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Family Limitation in Pre-Industrial England

BY E. A. WRIGLEY

M. Louis Henry of the *Institut National d'Etudes Démographiques* in Paris has, by his development of the technique of family reconstitution, placed a powerful new weapon in the hands of historical demographers in those countries fortunate enough to possess good parish registers. By this method any running series of births (baptisms), deaths (burials), and marriages can be exploited to provide a detailed picture of many aspects of the fertility, mortality and nuptiality of a community.

Family reconstitution is in principle a simple operation.¹ Information abstracted from the registers is transferred initially to slips, each event in each register being recorded on a separate slip. This in turn is collated on Family Reconstitution Forms (F.R.F.s) on each of which there is space to record the dates of baptism and burial of the two principals to the marriage, the date of the marriage itself, the names of the parents of the married couple, and, in the lower half of the form, the names and dates of baptism, marriage, and burial of all issue of the marriage. There is also space to record other information about residence, occupation, place of baptism and burial, and so on. Only a small proportion of families can be completely reconstituted in most parishes, but for many purposes partially reconstituted families can also be used. From the F.R.F.s a wide range of demographic measures can be calculated, including such things as age at first marriage, age-specific marital fertility, infant and child mortality, expectation of life (subject to some margin of error), birth intervals, and the percentage of pre-nuptial first pregnancies.

Only those registers in which there are few or no breaks are suitable for family reconstitution. Nor is it always the case that a register without any missing year is of use since for successful reconstitution the information given at each entry must normally be sufficient to allow the individual in question to be indentified with confidence. Many English registers fall short in this respect. Nevertheless by modifying French practice somewhat to take account of the idiosyncracies of English parish registers it is possible to apply Henry's family reconstitution methods to some English registers. As a result it is reasonable to hope that in time the demographic history of England during the period from the mid-sixteenth to the mid-nineteenth century will be seen much more fully and in much sharper focus.

¹ For a full description of the method and a discussion of the type of register to which it can be applied see E. A. Wrigley (ed.), *Introduction to English Historical Demography* (1966), chapter 4. This in turn is largely based upon the earlier French manual of M. Fleury and L. Henry, *Des registres paroissiaux à l'histoire de la population. Manuel de dépouillement et d'exploitation de l'état civil ancien*, I.N.E.D. (Paris, 1956). A new and expanded edition of this work has recently been published.

Although in general it may be true that French parish registers lend themselves more easily to family reconstitution than English because the French *curés* were in the habit of recording much more detail in their registers than the English vicars in theirs,¹ in one respect England is very fortunate. A few hundred English registers go right back to 1538 and a much larger number is still extant from the early seventeenth century, though of course it often happens that there are gaps, especially for the Civil War years.² In France in contrast the registers are seldom of use for family reconstitution purposes before the last quarter of the seventeenth century. The middle years of the seventeenth century both in England and on the Continent were often a turning-point in demographic history when a period of rapid population growth came to an end and a different pattern of slower growth, stagnation or decline set in. This occurred before most French registers are suitable for reconstitution, but some English parishes maintained good registers from a much earlier date. In them a complete cycle of demographic experience can be examined, beginning with a period of rapid growth in the sixteenth and early seventeenth centuries, followed by a check and decline, which in turn gave way to renewed growth during the eighteenth century.

I

The parish of Colyton in the Axe valley in east Devon possesses an exceptionally complete register. The record of baptisms, burials and marriages is uninterrupted from 1538 to 1837 (the date of the beginning of civil registration) and beyond. Moreover, the degree of detail given at each entry varies considerably in different periods of the register. These two characteristics in combination made the Colyton register particularly suitable for a pilot study of family reconstitution using English parish registers. The second is important because it makes it possible to determine the threshold level of information necessary for successful reconstitution below which the identification of the people named (especially in the burial register, the most sensitive of the three in this respect) becomes in many cases impossible.³ In the event Colyton proved to be a parish of the greatest interest from a general, as well as a technical, point of view, for Colyton's population history was very varied during these three centuries. The changes in fertility which occurred are especially striking. The bulk of this article is devoted to this topic. Other aspects of the parish's demographic history are touched on only *en passant*.

Figure 1 shows the totals of baptisms, burials and marriages in Colyton plotted

¹ The second chapter of E. Gautier and L. Henry, *La Population de Crulai*, I.N.E.D. Cahier no. 33 (Paris, 1958), gives an account of the type of information to be found in a good French register. See also E. A. Wrigley, *Some Problems of Family Reconstitution using English Parish Register Material*, Proceedings of the Third International Economic History Conference, Munich, 1965.

² No good general inventory of parish registers exists, though the Society of Genealogists hopes shortly to publish a revised edition of the *National Index of Parish Registers* which will cover both originals and transcripts. The inventory which Rickman published in the 1831 Census is still the best starting point for work in many counties.

³ This question is dealt with in Wrigley, *Some Problems of Family Reconstitution*.

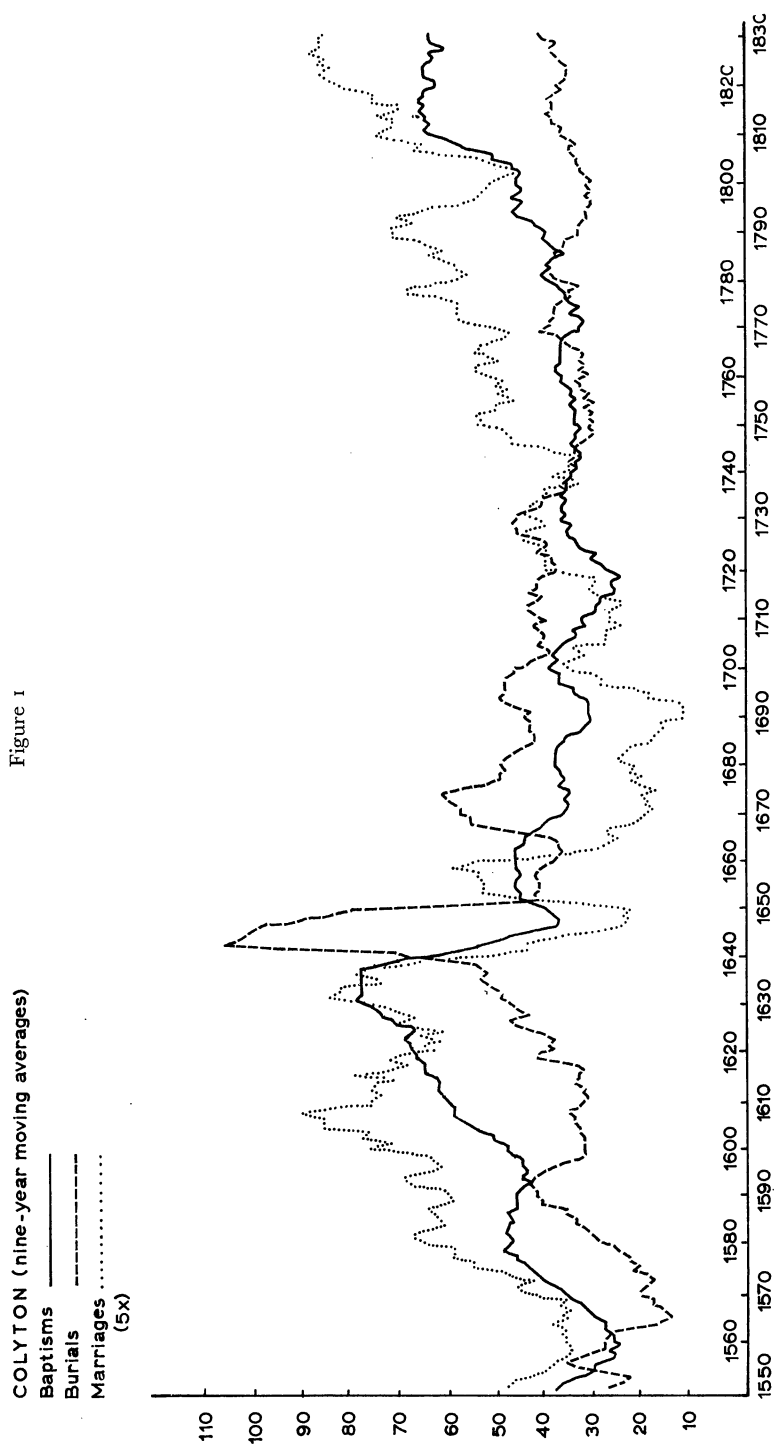


Figure 1

as nine-year moving averages. From them it appears that the population history of the parish fell into three phases: a first in which there was usually a substantial surplus of baptisms over burials and the total population rose sharply; a second during which burials usually exceeded baptisms and the population as a whole appears to have fallen somewhat; and a third beginning only in the 1780's when large surpluses of baptisms over burials again appear and the population rose sharply once more. The second period may be subdivided about 1730, since after that date there was near balance between baptisms and burials, whereas before it there was usually a surplus of burials. The abruptness of the division between the first and second periods is masked by the moving averages but is clearly revealed by annual figures. Between the beginning of November 1645 and the end of October 1646, 392 names are recorded in the Colyton burial register, in all probability as a result of a last and virulent outbreak of bubonic plague. This was perhaps a fifth of the total population. After this drastic mortality the number of baptisms stayed upon a much lower level. The average annual figure 1635-44 was 72.8, higher than in any subsequent period in the Colyton register. In the decade 1647-56 the annual average fell to 40.0. Apart from the first decade after the catastrophe the moving averages show that there were normally more burials than baptisms for two generations. The boundary between the second and third major periods is also quite sharp. In the decade 1776-85 the average annual surplus of baptisms over burials was only 0.5, a figure typical of the preceding half century. In the next ten years the average surplus rose to 7.8 and increased considerably thereafter.

Another feature of the moving averages is worth remarking. There was a well-marked inverse correlation between baptisms and burials until the end of the seventeenth century which can still be detected at times in the eighteenth. Periods which encouraged the formation of a large number of marriages and thus produced a rise in the number of baptisms were periods of low mortality and vice versa. This may seem a very natural correlation to appear, but it is interesting to note that there were parishes in which marriages, baptisms and burials were positively correlated in an equally marked fashion. This was true, for example, of Hartland on the northern coast of Devon. The further investigation of this issue may well throw much light on the question of the links between populations and their livelihood.¹

The changes in the balance between births and deaths revealed in the annual totals of baptisms and burials show that great changes took place in Colyton in the three centuries between Thomas Cromwell's injunction and the inception of civil registration. But although the crude figures may arouse curiosity about the changes in fertility, mortality, nuptiality and migration which could produce such big swings in the relative numbers of baptisms and burials, they cannot go far towards satisfying that curiosity. To penetrate more deeply into the matter it is essential to dispose of more refined measures of demographic conditions. For example, a fall in the number of baptisms might

¹ Hartland also possesses an unusually fine register. Mrs J. V. Stewart is at present engaged upon a family reconstitution study of this parish.

be the result of a rise in the average age at first marriage, or a rise in the average interval between births (perhaps as a result of changes in suckling customs, perhaps through the practice of abortion or the employment of a contraceptive technique), or even in some communities a reduction in the number of illegitimate births.¹ On the other hand, it might simply be the result of heavy emigration without any significant changes in general or marital fertility of the type just mentioned. And still other changes, for example in the age and sex structure of the population, might produce similar fluctuations in the relative number of births and deaths. To be able to decide between the many possibilities and to measure the changes accurately family reconstitution is necessary.

II

It is convenient to begin the discussion of fertility changes at Colyton by considering the fluctuations in age at first marriage of the two sexes. In societies in which there is little control of conception within marriage this is one of the most important variables bearing upon reproduction rates. Indeed, it is sometimes asserted that a lowering of the age of first marriage for women largely accounted for the rapid rise of population in England in the second half of the eighteenth century. The mean age at which women bore their last child in European communities with little or no control of conception was usually about 40,² and for some years before this their fecundity declined

Table 1. *Age at First Marriage*

| Men | No. | Mean | Median | Mode ³ |
|-----------|-----|------|--------|-------------------|
| 1560-1646 | 258 | 27.2 | 25.8 | 23.0 |
| 1647-1719 | 109 | 27.7 | 26.4 | 23.8 |
| 1720-69 | 90 | 25.7 | 25.1 | 23.9 |
| 1770-1837 | 219 | 26.5 | 25.8 | 24.4 |
| Women | | | | |
| 1560-1646 | 371 | 27.0 | 25.9 | 23.7 |
| 1647-1719 | 136 | 29.6 | 27.5 | 23.3 |
| 1720-69 | 104 | 26.8 | 25.7 | 23.5 |
| 1770-1837 | 275 | 25.1 | 24.0 | 21.8 |

Note. The total numbers of marriages in the four periods were 854, 379, 424 and 888 respectively.

rapidly. It is clear therefore that a mean age at first marriage of 22 in these circumstances will give rise to twice as many births in completed families as a mean age of, say, 29 or 30. Table 1 shows that in Colyton there were remarkable changes in the mean age at first marriage of women, though the mean age

¹ Registered bastard baptisms might reach quite a high percentage level even as early as the sixteenth century. For example, 135 out of the total of 876 children baptized at Prestbury in Cheshire 1581-1600 (16 per cent) were bastards. I am indebted to Dr Stella Davies for this information.

² See, for example, L. Henry, *Anciennes familles genevoises*, I.N.E.D. Cahier no. 26 (Paris, 1956), p. 88; J. Ganiage, *Trois villages de l'Ile de France*, I.N.E.D. Cahier no. 40 (Paris, 1963), pp. 71-2; Gautier and Henry, *La Population de Crulai*, p. 157.

³ The mode was calculated here from the mean and median using Tippet's formula, Mean-Mode = 3(Mean-Median). See L. H. C. Tippet, *The Methods of Statistics*, 4th revised ed. (1952), p. 35.

of men did not greatly vary. The strangest period to modern eyes was the period 1647-1719.¹ Immediately after the terrible mortality of 1646 the average age at first marriage of women shot up to almost 30 and was maintained at this very advanced age for some 70 years.² During this period, moreover, the mean age of women at first marriage was two years higher than that of men.³ Table 2 shows the means for shorter periods. It is noteworthy that the new

Table 2. *Mean Age at First Marriage*

| | Men | | Women | |
|---------|-----|------|-------|------|
| | No. | Mean | No. | Mean |
| 1560-99 | 73 | 28.1 | 126 | 27.0 |
| 1600-29 | 124 | 27.4 | 162 | 27.3 |
| 1630-46 | 61 | 25.8 | 83 | 26.5 |
| 1647-59 | 38 | 26.9 | 48 | 30.0 |
| 1660-99 | 36 | 27.6 | 61 | 28.8 |
| 1700-19 | 35 | 28.1 | 27 | 30.7 |
| 1720-49 | 55 | 26.2 | 58 | 27.2 |
| 1750-69 | 35 | 25.0 | 46 | 26.3 |
| 1770-99 | 93 | 27.6 | 107 | 26.4 |
| 1800-24 | 67 | 25.6 | 100 | 24.9 |
| 1825-37 | 59 | 25.9 | 68 | 23.3 |

pattern established itself very quickly after 1647 in Colyton. The change was abrupt and decisive. Before this middle period and again for a time after it the mean age for men and women differed very little, being in each case 26-27, while in the latest sub-period and possibly also in the earliest the more familiar pattern of men marrying women younger than themselves is found. By the period 1825-37 the mean age at first marriage for women had fallen to only 23 while that for men was 26, figures which appear to modern eyes much more 'normal'.

Changes in the median age at first marriage for women were much less violent than the changes in the mean while the modal age did not change at all until the end of the eighteenth century, being unaffected in the middle period, 1647-1719. The commonest age at first marriage at that time remained about 23, but there was a much longer 'tail' to the right of the distribution. The contrast between different periods is well brought out by a table showing the percentage of old and young brides at different periods of Colyton's history. By the last decade of the three centuries a quarter of the brides were teenagers, in the period 1647-1719 only 4 per cent; while on the other hand 40 per cent

¹ The time divisions used here and in subsequent tables were chosen to maximize the difference between the main periods of Colyton's demographic history.

² The difference between the two means 1560-1646 and 1647-1719 is 2.61 years. The standard error of the difference is 0.69 years. The difference of the means is therefore 3.8 times the standard error of the difference, and we may properly conclude that women in the second period were really marrying later than in the first.

³ See Wrigley, *Some Problems of Family Reconstitution*, for a full discussion of the accuracy of the figures of age at marriage. See K. M. Drake, *Marriage and Population Growth in Norway, 1735-1865*, unpublished Ph.D. thesis (Cambridge, 1964), esp. pp. 93-103, for a very interesting examination of the factors which might induce men to take brides older than themselves in Norway in the late eighteenth and early nineteenth centuries.

Table 3. *Women at First Marriage*

| | -19 | | 30+ | | 40+ | |
|-----------|-----|------|-----|------|-----|------|
| | No. | % | No. | % | No. | % |
| 1560-1646 | 24 | 6.5 | 95 | 25.6 | 18 | 4.9 |
| 1647-1719 | 6 | 4.4 | 54 | 39.7 | 14 | 10.3 |
| 1825-37 | 17 | 25.0 | 5 | 7.4 | 1 | 1.5 |

were above thirty when they married for the first time in the earlier period compared with only 7 per cent in the later.

The male mean, medians and modes were notably 'sticky'.¹ Men entered married life at much the same time for almost three hundred years (only in the last few decades was there a slight fall in the male mean), but they proved remarkably flexible in their judgment of what constituted an acceptable age in their brides. A higher proportion of men married women older than themselves in the period 1647-1719 than either before or later. In the period 1560-1646 in 48 per cent of the first marriages in which the age of both parties is known the man was older than the woman, in 47 per cent the woman was older than the man, and in 5 per cent their ages were equal. In the period 1647-1719 the percentages were 40, 55 and 5, while by the period 1800-37 the figures were 59, 29 and 12.

The figures of age at first marriage demonstrate immediately the great range of general fertility levels which might be found in pre-industrial communities. Other things being equal, the changes in mean age of marriage alone provided scope for a very wide range of rates of increase (or decrease) of population. In marriages not prematurely interrupted by death an average age at first marriage for women of, say, 24 might well produce two more children than marriages contracted at an average age of, say, 29. The most extreme female mean ages at first marriage found at Colyton (30.7 in 1700-1 and 23.3 in 1825-37) can easily result in average completed family sizes differing from each other by a factor of 2.

The details of age at first marriage in themselves go far towards explaining the changes in numbers of children baptized which are apparent in the moving averages of crude totals of baptisms. However, any changes on the fertility side of the population history of Colyton which arose from changes in the mean age of first marriage were considerably amplified by changes in fertility within marriage as Table 4 and Figure 2 will make clear.

In the first period 1560-1629 the age-specific marital fertility rates in Colyton were high, being distinctly higher than those found at Crulai in the late seventeenth and early eighteenth centuries.² There is a marked decline of

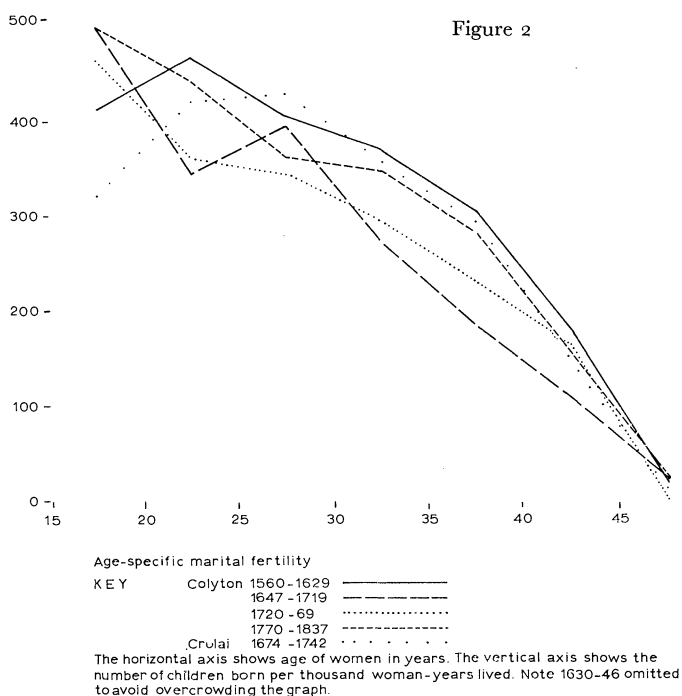
¹ This may well be a very common feature of European demography in many centuries. See, for example, *Report of the Royal Commission on Population*, Cmd. 7695, p. 249, para. 25, for England in recent decades. See also E. A. Wrigley, *Industrial Growth and Population Change* (Cambridge, 1962), pp. 155-7, for nineteenth-century France and Germany.

² The Crulai figures reveal in a very striking way the phenomenon of teenage subfecundity. This is absent in the Colyton figures, but its absence is not significant because a very high proportion of first births in Colyton were pre-nuptially conceived (about a third until the nineteenth century when the figure rose to about half). A large proportion of these in turn were born shortly after marriage (22 per cent of all first births were baptized within six months of marriage 1538-1799, 36 per cent 1800-37).

Table 4. *Age-specific marital fertility (children born per thousand woman-years lived)*
(In brackets the number of woman-years on which the rate is based)

| Colyton | 15-19 | 20-4 | 25-9 | 30-4 | 35-9 | 40-4 | 45-9 |
|-----------|------------|-------------|-------------|--------------------------|-------------|-------------|------------|
| 1560-1629 | 412 (17.0) | 467 (205.5) | 403 (473.5) | 369 (561.5) ^a | 302 (517.0) | 174 (443.0) | 18 (383.5) |
| 1630-46 | 500 (4.0) | 378 (63.5) | 382 (120.5) | 298 (107.5) | 234 (55.5) | 128 (23.5) | 0 (16.0) |
| 1647-1719 | 500 (4.0) | 346 (52.0) | 395 (187.5) | 272 (253.5) | 182 (258.5) | 104 (249.5) | 20 (200.5) |
| 1720-69 | 462 (19.5) | 362 (69.0) | 342 (164.0) | 292 (216.0) | 227 (203.0) | 160 (156.0) | 0 (138.0) |
| 1770-1837 | 500 (34.0) | 441 (279.0) | 361 (498.0) | 347 (504.5) | 270 (430.0) | 152 (224.0) | 22 (186.0) |
| Crulai | | | | | | | |
| 1674-1742 | 320 (65.5) | 419 (305.5) | 429 (599.0) | 355 (633.0) | 292 (588.5) | 142 (505.5) | 10 (205.5) |

Note. The Crulai figures are taken from Gautier and Henry, *La Population de Crulai*, pp. 102 and 105, and Table VII, pp. 249-54. The Colyton rates are derived from marriages formed during the years specified, except that marriages which bridge the period 1630-1646 to 1647-1719 are divided at the end of 1646, data from before that date being allocated to the earlier period, beyond it to 1647-1719. The reason for this appears in the text below, pp. 91-2.



fertility in the last fifteen years before the plague of 1645-6 and this became more pronounced after 1646. Fertility remained low throughout the period marked also by an exceptionally high average age at first marriage for women.¹ During the period 1720-69 there was some recovery in the rates, while during

Teenage brides, like others, were often pregnant at marriage and since most births to teenage mothers were first births, the 15-19 rate is inflated as a result and no valid comparison with Crulai can be made. The same is true to a lesser degree of the age-group 20-4.

¹ It is unfortunately not possible to estimate what changes took place in the proportions of women ever married at, say, 45.

the final period 1770-1837 the rates were much higher though still not quite at the level attained in the sixteenth and early seventeenth centuries. There was therefore a cycle in marital fertility levels, passing from high through low to high once more during the three centuries under review. Both the transition from the initial high level to a lower level of marital fertility and the subsequent recovery in fertility levels are of the greatest interest, but in this article I shall concentrate chiefly on the change from high to low levels of fertility in the mid-seventeenth century, though the rise in fertility during the eighteenth century is a matter of equal fascination. Comparison of the periods 1560-1629 and 1647-1719 reveals the fact that the relative difference between the five-year age-groups becomes more and more marked with rising age. With 1560-1629 as 100 in each case the figures for 1647-1719 are 74, 98, 74, 61 and 60 for the age-groups 20-4, 25-9, 30-4, 35-9 and 40-4 respectively. The anomalous figure for the 20-4 age-group may be explained perhaps by the small number of years in marriage from which it was derived, but apart from this the progressively greater gap is well marked. When represented graphically the curve of the period 1560-1629 is convex to the upper side, while the curve of the later period is slightly concave to the upper side in the later years of the fertile period.¹ Since the latter is often taken as an indication of the restriction

Table 5
1560-1629²

| No. of children | 20-4 | 25-9 | 30-4 | 35-9 | 40-4 | 45-9 | Total |
|-----------------|------|------|------|------|------|------|-------|
| 0 | 1 | 2 | 6 | 16 | 34 | 61 | 120 |
| 1 | 1 | 16 | 19 | 24 | 32 | 6 | 98 |
| 2 | 6 | 31 | 49 | 35 | 9 | 0 | 130 |
| 3 | 2 | 9 | 14 | 9 | 4 | 0 | 38 |
| 4 | 0 | 2 | 0 | 3 | 1 | 0 | 6 |
| 5 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| Total | 11 | 60 | 89 | 87 | 80 | 67 | 394 |
| Average | 2.18 | 1.88 | 1.84 | 1.53 | 0.83 | 0.09 | |

1647-1719

| No. of children | 25-9 | 30-4 | 35-9 | 40-4 | 45-9 | Total |
|-----------------|------|------|------|------|------|-------|
| 0 | 1 | 8 | 17 | 23 | 32 | 81 |
| 1 | 6 | 11 | 15 | 14 | 2 | 48 |
| 2 | 4 | 16 | 9 | 3 | 0 | 32 |
| 3 | 4 | 3 | 0 | 0 | 0 | 7 |
| 4 | 2 | 0 | 0 | 0 | 0 | 2 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 17 | 38 | 41 | 40 | 34 | 170 |
| Average | 2.00 | 1.37 | 0.80 | 0.50 | 0.60 | |

¹ The changes which took place at Colyton are very similar to those which took place at the same period in the Genevan *bourgeoisie*. See Henry, *Anciennes familles genevoises*, esp. pp. 75-81. The family limitation which began amongst the Genevan *bourgeoisie* in the second half of the seventeenth century, however, became accentuated in the eighteenth, whereas in Colyton there was a reversion to the earlier fertility patterns.

² In this table and subsequently in Tables 11 and 12 the period 1560-1629 is used rather than 1560-1646 both because fertility was somewhat lower 1630-46 and because of the problem of the 'bridging' families (see pp. 91-2 and Table 7 below).

of fertility within the family it is important to look further into the fertility characteristics of women in the period 1647-1719. The reason why a concavity to the upper side of a curve representing age-specific marital fertility often indicates family limitation is, of course, that most married couples want some children but not as large a number as might be born to them without any limitation of fertility. They will tend to concentrate their reproductive effort into the earlier part of the wife's fertile period. Age-specific fertility in the younger age-groups in these circumstances may remain high, but in the later age-groups there will be a progressively greater shortfall from the full fertility potential of the women in question, producing the characteristic concavity in the curve.

Table 5 shows the frequency with which women bore 0, 1, 2, 3, 4, or 5 children when living throughout a specified five-year age-group. At the foot of each column the average number of children born in the five-year period is shown. The figures when converted approximate closely to the rates shown in Table 4 as is to be expected (where they are a little lower it is because they largely eliminate the influence of the very short interval between marriage and first baptism - see p. 88, n. 2). It is possible to make an analysis of variance on the four age-groups over 30 in the two periods, with the following result.

| | Sum of squares | Degrees of freedom | Estimate of variance | <i>F</i> |
|------------|-------------------|-----------------------|-------------------------|----------|
| Total | 490.00 | 475 | | |
| Age-groups | 168.92 | 3 | 56.31 | 88.2 |
| Periods | 20.38 | 1 | 20.38 | 31.9 |
| Error | 300.70 | 471 | 0.6384 | |

A test for interaction produces an *F* which is not significant and the assumption of additivity can be retained. The difference between the two periods is very highly significant (beyond the 0.1 per cent level) and we may therefore say with confidence that there was a fall in fertility above the age of 30 between the two periods.¹

The possibility of the existence of some form of family limitation immediately suggests a comparison of the fertility rates in the age-groups 30-44 of those women marrying below the age of 30 with the rates for those marrying in their thirties. Since the former will already in most cases have borne children before entering their thirties, it is to be expected that their fertility rates will be lower than those of women marrying after 30 who will have less reason to seek to restrict the number of their children. Table 6 shows that the expected pattern is present though it should not be forgotten that rather higher rates amongst those marrying at 30 or over are to be expected anyway because the interval between marriage and the birth of the first child is much less than the later birth intervals and this will cause the fertility rates of women bearing their first child after a marriage above 30 to appear higher than those who married younger even if the true fertility position were the same. The differences, however, are much too large to be accounted for on this ground. It is of

¹ I am greatly indebted to Dr T. H. Hollingsworth for his advice on statistical technique in this article and for his comments generally.

Table 6. *Age-specific Marital Fertility (children born per thousand woman-years lived)*
(In brackets the number of woman-years on which the rate is based)

| 1647-1719 | | | | |
|----------------|-------------|-------------|-------------|-----------|
| | 30-4 | 35-9 | 40-4 | 45-9 |
| Women marrying | | | | |
| -29 | 265 (215.5) | 146 (191.5) | 96 (146.0) | 0 (108.5) |
| 30+ | 316 (38.0) | 284 (67.0) | 116 (103.5) | 43 (92.0) |

interest incidentally to follow the short-term experience of the couples who had married before the plague visitation of 1645-6 and who survived the terrible year. It has sometimes been supposed that the 'instinctive' reaction of a population after a heavy loss of life is to increase fertility to fill the gaps created by death. Table 7 shows the age-specific fertility rates of women in families which bridged the plague year and where the age of the wife is known. Some were at

Table 7. *Age-specific marital fertility (children born per thousand woman-years lived)*
(In brackets the number of woman-years on which the rate is based)

| | 15-19 | 20-4 | 25-9 | 30-4 | 35-9 | 40-4 | 45-9 |
|-------|-----------|------------|------------|------------|------------|------------|----------|
| -1646 | 572 (3.5) | 429 (28.0) | 412 (51.0) | 370 (40.5) | 194 (15.5) | 0 (4.0) | |
| 1647+ | | | 174 (11.5) | 247 (36.5) | 154 (52.0) | 127 (55.0) | 0 (43.5) |

the beginning of their child-bearing period when the plague struck, others were near the end, which explains how there are rates on both sides of the temporal division for most age-groups. The numbers involved were, of course, small, but the picture which emerges is nonetheless suggestive. Fertility rates dropped sharply and immediately to the levels which were to be characteristic of Colyton for the next two or three generations even though the women in question had displayed a fertility well above the average in the period before the swingeing losses of 1646.¹ The change from a high to a low level of fertility within these families was abrupt and complete, just as was the change to a later age at first marriage for women.

The examination of mean birth intervals can also throw much light on the question of family limitation. Table 8 shows the mean birth intervals 0-1, 1-2, 2-3, 3-4 and penultimate to last of completed families of four or more children in the three periods 1560-1646, 1647-1719 and 1720-69.² A completed family is one in which the woman reached the age of 45 in marriage and would therefore in almost all cases have completed her child-bearing. Only those women who married under 30 are included in the table, since if family limitation was to be found in the period 1647-1719 it is in such families that it would be most clearly apparent for reasons touched on above. To those in each group of whom the exact age at marriage is known have been added completed families³ in which the age of the wife is not known when there were six or more

¹ It may be of interest to note that Creighton, in discussing the aftermath of the Black Death, quotes a passage from the *Eulogium Historiarum* that 'the women who survived remained for the most part barren during several years'. C. Creighton, *History of Epidemics in Britain*, 2 vols (Cambridge, 1891, 1894), I, p. 200. Creighton also quotes Piers the Plowman to much the same effect.

² The period 1770-1837 yields too few completed families to be worth including.

³ Completed families here comprise any in which at least 27 years is known to have elapsed between the beginning and end of the marriage.

children born to the marriage in the periods 1560-1646 and 1720-69 and where there were four or more children in the period 1647-1719, since in the vast majority of these cases the wife was under 30 at marriage. Including such marriages increases substantially the number of cases which can be studied (by almost three-quarters). The most striking feature of this table is the

Table 8. *Mean Birth Intervals (in months)*

| | 0-1 | No. | 1-2 | No. | 2-3 | No. | 3-4 | No. | Last | No. |
|-----------|------|-----|------|-----|------|-----|------|-----|------|-----|
| 1560-1646 | 11.3 | 87 | 25.2 | 87 | 27.4 | 84 | 30.1 | 77 | 37.5 | 76 |
| 1647-1719 | 10.3 | 23 | 29.1 | 23 | 32.6 | 26 | 32.1 | 18 | 50.7 | 34 |
| 1720-69 | 11.9 | 24 | 25.1 | 24 | 29.8 | 24 | 32.9 | 22 | 40.6 | 24 |

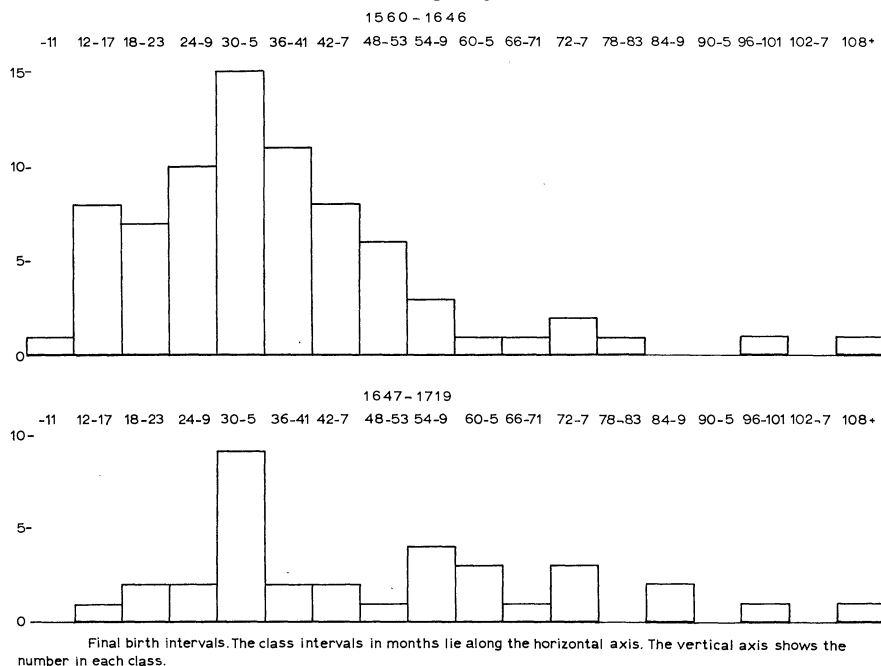
Birth Intervals 1-4 combined

| | Mean | No. |
|-----------|------|-----|
| 1560-1646 | 27.5 | 248 |
| 1647-1719 | 31.4 | 67 |
| 1720-69 | 29.1 | 70 |

Notes. The smaller number of intervals 3-4 arises because when the interval 3-4 was also the last interval it is not included in the 3-4 totals. The large number of last birth intervals 1647-1719 and the reduced number 1560-1646 is a result of splitting families which bridged the year 1646 in the way described above.

A difference of means test may be applied to the means of the last birth intervals 1560-1646 and 1647-1719. The difference in the two means is 13.1 years. The standard error of the difference is 4.62 years. The difference of means is therefore 2.88 times the standard error of the difference, and the difference is significant at the 1 per cent level. The same test applied to the means of all birth intervals 1-4 shows the mean of 1560-1646 to be significantly different from the mean of 1647-1719 at the 5 per cent level (difference of means 2.15 times the standard error of the difference).

Figure 3



contrast between the middle period and the other two in the mean interval between the penultimate and last births. A marked rise in this interval is typical of a community beginning to practise family limitation.¹ It rises in these circumstances because even after reaching an intended final family size additions are nevertheless occasionally made either from accident (failure of whatever system of restriction is in use), from a reversal of an earlier decision not to increase family size, or from a desire to replace a child which has died.

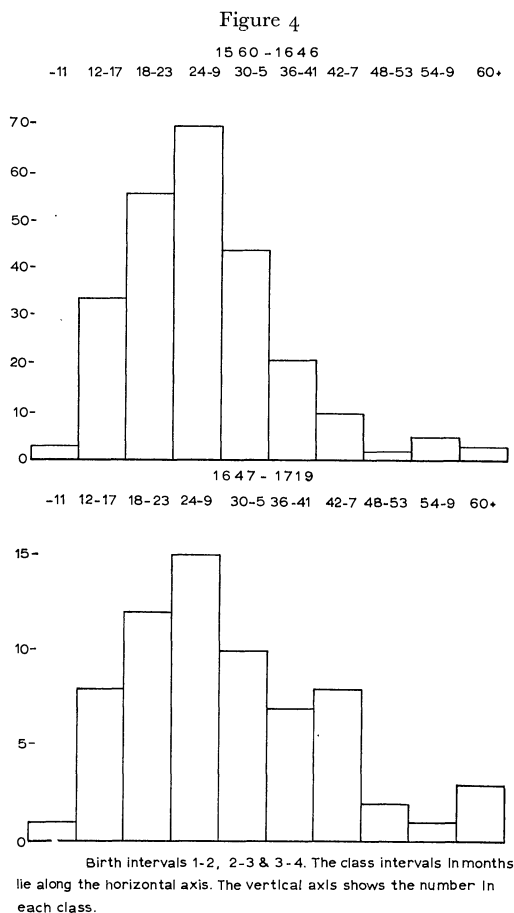


Figure 3 shows the distribution of final birth intervals of the two periods 1560-1646 and 1647-1719 in the form of a histogram. In the earlier period the distribution is unimodal with a fairly clear peak about the 30-5 month interval. In the later period this peak is again apparent but there is also a suspicion of a second peak in the 54-65 month intervals, suggesting that while the 'natural' distribution continued to occur in some cases, there was superimposed upon it a different pattern which might be the result of family limitation.

Table 8 contains other points of interest. The mean interval between marriage

¹ See Henry, *Anciennes familles genevoises*, esp. pp. 93-110

and first baptism did not change materially over the two centuries covered by the table. The later birth intervals, 1-2, 2-3, and 3-4, were always higher in 1647-1719 than in 1560-1646, though, rather surprisingly perhaps, the difference showed no tendency to grow greater as the rank of birth increased. It is also surprising to find the higher mean present as early as the 1-2 birth interval. One might have expected in the light of experience elsewhere that the early stages of family formation would have been as rapid in the middle period as either earlier or later, but this appears not to have been the case. The frequency distribution of all births 1-2, 2-3 and 3-4 (taken together since the numbers involved are small and the pattern much the same at each birth interval) shows that the reason for the higher mean in the period 1647-1719 does not lie in the shift of the peak frequency to the right but in the greater skewness of the distribution to the right. The median and modal figures underline this point. The frequency-distribution pattern is compatible with the view that family limitation was being practised. Some other changes in frequency

Table 9. *Means, Medians and Modes of all Birth Intervals 1-4*

| | Mean | Median | Mode |
|-----------|------|--------|------|
| 1560-1646 | 27.5 | 26.6 | 24.8 |
| 1647-1719 | 31.4 | 29.0 | 24.1 |

distributions which might have occurred and which would have produced a higher mean would have shown a different pattern. For example, if there had been a general increase in the customary suckling period which would have increased the mean birth intervals by prolonging the period of lowered fecundity in the mother, there would probably have been a shift in the peak frequency to the right.¹

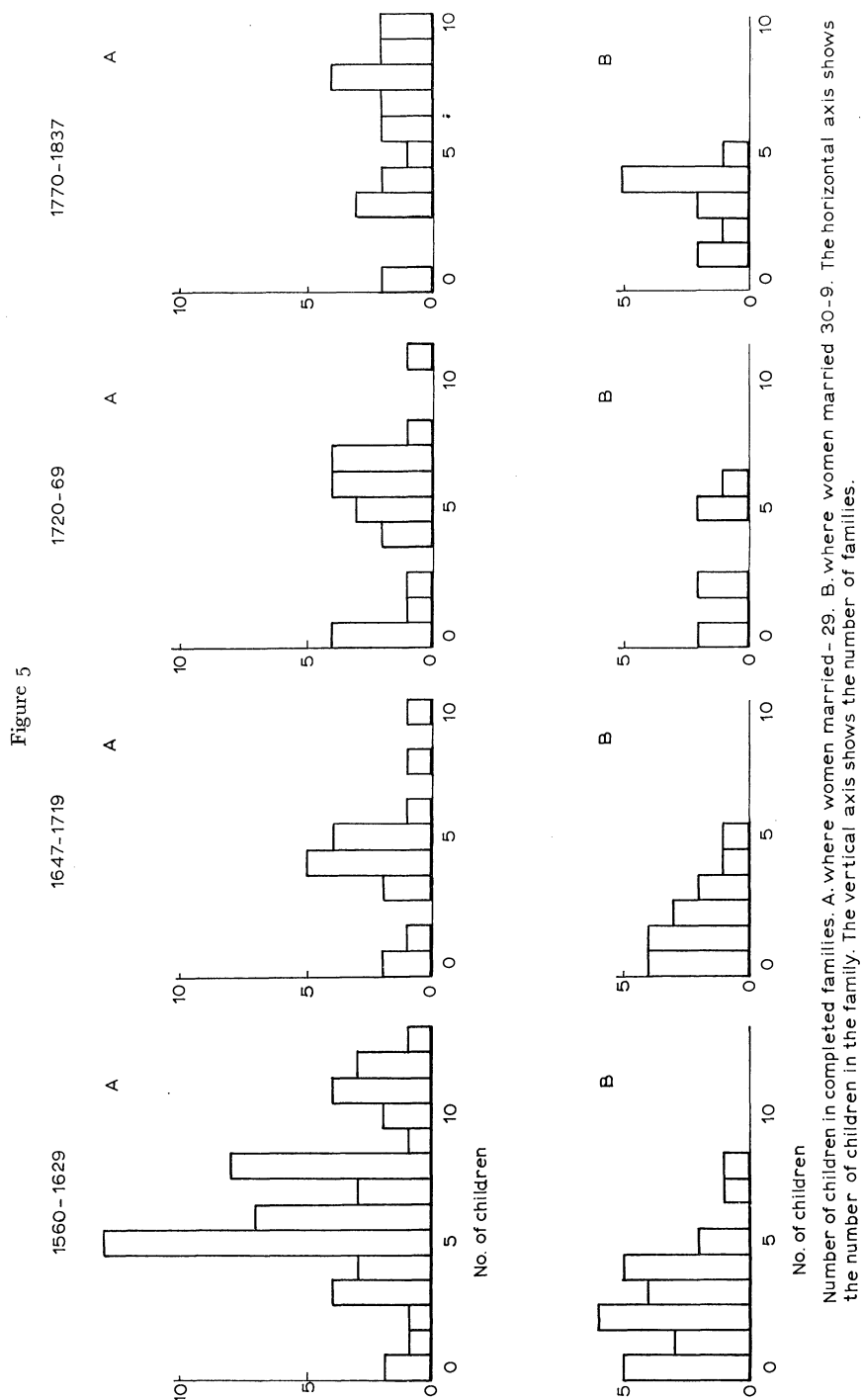
Another tell-tale sign of family limitation is a fall in the age at which women bear their last child in families in which they are at risk to the end of the child-bearing period (45 years of age). This is likely to arise for the same reasons which tend to produce a very long final birth interval and will be most evident among women who marry young and have had several children well before the end of their fertile period. Table 10 shows the mean ages at the birth of the last child of women marrying above and below the age of 30. In the first of the three periods the mean age at birth of last child was much the same for

Table 10

| | -29 | No. | 30+ | No. |
|-----------|------|-----|------|-----|
| 1560-1646 | 39.8 | 50 | 40.5 | 25 |
| 1647-1719 | 37.6 | 22 | 42.7 | 14 |
| 1720-69 | 40.4 | 14 | 41.4 | 5 |

women marrying -29 as for those marrying above 30, in each case about 40, and the same is true of the period 1720-69. But in the middle period the mean

¹ See the searching discussion of this question and the data presented in Henry, *Anciennes familles genevoises*, chaps. 4 and 5. It is of interest also to note that the mean birth interval after the death of the preceding child under one year of age (excluding last birth intervals) was 20.6 months in the period 1538-1646 (114 cases) and 22.7 months (15 cases) in 1647-1719 (data drawn from all families in which the date of the end of the union is known).



Women marrying -24 and 25-9 are brought together in the upper set of histograms. Since the number of women marrying -24 and 25-9 was much the same in each separate period (24 and 29 in 1560-1629, 9 and 8 in 1647-1719, 9 and 12 in 1720-69, and 10 and 10 in 1770-1837), this does not introduce much relative distortion and allows a clearer pattern to emerge.

age at birth of last child for women marrying under 30 was lower than for those marrying over 30 and lower than for women in the same age-group in the other two periods. Both these features are to be expected if family limitation were taking place.¹ The fall between 1560-1646 and 1647-1719 in the mean for women marrying under 30 was 2.25 years. This in combination with a steep rise in the mean interval between the penultimate and last births underlies, of course, the very low age-specific fertility figures found in the age-groups 30-4, 35-9 and 40-4 for women marrying under 30 (see Table 6). The eighteenth century shows a reversion to the earlier pattern in age at birth of last child as in the other fertility characteristics considered.

A convenient measure which reflects the combined effects of the changes already discussed is the mean size of completed families. Table 11 sets forth the chief statistics.

Table 11. *Mean Completed Family Size*

| | -24 | 25-29 | 30-9 |
|-----------|-----------|-----------|-----------|
| 1560-1629 | 7.3 ± 1.3 | 5.7 ± 1.1 | 2.7 ± 0.8 |
| 1646-1719 | 5.0 ± 2.0 | 3.3 ± 1.7 | 1.7 ± 0.9 |
| 1720-69 | 5.8 ± 2.5 | 3.8 ± 1.7 | 2.4 ± 1.7 |
| 1770-1837 | 7.3 ± 1.6 | 4.5 ± 2.3 | 3.2 ± 0.9 |

Note. The figures after the means are the 95 per cent confidence intervals.

The extent of the decline between the first and second halves of the seventeenth century is underscored by the figures of completed family size.² Figure 5 gives more detail of the distribution of family sizes in the form of a series of histograms.

Perhaps the most striking single feature of the detailed distribution is that only 18 per cent of women marrying under 30 between 1647 and 1719 and living right through the fertile period had families of 6 children or more (3 in 17), compared with 55 per cent (29 in 53) in 1560-1629, 48 per cent (10 in 21) in 1720-69 and 60 per cent (12 in 20) in 1770-1837. Very large families, on the other hand, were rare at any time in Colyton, the largest during the full three centuries being only 13. Childless marriages were also rare in the period of high fertility before 1646. Of all marriages formed when the bride was under 35 and lasting till she was 45 or more, only 5 out of 70 were childless. Since a small number of marriages are infertile for physiological reasons the position in the earliest period may well represent a figure close to the minimum which can be expected.³ It is notably similar to the Crulai figure, and is found also in the latest period 1770-1837 when marital fertility was again high at Colyton. In the other two periods, 1647-1719 and 1720-69, the proportion of childless

¹ The difference in mean age at birth of last child of women marrying under 30 between 1560-1646 and 1647-1719 is 2.25. The standard error of the difference of the two means is 1.24. The difference between the two means is therefore not significant at the 5 per cent level (the former is only 1.81 times the latter).

² The fall occurred at a time when age-specific death-rates, especially of young children, were rising so that the net reproduction rate fell even more sharply than the gross rate. It is doubtful whether the net reproduction rate of the population of Colyton reached unity during the period when fertility rates were at their lowest.

³ See, for example, the tables of D. V. Glass and E. Grebenik reproduced in *The Cambridge Economic History of Europe*, vol. VI, pt. 1 (Cambridge, 1965), p. 114.

Table 12. *Childless Completed Marriages* (wife marrying -35)

| | Childless | Total | % |
|-----------|-----------|-------|----|
| 1560-1629 | 5 | 70 | 7 |
| 1647-1719 | 4 | 22 | 18 |
| 1720-69 | 6 | 29 | 21 |
| 1770-1837 | 2 | 26 | 8 |
| Crulai | | | |
| 1674-1742 | 5 | 77 | 6 |

Note. The Crulai figure is calculated from Gautier and Henry, *La Population de Crulai*, Table VII, pp. 249-54.

families was much higher. It is interesting that the period 1720-69, an intermediate period in most other respects, had such a high proportion of childless marriages, though the absolute numbers involved are not large and are subject to wide margins of error. The difference between the first period, 1560-1629, and the two succeeding periods, 1647-1719 and 1720-69, is, however, not significant at the 5 per cent level even if the latter two periods are grouped together (χ^2 test).

Statistics of the mean size of completed families can, of course, be rather misleading, since many marriages were interrupted by the death of one of the partners before the wife had passed through her child-bearing period. Table 11 shows, for example, that in 1560-1629 the mean sizes of completed families born to women marrying -24, 25-9, and 30-9 were 7.3, 5.7 and 2.7 respectively. But if to these families are added all those cut short before the wife reached 45 the mean sizes fall to 5.2, 4.9 and 2.4 respectively. Marriages contracted in early life are, of course, more likely to be affected and the proportionate fall in family size is greater in their case. In all the tables expressing family size the importance of age at marriage is clear. At all periods the contrast between marriages contracted in the early twenties and those which took place when the bride was in her thirties is marked. The immense social and economic import of the fall of seven years in the average age at first marriage for women which took place between the beginning of the eighteenth and the early nineteenth century, therefore, is firmly driven home.

Before turning to the more general issues raised by the history of family formation in Colyton during the three centuries when the parish registers are the prime source of information about demographic changes, it is appropriate to touch upon the question of the completeness of registration. This is too large a topic to be treated here in its entirety, but one issue must be mentioned. Since the foregoing tables have been cast in a form which makes it easy to compare Colyton with industrializing countries today or with historical studies of the type done on French parish registers, it is important to know how accurate the Colyton statistics are. It is evident that when the figures err they will err by understating rather than overstating the levels of fertility reached. For example, although the families which are used for the calculation of age-specific fertility are subjected to a fairly rigorous test of presence in the parish,¹ there must be small a proportion of baptisms recorded in the registers

¹ For details see Wrigley (ed.), *Introduction to English Historical Demography*, chap 4.

of other parishes which should ideally have been included in the fertility data for Colyton families. In addition to small 'leakages' of this sort there is a major source of 'leakage' which deserves attention. In some periods in English parishes many children who died soon after birth were never baptized¹ and some of these were buried without benefit of church service. No system of correction can overcome the difficulties arising from under-registration entirely, but some idea of the order of magnitude of correction which seems appropriate can be gained from a consideration of infant mortality and especially the frequency distribution of the apparent age at death of children dying under the age of one.

Table 13 shows the age at death of children dying under one for the parish of St Michael le Belfrey in York and for Colyton at two different periods. The

Table 13. *Age at Death*

| | 1st d. | 1-6 d. | 1-4 w. | 1 m. | 2 m. | 3-5 m. | 6-11 m. | Total |
|---|--------|--------|--------|------|------|--------|---------|-------|
| A | 33 | 28 | 21 | 9 | 8 | 20 | 21 | 140 |
| B | 35 | 19 | 27 | 16 | 9 | 15 | 24 | 145 |
| C | 19 | 18 | 20 | 26 | 7 | 24 | 24 | 138 |

A. St Michael le Belfrey, York, 1571-86

B. Colyton, 1538-99

C. Colyton, 1600-49

register of St Michael le Belfrey during the years 1571-86 is very remarkable in that an exact age at burial is given (even down to an age in hours if the child died during its first day of life) and every care appears to have been taken to secure a complete coverage of vital events. The baptism register contains many entries of baptism by the midwife in the house and the burial of unbaptized children is also scrupulously set down. In Colyton in the same period only an apparent age at death can be calculated by comparing the dates of baptism and burial. Comparison of the A and B lines in Table 13 at least does nothing to undermine the view that in the sixteenth century children in Colyton were normally baptized very soon after birth and that consequently the 'leakage' was very slight. The comparatively high proportion of children buried on the day they were baptized is difficult to reconcile with any other view.² Line C in Table 13, however, presents a very different picture. In the period 1600-49 the proportion apparently dying in the first week of life was much lower. In all probability this period sees the beginning of the custom of delaying baptism in Colyton. Two calculations may now be made, one of which probably underestimates the amount of correction necessary, while the other perhaps overstates it. The first assumes that the number of deaths above one week is correct and a figure for deaths in the first week is calculated

¹ It would be more accurate to say that they never appeared in the baptism register. In some parishes it was the custom to baptize privately in the home if the child were in danger of death, but only to record it in the register after a subsequent public ceremony if the child survived its first dangers.

² It is interesting to note that at Crulai in the late seventeenth and early eighteenth centuries, where baptism is known to have taken place almost invariably on the first day of life, 30 per cent of all deaths under one were on the first day (99 in 331), compared with 24 per cent at Colyton, 1538-99. Gautier and Henry remark, however, that a proportion of these may well in fact have been born dead. Gautier and Henry, *La Population de Crulai*, p. 170.

on the assumption that they form the same percentage of total deaths as at Colyton, 1538-99, or at St Michael le Belfrey. This assumption might give an approximately correct answer if baptism usually took place within a few days of birth, but would tend to be on the low side since some of those apparently dying in the first week of life would in fact be more than a week old. Alternatively a figure may be calculated on the assumption that half the children buried at an apparent age of less than one month were in fact more than a month old and that the resulting figure of deaths above a month old formed the same percentage of total deaths as at Colyton earlier or at St Michael le Belfrey. Like the first method this gives, of course, only a very rough and ready correction, but this time probably on the high side. Use can also be made of the life-table mortality rates 1-4, 5-9 and 10-14 (a few of which are listed on p. 101, n. 1). Comparison of these with the United Nations specimen life-table rates also throws some light on the question of the likely order of magnitude of infant mortality rates.¹ These several exercises suggest that the fertility rates quoted in Table 4 understate the true position by between two and six per cent, with a low figure appropriate for the first period, 1560-1629, and figures in the upper part of the range more likely in the later periods. It appears most unlikely that differences in the degree of under-registration at different periods can serve to explain any of the major changes which appear in tables in the earlier sections of this article.

III

I have so far written of the striking changes in marital fertility which took place in Colyton between the first and second halves of the seventeenth century as if they were the result of a system of family limitation deliberate in the sense that social or individual action caused fewer children to be born, or at all events to survive long enough to be baptized, than would have been the case without such restraints. But is this a correct assumption? And if so, what were the means employed to reduce fertility so drastically?

Any explanation other than family limitation must take account of the fact that fertility fell much more steeply in the later years of the fertile period than the earlier, of the remarkable change in the mean age at first marriage for women, and, if possible, of the later reversion to a position not unlike that of the late sixteenth and early seventeenth centuries. Some of the explanations which might be entertained on one score are unacceptable on other grounds. For example, a fall in marital fertility might simply reflect a change in suckling habits, but this would not explain the much more drastic fall in fertility in the higher age-groups. Perhaps the only explanation other than family limitation which might cover the known facts is an economic reverse of such severity that the physiological condition of women of child-bearing age was affected by it (either from simple undernourishment, or from the absence in their diet of elements necessary for high fertility). This might plausibly be argued to be likely to affect the older age-groups more than the younger. Such an

¹ I hope to deal more adequately with the mortality experience of Colyton in a later article.

explanation has the additional attraction that it is fully consonant with the steep rise in child mortality which took place at that time.¹ This alternative explanation deserves further careful study, but suffers from several defects.

The first difficulty is that fertility in the higher age-groups was much higher among women who married late in life than among those who married early. This might be explained on the ground that those who had already borne several children were exhausted by this and that their physical condition deteriorated seriously as a result. But it is doubtful whether child-bearing would have had this effect on the mass of women. Gautier and Henry remark that this did not occur at Crulai, and that it is not apparent in modern Indian rural populations.² Again, the abrupt change to much lower fertility levels among the families which spanned the great mortality of 1645-6 creates a problem. It is difficult to imagine a change in economic conditions effecting such a swift and complete change in the absence of family limitation. It is possible, of course, that this fall in fertility was due to the after-effects of plague infection on the women who survived, but against this it must be noted that their fertility after 1647 was closely similar to the general pattern over the next two generations. But perhaps the most important difficulty is that although death-rates at all ages rose in the second half of the seventeenth century, and expectation of life fell by several years to the low 30's,³ it was still as high in Colyton at this period as it was in Crulai at much the same time. Yet fertility rates at Crulai were almost as high as in Colyton in the sixteenth century, and moreover the pattern of age-specific rates in Crulai shows no sudden dip in the thirties. This undermines a main base of the argument from an general worsening of economic conditions, unless indeed it is held that diet and other conditions of life in Colyton, though generally no worse than in Crulai, were nevertheless more deficient in certain vital constituents necessary for high fertility in women.

There are, however, difficulties also with the view that family limitation lay behind the change in fertility in Colyton. These difficulties fall under two main heads: the explanation of the rise in child mortality which accompanied the fall in fertility, and the question of the means which it is reasonable to envisage having been employed to secure a lower fertility. The first is a problem because it might seem natural to suppose that if a population began to limit its fertility drastically it would take the better care of those children who were born. If child mortality changed it would fall rather than rise. The second is a problem for the reason that Malthus expressed succinctly when he referred to the 'passion between the sexes' as a potent and unchanging feature of behaviour.

¹ The late seventeenth century was much more unhealthy for young children at Colyton than the preceding century, as is shown by these life-table mortality rates (the figures in brackets for 1600-49 are the rates which result from eliminating the deaths from plague in 1645-6. Rates per thousand).

| | 1538-99 | 1600-49 | 1650-99 |
|-------|---------|---------|---------|
| 1-4 | 88 | 97 (85) | 162 |
| 5-9 | 30 | 54 (30) | 45 |
| 10-14 | 16 | 41 (19) | 37 |

² See Gautier and Henry, *La Population de Crulai*, pp. 98-100.

³ I hope to publish the evidence for this statement on a later occasion.

Yet if the passion between the sexes is given free rein within marriage how can one explain a sudden fall in marital fertility in a period long before modern mechanical and chemical methods of birth control were practised? Both these are objections of weight and any answer to them is bound to be tentative. I am more concerned in this section of the article to set an argument in train than to suggest that a full answer can as yet be given.

It may be that the problem of the fall in fertility coinciding with a rise in child mortality is only a problem if viewed, anachronistically, in modern terms. If the reason for limiting family size had been prudential and consciously so rather in the way that a modern family may choose between an extra child or an expensive education for the existing children, then a concomitant rise in child mortality would be very surprising.¹ But the change may well have been of a very different type. It must be borne in mind that the view that pre-industrial societies normally did little or nothing to restrict the level of fertility within marriage is an extreme hypothesis. Societies at a low level of material culture frequently developed taboos upon intercourse during long periods of married life, and practised abortion or infanticide.² There is a very large literature about the connexion between the social activities of animals and the maintenance of population size at a level substantially below the maximum number which their habitat could support.³ Both in primitive human groups and in an enormous range of insect, fish, bird and mammal species it is clear that methods developed within the group through social activity to prevent numbers from pressing too hard upon the food base confer a notable selective advantage. If numbers are allowed to grow too great the ecological balance of the area may be upset and the ability of the area to provide food for the population be impaired. Moreover, the group as a whole is more likely to be successful if its members are well fed and in good health than if the constant pressure of numbers makes it hard to keep adults vigorous. A tribe of Australian aborigines having only a limited food base on which to support itself behaves much as bird and animal communities do in similar circumstances. It throws up social controls which prevent so large a number of new mouths coming into existence as to prejudice the wellbeing of those already living. This may be done in animal populations either by preventing some adults from breeding in a given season, or by delaying the entry of adolescents into the breeding population, or by restricting the number of viable offspring, or by causing the early death

¹ Unless indeed the change in economic conditions had been so catastrophic that not even a fall in marital fertility as steep as that which took place in Colyton could ensure as good a life for the children of the small families of the late seventeenth century as their parents and grandparents had enjoyed in the much larger families of their childhood. There is, unfortunately, very little evidence as yet about the state of the Colyton economy in the late seventeenth century. Study of the Exeter wheat price series suggests that living was dear in this region at the beginning of the period of low fertility, though prices had fallen to low levels well before its end (in 1647 wheat was 62.72 shillings per quarter at Exeter, a level not surpassed until 1795, and prices stayed high for much of the 1650's and 1660's – but they had been very high before this, reaching 62.94 shillings in 1596). The state of affairs in Colyton may, of course, have been either better or worse than in the county or country as a whole.

² See e.g. N. E. Himes, *Medical History of Contraception* (Baltimore, 1936), and F. Lorimer, *Culture and Human Fertility* (Paris, 1954).

³ This subject is brilliantly reviewed in V. C. Wynne-Edwards, *Animal Dispersion in relation to Social Behaviour* (1962). A. M. Carr-Saunders has also used this argument in *The Population Problem* (1922).

of many which are born, or indeed by many combinations and modifications of these methods. But in all cases the effect is to keep population numbers fluctuating some way beneath the maximum – that is at a level which neither prejudices the flow of food by creating too great a pressure on the available food base (over-fishing in Wynne-Edwards terminology; encroaching on capital rather than living off dividend in more familiar jargon) nor stunts the development of the adult members of the community but yet does not restrict numbers much below the level imposed by these desiderata. It is important to note that when a population has risen substantially above this level and a contraction of numbers is necessary it is normally secured, in part at least, by reducing the flow of new members into the community, and it is to be expected both that the number of births will fall and that the infant death-rate will rise. Conversely, if numbers fall below the optimum range it is probable that there will be both a rise in fertility and a fall in the wastage of life among the very young members of the population. If therefore a model drawn from the study of animal populations were made the basis of expectation, it would occasion no surprise that fertility and child mortality should change in Colyton in the way that they did in the later seventeenth century.¹ Such a model, incidentally, also makes the changes in mean age at first marriage of women (particularly the reversal of the usual age gap between the sexes at marriage) easier to understand, since this too is a reaction which might be expected in a population which was restricting its numbers to approach an optimum.

Populations whose economy is based upon hunting and the collection of food appear to conform closely in their methods of population control to the general model of animal communities. Pre-industrial populations whose economies are based upon the cultivation of the land are differently placed. In their case the food base may be substantially broadened from time to time by technological advance (for example by the development of a more effective plough or the introduction of a new type of food crop). Their population control problems are much less simple, since in periods following technological or organizational advance and an expansion of the food base they may be able to allow populations to rise for several centuries with only intermittent checks from epidemics and bad harvests, but they will be brought up against the same problem once more when the possibilities of any given advance in material culture have been exhausted. The Malthusian model under which populations tend to approach a maximum rather than fluctuate well below this is perhaps an aberration in the history of populations from the more general model to which most animal societies conform, rather as the classical model of full employment is a limiting case of Keynesian employment theory. At times when the potential of a technological or organizational advance has been fully used up populations may well have to relearn methods of social control of population size which could be forgotten as long as an expansion in the food base had made Malthusian

¹ The argument here is, of course, very general. Several other possible causes of higher child mortality can be envisaged. It may be, for example, that smallpox at this period was both more virulent and more widespread than earlier.

behaviour for a time possible and even appropriate.¹ In the absence of much more empirical work much of this discussion is inevitably speculative, but it may well explain why populations in the late fourteenth and fifteenth centuries remained at a lower level than before the Black Death in spite of the rise in real incomes which apparently took place among the peasants. Upon Malthusian assumptions this should have produced a fall in the age of marriage and a rapid rise in population.²

All the foregoing, of course, does not imply that the individual man or woman was conscious of this range of issues in the least, any more than the individual robin or rook is conscious of the problems of avoiding too large a population, but like robins and rooks people respond sensitively to social pressures. It would be surprising if there were not present in pre-industrial European populations a range of possible courses of social action which could secure a stabilization of numbers well short of the appalling conditions of control envisaged at times by Malthus. Populations before then and since have acted to secure this: it would be surprising if none in the intervening centuries had acted in the same way, and had done so not merely by altering socially acceptable patterns of age at marriage, but by changing normal levels of fertility within marriage (perhaps in ways which bore more heavily upon the lower sections of the social pyramid), and even by changes in social custom likely to produce higher child mortality.³

There remains the second general problem in accepting at its face value the evidence for control of fertility within marriage at Colyton, the problem of the methods used to produce this result. Once more one can plausibly argue that this is a problem only if approached with preconceived ideas, or more properly, since this is to some extent inevitable, with a particular set of preconceived ideas. It is quite clear that European pre-industrial populations could severely restrict their family sizes, not merely in the wealthy and leisured families, but throughout a whole community. When in the late eighteenth century rural populations in France still set in traditional economic ways began to limit the size of their families⁴ they did not have at their disposal any of the modern chemical or mechanical means of contraception. They limited their families, so far as is yet known, by practising *coitus interruptus* or *reservatus*, and no doubt procuring many abortions, possibly also by infanticide. Any means which may have been available to French peasants of the Ile de

¹ The word Malthusian is not, of course, used here in the French sense. An interesting example of this cycle of events is afforded by the Irish population in the eighteenth and nineteenth centuries.

² In a recent article Bean argues that recurrences of plague in the fifteenth century were not sufficiently severe to keep population down to post-Black Death levels and that therefore it is reasonable to suppose that numbers were increasing. This view is advanced with proper caution, but is interesting as an illustration of the tendency to expect populations to rise unless some exogenous agency keeps them down. See J. M. W. Bean, 'Plague, Population and Economic Decline in England in the Later Middle Ages' *Economic History Review*, 2nd ser. XV (1963), 431-6.

³ This possibility must have been in Krause's mind when he wrote: 'The usually cited infant death rates greatly exaggerate pre-industrial European infant mortality, especially among infants born to families which wanted to keep them alive.' J. T. Krause, 'Some Implications of Recent Work in Historical Demography', *Comparative Studies in Society and History*, II (1959), 177.

⁴ See Gautier and Henry, *La Population de Crulai*, and J. Ganiage, *Trois villages de l'Ile de France au XVIIIe siècle*, I.N.E.D. Cahier No. 40 (Paris, 1963).

France or Normandy at the end of the eighteenth century were also available to English communities a century and a half earlier – and indeed to European communities for many centuries before that.¹ Such means may perhaps be regarded as being permanently at the disposal of European pre-industrial populations, requiring only the right sort of ‘trigger’ to bring them forth. Circumstances in Colyton in the middle of the seventeenth century appear to have been such as to produce this change. The parish register of Colyton carries no clues to the methods of family limitation used. These may never be known with certainty, but it is likely that there was scope for the quiet disposal outside the ecclesiastical purview of abortions, and indeed of the victims of infanticide if this was practised. The early hours of a child’s life provide many occasions when it is easy to follow the maxim that ‘thou shalt not kill but needst not strive officiously to keep alive’. In the nature of things there cannot be much evidence about the frequency of *coitus interruptus* and similar methods of avoiding conception in the absence of literary evidence on the subject. There is, however, a good deal of evidence from more recent times of the large scale upon which *coitus interruptus* may be practised and that it is an effective means of controlling conception.² *Coitus interruptus* may well have been the most important method of family limitation in use in Colyton in the seventeenth and early eighteenth centuries.³ It was probably widely employed by French populations to secure a lower marital fertility a century later.

IV

Before it can be known whether the population history of Colyton in the seventeenth century is typical of much of England or is an unusual variant from the normal pattern, very much more work needs to be done. Family reconstitution is a laborious and expensive form of analysis and it may be some time before detailed studies of fertility using this method have been done sufficiently often and widely to permit confident generalizations about regional or national trends. It is much simpler, of course, to assemble evidence about the changes

¹ Helleiner concluded recently that contraception and abortion may have been more widely practised in pre-industrial Europe than has usually been supposed. He takes issue with Mols on this question quoting literary evidence of *coitus interruptus* from Germany in the sixteenth and eighteenth centuries. In commenting on the big falls in births recorded during many French *crises* he writes, ‘But when all is said, the magnitude of the decline in births is such as to suggest to most students of the phenomenon that people during crises had recourse on a considerable scale to birth control or abortion.’ K. F. Helleiner, ‘New Light on the History of Urban Populations’, *Journal of Economic History*, XVIII (1958), 60–1.

² See, for example, Glass and Grebenik, *The Cambridge Economic History of Europe*, vol. VI, pt. I, pp. 113–18, esp. footnote 1 on p. 118.

³ Sutter remarks that *coitus interruptus* is a technique which has sprung up independently in many places and at many times. He writes ‘Chaque couple pourrait l’inventer. Il ne nécessite, d’autre part, l’intervention d’aucun corps étranger, ni d’aucune manœuvre féminine particulière’. It is a technique ‘– capable d’auto-apparition et pouvant se diffuser sans propagande. Ce n’est pas une manifestation culturelle comme les autres méthodes, il est propre à l’espèce humaine et n’est pas une caractéristique ethnologique spécifique’. H. Bergues, P. Ariès E. Helin, L. Henry, R. P. Riquet, A. Sauvy and J. Sutter, *La prévention des naissances dans la famille. Ses origines dans les temps modernes*, I.N.E.D. Cahier No. 35 (Paris, 1959), p. 345.

It may be of some importance that *coitus interruptus* is essentially a male act since in animal populations in general the social activities which serve to maintain populations near an optimum are normally a male preserve.

in the balance between baptisms and burials derived from parish registers and reliable transcripts. The *Cambridge Group for the History of Population and Social Structure* has instituted a survey of this sort depending largely upon the help of local historians, genealogists and others interested in work of this type. Each volunteer fills in standard printed forms on which are recorded the monthly totals of baptisms, burials and marriages in accordance with a cyclo-styled sheet of instructions. In this way it may be possible to compile, say, a 5 per cent sample of the totals of vital events for the three centuries between the institution of parish registers and the beginning of civil registration. Already returns for about 290 parishes are to hand. If it can safely be assumed that changes in the ratio of baptisms to burials similar to those which occurred in Colyton were produced by changes in fertility and mortality similar to those noted in Colyton, then it is already clear that the pattern of events in Colyton is repeated in other places. In a high percentage of the parishes for which returns are available the surplus of baptisms over burials was much less in the second half of the seventeenth century and the first few decades of the eighteenth than either earlier or later. In a substantial minority of parishes the change was sufficiently marked to produce surpluses of burials over baptisms for all or most of the decades during this period.¹ In general it seems that the Colyton pattern was most commonly found and was most marked in certain parts of the west, north, and, surprisingly, in Kent, but is less obvious in the home counties and the Midlands. Perhaps the constant baptism deficit in London which required a countervailing surplus of baptisms to occur somewhere else may have had something to do with this. The systematic analysis of the returns, however, has not yet begun and all conclusions must remain tentative.

V

Colyton's population history shows that in pre-industrial English society a very flexible response to economic and social conditions was possible. This may well have important implications for the general course of social and particularly economic change in England in the seventeenth and eighteenth centuries. It is now often asserted that during the early decades of the Industrial Revolution it was largely rising home demand which sustained the increasing output of industrial goods.² It is arguable that the growing home demand occurred because of rising real incomes spread broadly through large sections of the community.³ The changes in real incomes and in the level of production were

¹ This pattern appears in the material which Drake analysed in the West Riding. He dealt with the parish of Leeds and a number of parishes in the wapentakes of Morley and Agbrigg. In them the change between the first and second halves of the seventeenth century is very striking. Population was rising rapidly in the first half of the century with surpluses of baptisms in most years. In the second half of the century the population appears to have been falling, and if the returns for all the parishes are added together it appears that in the period 1660-99 there were 72,310 burials compared with 70,723 baptisms. M. Drake 'An Elementary Exercise in Parish Register Demography', *Econ. Hist. Rev.* 2nd ser. XIV (1962), 427-45.

² Deane and Cole, for example, remark '... it seems that the explanation of the higher average rate of growth in the second half of the century should be sought at home rather than abroad'. P. Deane and W. A. Cole, *British Economic Growth, 1688-1959* (Cambridge, 1962), p. 85.

³ This is the tenor of the argument used by Landes in a recent review of the Industrial Revolution

not very dramatic or abrupt, but spread out over several decades. If the Malthusian picture of demographic behaviour were correct this type of slow sea change coming over an economy and eventually helping to provide conditions in which decisive industrial advance can take place is very difficult to credit since one would expect precarious gains in real incomes however achieved to be wiped out quickly in a flood of additional babies produced by earlier marriages (and possibly by increased fertility within marriage). If, on the other hand, populations behaved in a manner more likely to secure optimum than maximum numbers the establishment and holding of gains in real income are much easier to understand. The course of events in Colyton shows this to be a possibility. The balance between fertility and mortality was probably at all times delicate and unstable under stress. Colyton itself shows that the very restrictive adaptation which appeared in the middle of the seventeenth century was beginning to give way after 1720 and that in the 1770s or 1780s demographic behaviour reverted to the sixteenth century type. Nevertheless for three quarters of a century in an extreme form and for well over a century altogether Colyton behaved demographically in such a way as to make possible an increase and even a steady growth in real incomes.¹ If changes in the economy and technology of the period made possible rising production and real incomes, demographic behaviour was not such as to prejudice them immediately.

This forms an instructive contrast with the course of events in the sixteenth and early seventeenth centuries which do seem to fit what may be called a Malthusian model quite well. There is much evidence that over the country as a whole population in the sixteenth century was rising faster than production and that real incomes became depressed. One of the reasons why the 'industrial revolution of the sixteenth century' which Nef has documented had no chance of fructifying into a steady expansion in production and real incomes was that population behaved much in the way Malthus supposed to be almost inevitable. The sixteenth century English economy and population was 'over-fishing' ² and paid the penalty, just as the Irish population of the late eighteenth and early nineteenth century was 'over-fishing'. As with animal populations in similar circumstances a sharp adjustment was inevitable. It is possible that at times in the late eighteenth and early nineteenth centuries the same cycle of events came close to being repeated for the great surge of population increase towards the end of the eighteenth century caused serious difficulties of which

in Britain. See D. S. Landes, 'Technological Change and Industrial Development in Western Europe, 1750-1914', in *The Cambridge Economic History of Europe*, vol. VI, pt. I (Cambridge, 1965), pp. 280-5.

¹ In this connexion it is important to note that a decline of fertility as great as that which occurred in Colyton in the seventeenth century must have had a marked effect on the age-structure of the population. The proportion of the population of working age must rise and the burden of unproductive mouths be reduced. For example, the United Nations study, *The Aging of Populations and its Economic and Social Implications*, Department of Economic and Social Affairs, Population Studies no. 26 (New York, 1956), Table 15, p. 26, gives 58.8 as the percentage of a stable population in the age-group 15-59 when the gross reproduction rate is 2.0 and expectation of life at birth is 40 years, compared with 65.0% in the same age-group when the gross reproduction rate is 1.0 and expectation of life at birth is 30. The ratio of productive to non-productive people in the first case is 1.43: 1.00, in the second 1.86: 1.00.

² I have discussed some aspects of this elsewhere. See E. A. Wrigley, 'The Supply of Raw Materials in the Industrial Revolution', *Econ. Hist. Rev.* 2nd ser. XV (1962), 1-16.

contemporaries were keenly aware. But if the new pattern of behaviour which can be seen in Colyton in the intervening period proved fragile and eventually gave way to a reversion to the older pattern, it may have helped to win a vital breathing space in the interim. Contemporary French population behaviour appears to have been very different and much more Malthusian (in the sense in which I have used the adjective in this article). Sauvy has estimated that towards the end of the eighteenth century French population was 100 per cent above the optimum level.¹ In consequence any adventitious increase in real incomes in the short term was not likely to be used to swell demand in the industrial sector but simply to secure a slightly better level of nutrition.

VI

In this article I have been unable to deal extensively with more than a small fraction of the interesting topics which spring to mind in studying the family reconstitution data of Colyton. Mortality remains largely untouched, and on the fertility side such things as pre-nuptial pregnancy rates, the interval between being widowed and remarrying, and bastardy rates. Moreover, though much has been written of the remarkable fall in fertility in the mid-seventeenth century, the equally remarkable recovery in the eighteenth century has not been fully analysed; nor have the implications of the high level of fertility during the reigns of Elizabeth and James I been sufficiently discussed. While the middle period is perhaps the most fascinating because it is the most unexpected, the significance of the earlier and later periods is also great. Each period is the more interesting and intelligible because a knowledge of the others provides a perspective in which to view it.²

The life of men in societies is a subtle and complex thing which can and does influence behaviour at marriage and within marriage. Since the disadvantages to society and to the individual of the unrestrained flow of births which it is within the physiological capacity of women to sustain are very great, societies take care at all times not to expose themselves to such strains. In comparing the sixteenth and the late seventeenth centuries in Colyton the contrast is not between a society producing children at a maximum rate and a society imposing maximum restrictions but rather between two points on a spectrum of possibilities, each some way from the furthest extremes. In the earlier period the control appears to have lain largely in conventional ages at first marriage which were even then so late for women as to cause them to spend on an average at least a third of their fertile life unmarried. But once marriage had taken place restraints upon fertility appear to have been slight. In the later period

¹ A. Sauvy, *Théorie générale de la population*, 2 vols (Paris 1956, 1959), I, 186–7. Sauvy sets the optimum between 10 and 12 millions at most in 1790 against an actual population of 24 millions.

² Colyton shows not only that it was within the power of pre-industrial communities to halt population growth, but also that their powers of growth were very remarkable. Over a period of about ninety years (1538–1629) when fertility was high and mortality comparatively low (expectation of life was about 40) baptisms stood to burials in the ratio of 1.61: 1.00 – a ratio as high as this was common at this period. Rates of increase well above 1 per cent per annum were clearly possible – equivalent, say, to a doubling of population within about half a century.

after the great plague visitation of the mid 1640's the restraint through age at marriage became more pronounced and was compounded by new restraints within marriage. These in combination lowered fertility to the point where increase stopped.

It is likely that among the circumstances which produce large changes in fertility economic conditions often bulk large, but it also seems probable that the relationship is not direct and simple but indirect and flexible. Societies are unwilling to allow matters to reach a Malthusian extreme. But the buffer provided by a society's socio-demographic organization to cushion the shock of harvest fluctuation and economic *débâcle* may be either thin or thick, may be as inadequate as in parts of South-East Asia today or parts of the Beauvaisis in the seventeenth century, or so ample that the society has scope for further economic advance and is free from the periodic *crises démographiques* which are sometimes thought typical of all pre-industrial societies. The *mercuriale* may be a reliable guide to demographic fluctuations in parts of France in the seventeenth century, but some pre-industrial societies were much better buffered against the hazards of the weather than that. In the absence of a continuing advance in material culture a population will always find in time a rough equilibrium level of numbers, but the living standards which result from this will not be the same in all cases. Malthus proposed one limiting case, that in which living standards are minimized but numbers maximized. Other equilibria are also possible and will vary with the extent of the restrictions upon fertility developed within the society in question. If the restrictions are sufficiently severe, the equilibrium may occur at a point substantially beneath the maximum level of population, with all that this implies for the likelihood of success in establishing a beneficent spiral of economic activity rather than becoming involved in that other chain of events which keeps the masses miserably short of food and prevents economic growth.

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