 | 644 | 1.00 |
| 1743 | Diocesan survey | 759 | 642 | 1.18 | 724 | 1.05 |
| 1743 | RLA | 756 | 642 | 1.18 | 724 | 1.04 |
| 1752 | RLA | 756 | 835 | 0.91 | 780 | 0.97 |
| 1772 | RLA | 927 | 988 | 0.94 | 968 | 0.96 |
| 1779 | RLA | 932 | 956 | 0.97 | 1,029 | 0.91 |
| 1784 | RLA | 945 | 1,002 | 0.94 | 1,085 | 0.87 |
| 1801 | Census, augmented | 1,475 | 1,230 | 1.20 | 1,372 | 1.08 |
| 1811 | Census, augmented | 1,782 | 1,578 | 1.13 | 1,672 | 1.07 |
| | minimum | | | 0.87 | | 0.87 |
| | maximum | | | 1.27 | | 1.16 |
| | mean | | | 1.03 | | 1.01 |

**Note:** RLA = resiant lists analysis, PA = long average of PB series, PB5 = five-year average of PB series, R = ratio of source to PB5 or PA.

**Source:** See text.

be too high for the parish at that time, producing too low a population base. A similar situation is seen in 1657 and 1685, when five-year averages of the PB series are lower than both the respective long averages and sources. The fluctuations in the PB series may be partly an effect of using national correction factors, and vital rates, whereas its own long average, and the sources, may better represent local reality.

**Figure 3 Population base series and combined source series, 1563–1811**




**Source:** Table 4, and see text.

There are two main periods when a PB fluctuation is closely matched by sources, in the 1670s and 1780s. Five-year averages of the PB series centred on 1672 and 1676 are closer to the estimates from the RLA and the Compton Census than to the long averages. This may reflect a genuine population peak, observed at an extreme in the census, which is reduced by the long average. In the 1780s a similar situation is seen in reverse, perhaps showing a genuine dip. Five-year averages centred on 1779 and 1784 are closer to the estimates from the RLA than to the long averages. This is, however, at a time when the RLA is reaching the limits of its potential, and its evidence may therefore be at an extreme low. In both these cases, the fluctuation may be real, but the sources are probably indicating a maximum range.

Slow population growth in the late seventeenth century, followed by a sluggish increase in the early eighteenth, has been observed nationally.[45] The rise in the PB series between 1695 and 1710 is an apparent anomaly, but may be partly due to the effects of the Marriage Duty Act.[46] The parish registers between 1695 and 1705 include inserted baptism entries, and burials of parishioners elsewhere. Some of these might not normally have been included but for the law, and they raise the birth and death series, as seen in Figure 1. This diligence continues after 1705 and through a change of vicar in 1709, but

**Table 5 Augmented census totals compared to the population base series**

| Date | PA | AC | R/AC | PB5 | R/PB5 |
|---|---|---|---|---|---|
| 1801 | 1,372 | 1,475 | 1.08 | 1,230 | 0.90 |
| 1811 | 1,672 | 1,782 | 1.07 | 1,578 | 0.94 |
| 1821 | 1,985 | 2,183 | 1.10 | 1,888 | 0.95 |
| 1831 | 2,474 | 2,527 | 1.02 | 2,504 | 1.01 |

**Notes:** PA = long average of PB series, AC = augmented census, PB5 = five-year average of PB series, R = ratio of augmented census or five-year average to long average.

**Sources:** See text.

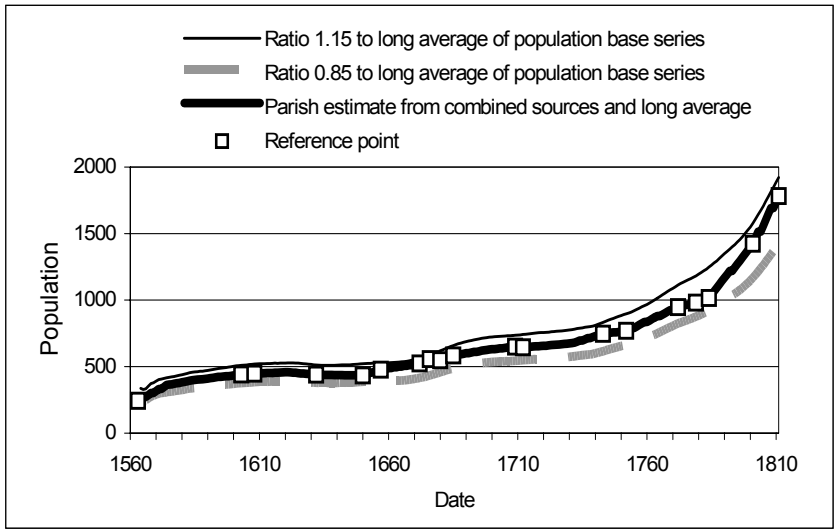
comes to an end after a local smallpox epidemic in 1712. The vicar's own tithe census of 1709 indicates that the population is closer to the long average than to the PB series. Again the long average and the sources appear to be closest to reality.

After 1790 the PB series is lower than the long average, while the augmented census totals for 1801 and 1811 are higher. The RLA is not reliable later than 1784, and there are no other comprehensive lists for the parish. The land tax returns for 1776–1832 do not describe households or residents.[47] This leaves the early censuses themselves as the main sources of information. Those up to 1831 were compiled by parish overseers of the poor, rather than by the enumerators introduced in 1841, but they do become increasingly reliable, subject to augmentation. Their augmented totals are shown in Table 5, together with five-year averages from the PB series centred on the same years, and both are compared to the long average.

The censuses have ratios in the region of 1.1 to the long average until a reduction to 1.02 in 1831, well within the range between sources and long average in Table 4. The PB series approaches the long average ever more closely, and by 1831 sources, PB series and long average have almost converged. These results support the augmented census total for 1831, and suggest that the earlier augmented totals are more accurate than the PB series. The reasons are elusive, although they may include wider under-registration than has been allowed for, as well as war, nonconformity and turmoil in the cloth industry.[48]

It would seem that the best population estimate for Stonehouse is almost always to be found from the relationship between the long average and the source series. During the 1670s the sources are closer to the PB series, but they still have ratios to the long average within the range shown in Table 4 for all sources, between 0.87 and 1.16. Only one, the estimate from the Compton Census, is at a higher ratio than 1.15, and that has been shown to be at a probable extreme. The fluctuations in the PB series have a ratio range to the long average of between 0.79 and 1.23, but they do not reliably define the range. They may be reflecting discrepancies between national correction factors and vital rates, and their real local values. Supporting analysis may indicate

**Figure 4 Parish estimate, 1563–1811**




**Source:** Table 4, and see text.

that some fluctuations are genuine, but in the absence of such evidence, a speculative range, which should be proportionally symmetrical, has to be set about the long average. As shown in Table 2, all the sources excluded after comparison with the RLA lie beyond the ratio range of 0.8–1.2 to the long average. It is therefore proposed that the normal ratio range within which the population may be expected to lie should be 0.85–1.15 to the long average of the PB series, but extremes could lie between the ratios of 0.8 and 1.2.

**Constructing a parish estimate**

A population estimate for Stonehouse, which respects these considerations, may be derived from Table 4. Reference points are first set for each source date, from 1563 to 1811, by taking a mean between the long average and all sources selected for that year. The augmented census totals, which have been accepted as reliable, are included as reference points without alteration. If the gap between two of these points is between one and 20 years exclusively, values for the intervening years are found by interpolation. If the gap is 21 years or more, each point is linked by interpolation to the long average value 11 years away, the long average remaining unchanged for any remaining years. The results are shown in Figure 4.

The normal range of variation about the long average, also shown in Figure 4, will apply to the parish estimate where it follows that average. Where the reference points influence the estimate, the variation range may be reduced by

the weight of evidence from the sources, although this may be more a matter of judgment than of calculation. The reference points smooth the source series, but strong features will persist, such as the accelerated population rise in Stonehouse after 1780.

## Conclusion

This method results in a population estimate for Stonehouse 1563–1811 subject to a range of variation. The estimate is produced by amending parish registration with correction factors, developed by the Cambridge Group, to convert annual totals of Anglican baptisms and burials into births and deaths. These factors are based on probabilities, but they form part of a balanced template, and are therefore adopted as they stand. A population base series is generated, using national vital rates, which is regarded as providing annual solutions to the demographic accounting equation.

The population base series does not reliably describe the population, but is used to generate a long average, which indicates the trend of population growth. The ratios 0.85 to 1.15 to the long average describe a range about it within which the population may normally be expected to lie. Other sources may help to define the level of population within this range, and indicate extremes up to ratios of 0.8–1.2. Sources outside these ratios should be regarded as suspect in terms of population information. A parish estimate is prepared by merging the selected sources with the long average developed from registration. In the absence of other sources, the long average will serve as an approximate estimate, variable within the normal range.

This experiment has been carried out in one parish, but could be evaluated against source series in others. The method is most effective when used with continuous parish registration, and where a parish corresponds to the unit assessed in the early national censuses. If found to be viable, it could offer a self-reliant approach to local population estimates, where a source series is not available. Parish population reconstruction by this method could have potential as a tool to compare local population patterns with the national one, and to support further debate on factors influencing regional demography.

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