MARRIAGE AND ITS PROGENY IN THE CITY OF YORK, 1538 - 1751

Ursula M. Cowgill
Department of Biology,
University of Pittsburgh

INTRODUCTION

This study is concerned with marriage and its progeny in the City of York during the period 1538 through 1751. The data were obtained from seven urban (Yorkshire Parish Record Society 1899; 1901; 1911; 1915; 1922; 1923; 1935a; 1935b; 1936) and one rural parish record (Yorkshire Parish Record Society 1942). This information consisted of traceable marriages, identified by locating the bridal baptismal date, and wherever possible that of the groom. Once the existence of such a marriage had been established, its progeny were sought in the baptismal registers, though burials when present were recorded as well. Mortality data for both spouses appeared to be rather meager, though they were usually more frequent for the wife.

Such data permit a variety of comparisons, for example, the age of marriage of the bride and the number of children she bore; the relationship between the age of the mother and the life span of the child; maternal age and the sex of the child; sex ratio in relation to birth order; sex order in families and the spacing between siblings. Some comment will be offered on migration of adults to and from the various parishes.

MATERIALS AND METHODS

The data were gathered in several ways. Initially, the study of the population of the City of York was concerned with an historical study of the season of birth (Cowgill 1966) and then later with the location of life spans during the 16th and 17th centuries (Cowgill 1967; 1969). During this investigation, marriages when found were incidentally recorded and

their progeny listed. These data were located through baptisms and/or burials of children. In the present study, all marriages were found by the bridal baptismal date through the use of the indices of the various parish records. The last method involved a computer program which was begun as a pilot project using two City (Yorkshire Parish Record Society 1911; 1922) and one rural (East Riding) record (Yorkshire Parish Record Society 1942). This program consisted of the use of 80,000 punched cards containing all the information that could be gleaned from these three parish registers.

For the period under study there was no need to apply a correction for the difference in time between birth and baptism.

All dates prior to September 2, 1752 were converted to the new style calendar in order to avoid errors in time when family data were encountered around a period of calendrical correction. These corrections continued to be applied until the various records showed without a doubt that the clergy in question had actually accepted the Julian Calendar.

In a recent criticism of an earlier paper (Cowgill 1967), Wrigley (1968) writes "it would not do, for instance, to include the death of a four-year-old child in a count of mortality of children of that age if the only evidence of his presence in the parish were the recording of his burial, and other four-year-olds who did not die went uncounted for that reason." It is to be noted that in the earlier paper as in this study, knowledge of age is in practice determined solely by the baptismal date, so that Wrigley's hypothetical situation would not exist. More seriously, it must be admitted that the longer an individual lives, the greater is his chance of leaving the parish and so disappearing from the record. Henry (1968) maintains that much of the difference between the York curve and that of contemporary British Aristocracy is in fact due to such migration. However, a study of the two curves suggests that even though this cumulative source of error may exist, producing the difference in slope in the adolescent and adult populations, the very striking decline of the York curve in infancy is quite a different phenomenon; it is unreasonable

to attribute it to a differential loss of infants from the parish except by death.

In the present study, the number of stillbirths recorded that were positively identifiable with their parents was negligible when compared to the whole body of infants located. In any case, they are omitted from the data discussed in this paper. Infants that were stated to have lived one day or less are included.

Twins were the only multiple births encountered that were identifiable with their parents. These were recorded separately. Twins are considered as one birth but two children. Therefore, when only births or baptisms are being considered, the two children would only have been assigned one order, but in considering the actual size of a family they would be considered as two children.

Marriages, in the initial portion of this study, were originally located through their progeny. This progeny was identified positively in relation to the head of the household and, through its baptismal and burial dates. The data were then confirmed by the reverse procedure in order to insure that the original data were correct. Instances of multiple marriages that could be located through the bridal baptismal date were infrequent enough to not affect any basic conclusions that could be obtained from the data.

This entire study is dependent upon the accurate location of the bridal baptismal date. Marriages with progeny recorded where the bridal baptismal date is absent are not considered here. Once the bridal baptismal date was found, a search was made for the groom's baptismal date. The frequent lack of this statistic may be used in the development of a possible index of migration, along with identifiable marriages where no progeny or burial dates of the spouses involved are recorded as well as the number of marriages where no bridal baptismal dates were found.

It is clear that many couples came to the City of York from outside because they thought it was a nice place to get married. It is also true that marriage may occur in the bride's parish, and afterwards

she moves to her husband's parish where their progeny is recorded in the register of his parish. This series of events was, however, only encountered fifty times for all marriages traced. Until sometime in the 18th century, geographical locations of the couple are not stated in the marriage record. Therefore, using the number of untraceable marriages ceases to be of exact value in estimating the extent of migration since there is no real way of knowing how many people entered the City to become married only to leave again and how many came from elsewhere to establish households, or for that matter how many had been born outside the City,moved there, married there and left. It is of interest to note that servants who marry in York leave no further evidence of their lives in the parish registers. It is rare to find any baptismal date for servants, implying that they moved into the City for jobs and left once married.

It is of extreme importance in such work to ascertain that Mary Smith who is marrying John Henry is really the same Mary Smith for whom a given baptismal date exists. Frequently, there will be four Mary Smiths whose baptismal dates are within five years of each other and coincidentally whose marriages span over a similar period of time. Added to this, some Mary Jaques, let us say, has married John Smith and hence there is an added Mary Smith to deal with when considering burial dates that are listed by name with the statement that the husband, who remains nameless in the record is recently deceased, or the record neglects to note the one time existence of a mate. Added to this confusion is the fact that Mary Smith, one time Mary Jaques, will frequently, if she had three daughters two of whom died, name all three girls Mary Smith. If the clergy at the time of burial recording are harrassed either as a result of an epidemic or for some more obscure reason, and neglect to mention that the Mary Smith that died was an infant or a wife or was related to some head of household, the noted burial is impossible to identify positively.

Such contradictions in the records must be dealt with rigorously. If the four Mary Smiths are not distinguished in the marriage record by a

statement of some relation to some head of household it becomes impossible to separate them and the records are discarded as being of no statistical value for this study. Sometimes one Mary Smith may be distinguished from the others by a comment to the effect that her father died five months ago. It becomes then a matter of searching the burial record and finding Ambrose Smith, who happily is at that moment the only Ambrose Smith for whom there are any data. Conveniently enough, Mary Smith's baptismal record states that she is the daughter of Ambrose Smith. She can then be distinguished from the other Smiths. However, if her father happens to be called John Smith and just prior to his death John Smith married Mary Jaques, then the record must be discarded since the two John Smiths cannot be separated.

The above discussion largely related to the method employed when dealing with records by hand. However, all the various commentary was built into the computer program involving the pilot project. The results were checked by hand using two types of print out: one that was an alphabetical listing and the other an arrangement in chronological order. The two methods appeared necessary since they avoided the problem of errors in the indices of the records. It should be noted that some indices do not list the offsprings under the head of the household. For example, there will be a statement in the record "Mary Smith, daughter of Ambrose Smith, bap. Jan.2, 1650." In the index under Ambrose Smith there will be no page number for Mary Smith, though under Mary Smith there will be a reference. With problems of this type, all the Smiths must be checked in the register. This is one of the main reasons that marriages were located through their progeny initially as well as the reverse procedure. In this way errors in the indices could be noted.

It is interesting to note how few baptismal dates could be located for the groom. Since all the available parish records were checked for these dates, it would appear that the majority came from outside the City of York, or at least from those parishes from which no records were published. There were only 24 per cent of the marriages with recorded progeny

where the groom had a listed baptismal date. Wrigley (1968) states that in Colyton there were only eight men in 165 in the period 1538 to 1624 that had no baptismal record but there were 49 women out of 237 that had none. The reverse situation appears in York where from 1538 to 1601 there was only one male baptismal date for 89 traceable marriages. Past investigators (Wrigley 1968; Gautier and Henry 1968) have discarded marriages where baptismal dates of the groom have been absent; however, these people have been more concerned with mortality calculations while this paper is more concerned with marriage and its progeny. It should be noted that the groom's burial date is far easier to locate than his baptismal one. It is also interesting that though the groom's baptismal date is absent, suggesting he came from outside the City, his marriage is recorded, his children's baptismal dates if not also burial dates may be found, and eventually also his burial date, suggesting that his body was not returned to the parish from which he came. It appears not infrequently that the bride is returned to her parish for burial.

Though this paper is not strictly concerned with mortality date, it may be of interest to mention what is available. There were 70 men that had baptismal dates, of which only seven had complete life histories recorded. This is a rather extraordinary statistic, especially when it is considered that 12,877 male babies were baptized in York during the period 1538 through 1729. The latter date was chosen since it is unlikely that a man would have married much before the age of twenty-two. There were five men of this 70 that had natality, marital and mortality statistics but lacked recorded progeny. These numbers, even if they represent an underestimate, suggest an extraordinary amount of migration in and out of the City of York. It must be considered, however, that nothing is known in this study of the number of men who may have complete life histories recorded in the registers with only the baptismal date of his bride lacking. The average age of death of the first group of men was 47.5 and that of the five was 48.2 years. Forty per cent of the married men with children had burial dates while only five per cent without children had mortality data.

Only 66 of the 292 women with children had complete life histories; that this figure is greater than the proportion of husbands with full records is to be expected from the method used in collecting the data. Their average age at burial was 44.5 years. Only twelve of this group died as a result of childbirth. The remainder died from unknown causes. There were no women in this entire group that died as a result of bubonic plague. There were seventeen women of the 488 that had no recorded progeny but did have recorded mortality data. Their average age of burial was 40.9 years.

THE DATA

Table 1 shows the summary data for all parishes for the period covered. The total average age at which a woman married, her age at first child bearing and her age at last child bearing (last child is a second order birth or more) are weighted averages for the indicated period of study. For example, the total average age of women at their last child bearing is obtained by multiplying their average age for the parish in question by the number of last children, totaling up all parishes and dividing by the total number of last children.

AGE OF MARRIAGE

Essentially, 10.1 per cent of the theoretically traceable marriages were actually traced. Of these 37.4 per cent had recorded progeny, of which 70.9 per cent had more than one child. Noting the weighted averages for each century, it is interesting to observe that not only did the average a-e of marriage for both sexes increase with time but also the age at first and last child bearing. The mean age of marriage for England and Wales (Registrar General 1968) between bachelors and spinsters for men was 24.31 years and for women was 21.88 years for the year 1966. The average age of women at first child bearing was 23.45 years. The average number of children per marriage with recorded progeny was 3.56 for the York data while that for England and Wales in 1966, assuming an average of fifteen years of marriage, was in the range of 2.0 to 2.3

children. The age of brides in the parish of Colyton (Wrigley 1966a) in the Axe Valley in south-east Devon rose by two and a half years, from 27 to 29.6 years during the period of 1640 to 1720. During part of this period the age reached over 30. Prior to this time the mean age of marriage for both sexes was 27 years. During the period 1647 to 1719, when marital age was of such a nature to limit family size, less than 20 per cent of the women marrying under 30 years of age, surviving their husbands, and living until 45 years of age had families of eight children or more, while in the period 1560 to 1629 more than half of the same class of women had families of this size. After 1720 the mean age of marriage fell steadily, until in the early 19th century it had dropped to 23 years.

The population of York that is being discussed here, as has been pointed out previously (Cowgill 1967) is, economically speaking, an average population. On the basis of the number of households with one, two to three, four or more hearths (Tillott 1961), just a third of the entries came from what in 1672 was the wealthiest parish of the six for which data are given and just under a third from the three poorest. The average condition of the population here considered will therefore approximate the average condition in the City, most of the men involved being tradesmen and artisans of various kinds (Tillott 1961:163).

Gilling has the lowest age of marriage of any parish from 1538 to 1701, after which St. Lawrence has the lowest and Gilling has the second lowest. This suggests that possibly rural people marry a little earlier than their urban colleagues. In order to discover whether there was any relationship between the wealth of a parish and the average age at marriage, a correlation coefficient was obtained between the average age at marriage and the percentage of households in a given parish that in 1672 were exempt from the hearth tax. This was done only for the 17th century. The coefficient was found to be statistically insignificant. It is interesting that no relationship was found to exist between marital age and wealth.

Nevertheless, it may be of interest to consider the data that

are available on average age at marriage that have been discovered in other studies concerning old families (Peller 1943; 1947; 1948; Henry 1956; Henry and Levy 1960; Hollingsworth 1964). For members of the ruling families of Europe, the mean age at first marriage for women oscillated around 22 for the 300 years of this study while for men it increased from 27 to 30 in the late 18th and 19th centuries. The Swiss bourgeois women tended to enter marriage around the age of 22 in the late 16th century. This average age then underwent a steady rise up to the age of 27 in 1725 followed by a steep decline which reached its minimum of 22.5 years in 1825 and then rose again to about 24.5 in the late 1800's. The average age at marriage for men began about the age of 27, reached a peak of 32.5 in the late 17th century, earlier than for women, and then underwent a slow but steady decline to about 29.5 at the same time as that of the female decline, but unlike the latter continued to fall until the end of the study. In acute contrast to such data is the case of the French Dukes and Peers during the period of about 1650 to 1750, where women initially married around the age of 20. This was followed by a steady decline in age to a little over 18 years at the end of the period of study. In the case of men, the decline was much sharper, beginning around 25.5 years in 1650 and by 1750 the age of marriage had dropped to just a little over 21 years. The mean age at first marriage shown by women of the British Nobility dropped in the late 16th century from a little over 20 to about 19.5, then underwent a steady though somewhat irregular rise to about 1850 when the age was a little over 26, and then declined to a little over 25 by 1900. In the case of the groom, the rise was steady but even more irregular than that of the bride, beginning around the age of 25, culminating at nearly the age of 32 by 1850, and then dropping to a minimum of 27 in 1900.

In the case of the Colyton data (Wrigley 1966a) it would appear, at least during the period of 1647 to 1719, that an attempt was being made to limit family size by marrying late. This is more interesting when it is noted that it was not infrequent for the groom to be younger than the

bride. It would appear that the people of York were behaving in a similar fashion to those of rural Colyton but continued to marry late for a longer period of time. A test will be described later that tends to show that the people of York were not practicing other forms of family limitation that were available to people living on the continent (Finch and Green 1963). In the 16th century York family size was 4.86, in the 17th it dropped to 3.47 and by the first half of the 18th century it had fallen even further to 3.32. Marrying at a late enough age is unquestionable a reasonable and effective method of family limitation, though this is not to suggest that the effort was conscious. The British Nobility displayed a similar trend, though for any given period their bridal age was lower than that of the people of York and probably acted only in a minor way as an effective method of limiting family size. There was, however, a decline in family size from 1550 to 1724, at which point it rose until the early 19th century. The fact that the British Nobility behaved in a similar fashion to the population of York would tend to indicate the absence of an economic factor causing late marriage. The group that behaved even more similarly to that of York, for the extent of the data, was the old Genevan Families, though from 1725 onwards the data are more similar to those of Colyton. The study of the French Dukes and Peers clearly gives the impression that they wanted to increase their families.

INITIATION AND TERMINATION OF REPRODUCTION

It has been frequently stated (Pearl 1937) when considering mammals lower than man in the evolutionary scale, that the average age of mother at first child bearing exceeds slightly the average age of maturation or at the onset of menarche. For such mammals, it would be assumed that the range in age of mothers would be relatively small. In the case of the data obtained from the York registers, however, it would appear rather unlikely that the mother's age at first child bearing is particularly reflective of the age at which women, at least physiologically, are able to conceive, though the data suggest that the onset of menarche

is later than has been previously supposed. The average age of last child bearing, however, is probably reflective of the end of the physiological process. Day (1965), in his recent study of Australian Catholics, has noted that about half the women in this group completed child bearing by the age of 34, three quarters by the age of 38 and nine tenths by the age of 40. The figures for York are 45.4 per cent finished bearing children by the age of 34, 62.8 per cent by the age of 38, 70.5 per cent by the age of 40, leaving 29.5 per cent of the women having their last child after the age of 40. If the null hypothesis is taken to be that Day's data and those from York should be the same, a significant chi square based on numbers and not per cent is obtained which is beyond the 5 per cent level ($X^2 = 6.43$). There is therefore a significant difference between the two sets of data. We may conclude that the York population probably differed from genetically comparable modern groups by showing slightly later menopause as well as possibly later menarche.

Before discussing the York data in greater detail, it should be noted that it is not uncommon (Day 1965; Wrigley 1966a; 1966b) to assume that the end of the fertile period for women is 45 years, the explanation being that at most one percent of the women with children after 45 are lost from the data, though in Colyton, 37 per cent of the women in the period 1560-1629 and 44 per cent during 1647-1719 were still bearing children after the age of 40. The Registrar General report (1968) shows that 2.2 per cent of the women tabulated give birth beyond the age of 40. In a ten year study of the obstetric material of the Hadassah University Hospital (Koren _et al_. 1963), 1.7 per cent of the babies born belonged to women over the age of 40. Of this group, 89.3 per cent were between 41 and 45, 8.9 per cent between 46 and 50 and 7 were above 50 years of age. Of the patients of European origin, 80 per cent were primiparas and 32.5 per cent were multiparas. Patients of non-European origin showed 20 per cent primiparas and 67.5 per cent multiparas. It is interesting to note that the age of onset of menarche is the same for both groups of people (Ber and Brocinar 1964). It would seem therefore that

by programming computers to discard children born to women after the age of 45, interesting data is being lost, though a more inclusive study would involve investigating an enormous amount of material before statistically significant figures would be attained.

In the York material no cut off point was used either in the computer program or the data studied by hand. Table 2 shows a summary of the time elapsed between the birth of the last child and the burial of the mother. Day (1965) comments that women, especially at the older ages, who have gone seven years without bearing another child are as likely to have completed childbearing as those who have been childless for nine years. It would appear that not discarding data concerning women over 45 has not biased the data but possibly presented some new data. Similarly, including women over 34 who died before childbearing years may have ceased, the number being so small, will not affect any basic conclusion that may be reached.

A possible hypothesis may be suggested that is concerned with relatively late marriage and consequently late primiparas and terminal childbearing. Of all the married women that had recorded progeny, 13 per cent had first children that were illegitimately conceived, assuming that any babies born to a marriage of less than nine months were on the way at that time. This may suggest that the onset of menarche is considerably later than any of the data that Tanner (1963) has reported. In the York data there are 9 women in the 16th century, 32 in the 17th and 9 in the 18th century that married before the age of 20. However, only 5 in the 16th century, 24 in the 17th and 5 in the 18th century had babies before the age of 20. It is interesting to observe that in Colyton during the period 1647-1719 no children were born to women in the age group 20-24. This data would suggest that physiologically, conception was unlikely prior to the age of 20. Since nearly 30 per cent of the women were still bearing children after the age of 40, it would appear that menopause was developing later as well. In other words, from an evolutionary standpoint there appears to have been some mechanism functioning in the society to

maintain the fertility span such that enough children would continue to be born to maintain the population. Backman (1948) has suggested that in ancient and medieval periods the menarche began around the age of 14, but an acute retardation of this age occurred at the beginning of the 19th century. He proposed that this change was brought about by factors connected with industrialization. This is entirely contradictory to the evidence presented in this paper. Tanner's data show that the age of menarche in the various populations he discusses was steadily declining from about 1840 to the present time. The British Nobility (Hollingsworth 1964) certainly suggests that this age was on the rise from the late 16th century up to about 1850 when it began to decline. Ancient data (Hopkins 1965) implies that the age at onset of menarche was about the same as it is now. Presently, menarche is starting earlier (Tanner 1963) and menopause is supposedly getting later (Sharman 1962; U.S. Department of Health, Education and Welfare 1966), suggesting that the two mechanisms and their time of onset may be related, not only genetically but endochronologically as well. It is more likely that the onset of menopause is clocked by the age of menarche, so that the former process would be the more variable one, and at a time when menarche began late there would be a genetic selection acting in the population for late menopause. In this fashion, a minimum effective fertility span would always be maintained such that each population, regardless of the age at onset of menarche, would be able to replace itself. In the case of present day results, with menarche starting earlier, it should be pointed out that for what data exist this would appear to be a disadvantage. Infant and maternal mortality, prematurity and stillbirths are highly correlated with maternal age. During the younger years it is thought that this correlation is due to the physiological lack of readiness of the adolescent female for reproduction (Montague 1957).

FAMILY SIZE AS A FUNCTION OF TIME

Figure 1 shows the relationship by century between the age at marriage and the number of children a woman bore. A regression line was

determined utilizing Y, the age at marriage, X_1, the number of children and X_2 ,the century. The t-test involving the partial regression coefficient between the number of children and age at marriage is highly significant (t=-19.87, df=289) so that the age at marriage is of great importance in estimating the number of children. Similarly, the century is highly efficient in determining the number of children (t=-27.74, df=580). Despite the fact that there is a continuous increase in the age at marriage of women with the century, the t-test, when these two statistics are compared, gave a relationship that was only significant at the 20 per cent level. Such a level would be discarded as being statistically insignificant. In Figure 1, the regression line is calculated only for the 17th century. The average age at marriage was classified into groups of less than 20, 20 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 44, 45 to 49 and 50 to 54 years. The average number of children born in each group was then determined. The regression line, on the other hand, was based on 292 pieces of data each involving one woman and the number of children she had. The curves of the 17th and 18th centuries in Figure 1 agree rather closely up to a marital age of about 36 after which, surprisingly enough, both curves move upward, though the data in this region is rather scanty. The 16th century curve is quite different, as might be expected, since women married earlier, had more children and tended to cease childbearing on the average at an earlier age. Statistically then, the younger a woman was at marriage the larger the family she was likely to bear. The later the date at which she got married the fewer children she was likely to have.

The above data are not unique since it is obvious that a woman who marries for the first time at 40 years is bound to have fewer children than one who marries at 25 years. It is interesting to note that though family size decreased and age at marriage increased with time, only the latter statistic is related to time. In general, the trend of the data tends to emulate that of Colyton (Wrigley 1966a) and Crulai (Gautier and Henry 1958).

Table 3 shows the number of children by sex with and without recorded mortality data in relation to the size of family to which they belonged. When the figures were adjusted so that the effect of the total number of individuals involved in each case was removed, a chi square test showed that the size of the family had no significant effect on the longevity of its children. It might have been suspected that larger families would have tended to lose children as a result of neglect relatively more frequently than smaller ones. This situation, however, does not appear to have been the case. Similarly, no statistically significant relationship was found between the age at marriage of women and the life span of their first children. In considering the age of the mother at the birth of a specific ordered child and the life span of that child, no significant relationship was found for any birth position. After the second child there was a trend suggesting that the older the mother the shorter the life span of the child, reflected by negative but insignificant correlation coefficients obtained between the two variables. This requires further study; it would appear from the present data that neither the age of the mother at the baptism of a given child nor the size of the family into which he was born had any significant effect on his longevity. Lawrence (1951) has shown a positive association between sex ratio of children and longevity of both parents. Unfortunately there is not enough data from York to test this hypothesis.

SEX-RATIO

Table 4 shows the number of baptized children, by sex, born to all married women, age of mother at her infant's baptism and the number of her previous liveborn baptised children, 1538 through 1751. It becomes immediately apparent that with increasing maternal age, the sex ratio decreased. Similarly, as the order of birth increased more girls were born than boys, though the data are rather ragged in the higher birth orders. The apparent reason for this phenomenon is that with increasing maternal age male foetal wastage increases so that a successful conception

is more likely for a female. Data from the Registrar General discussed by Lowe and McKeown (1950) show that the sex-ratio of total births as well as live births decreased with increasing maternal age but that the sex-ratio of stillbirths increased. These authors suggest that the decrease in the sex-ratio of total births with increasing age of mother is the result of changes in the sex-ratio of abortions earlier than the 28th week. Ciocco (1938) has further suggested that multiparas have a greater reproductive wastage than primiparas. It has been shown by many (McMahan 1951; Myers 1954; MacMahon and Pugh 1953) that first born children have a slightly greater tendency to be male than subsequently born infants. It is interesting to note that in the York data for which the figures are adequate, it appears that the second child is more likely to be male than the first. It has been shown (Bernstein 1948; 1954) that the sex-ratio does not decrease with increasing birth order in modern day upper-class families, but does for the general population. It would also seem possible that the sex-ratio in upper-class families may be controlled by the "masculinity or femininity" of the occupation of the parents, the more "masculine" occupations producing a higher sex-ratio. In contrast to this suggestion is the work of Snyder (1961) showing that fighter pilots tend to produce girls in preference to boys when they are engaged in flying combat planes. Snyder's work has an enormously greater level of significance than that of Bernstein. Moreover, there has been the suggestion (Lyster and Bishop 1965) that an association between rainfall and sex-ratio exists, though the explanation for this probably lies in the fact that variations in rainfall change the trace element quality of the drinking water which in turn has an effect on spermatogenesis. Renkonen (1964) proposes the idea that there is an increasing incompatibility between the mother and her male offspring. This incompatibility may be present already at the first conception of a male, and it is suggested that it is sex-linked. Takahashi (1954) observed that the oldest mothers produced more boys than in any other age group, suggesting that a moderating effect on the incompatibility reaction might be developing. It

would appear therefore that many explanations could be offered for variations in sex-ratio.

It should be noted that families that have more than eleven children (cf. Table 4) tend to be those of the 16th century. It is interesting to observe that the most prolific couples appear to have produced their final offspring at the maternal age range of 35 to 39. The Registrar General (1968) reports that for 1966, the largest number of women producing 10 to 14 children are in the 35 to 39 year group but the 15 and over column is more related to the 40 to 44 year old group.

Table 5 shows the distribution of twins by sex and by century. The figures per thousand are different from those shown previously (Cowgill 1969) since those figures were based on the number of live and stillborn children traced in that study. In the present case, the number per thousand is based on 1039 livebirths. The highest twinning rate for this study appears to occur in the first half of the 18th century. Changes in the rate of twinning over the centuries may be suggestive of some type of selection, possibly behaving in relation to the economics of the time. There is still too little data to allow more than a comment.

Though the amount of data is small, the sex-ratio of babies that were illegitimately conceived was examined. Of these babies, there were 28 males and 11 females. A chi square test comparing these figures with the sex-ratio of the population studied, namely 110.75 males/100 females, gave a significance level beyond the one per centlevel (X^2=7.18). It is unfortunate that Ganiage (1963) in his study of three villages of the Ile-de-France in the 18th century neglects to state the sex of such children. Though the figures from York are small, one possible explanation lies in the fact that the mean time after marriage for the birth of these children is roughly three months, 0.34 years for males and 0.26 years for females. Renkonen and Lehtovaara (1963) present data that show a sex-ratio of 133.43 males/100 females for children born 90 days after marriage. Babies born five months after marriage show a sex-ratio of 110.89. These data were obtained from parish registers from Helsinki and involve only primiparas.

Table 3 shows the sex-ratio for those children that have recorded mortality data and those that do not. Presumably, the latter group gives some indication of those that survived and probably migrated.

Using the recent British Census material relating the age group of the mothers to the sex of their children, a comparison was made between the actual number of male children born to mothers of each age group and the theoretical number employing the sex-ratio of 105.9 obtained for all children. No level of significance was obtained. Similarly, if birth order is examined in the same fashion, the result is statistically insignificant. The York data (cf. Table 4) was examined in the same way resulting in a lack of statistical significance. It would appear therefore that the incidence of decreasing sex-ratio with increasing maternal age is merely a trend in both sets of data.

SEX ORDER

Tables 6 and 7 show the results of sex order in the families of York. In order to test the randomness of a family sequence in terms of the sexes of its children, the run test (Swed and Eisenhart 1943) was applied to the whole population of children. A sequence composed of two different kinds of objects, such as M and F, may be described in terms of runs. A run may be considered as a succession of similar objects preceded by and followed by different objects. Thus, in the arrangement, FFMMMFM, there are 3 F's and 4M's forming four groups. Too few or too many runs will raise doubt about the randomness of a sequence. In the case of the York data when combined as they came from the parish record, there are fewer runs than would be expected by randomness alone; the z is enormously significant ($z = 22.53$); the probability of z being this large or larger is extremely small. Since the run test, though versatile, is not extremely powerful, an approach using a chi square test was also employed. Suppose, of the first ten babies of all families of ten through sixteen children, the total number of males in each family is tabulated. A chi square test is then done between the frequency of male babies and a weighted

mean. If, for example, there are 4 families that have 5 male babies born in the sequence of the first ten and 2 families that have 4 male babies born in this sequence, the mean would be 4.67. This mean is then compared to the number of families in each instance. In the case of ten babies, a chi square test of 10.98 was obtained which is significant at the 5 per cent level. Families of nine children when treated in this manner gave a chi square of 6.96 which is beyond the 25 per cent level and would not be considered statistically significant. All families of eight through six babies when subjected to this test show a high degree of significance (eight babies, $X^2 = 14.65$, $P = 0.020$; seven babies, $X^2 = 56.20$, $P = 0.005$; six babies, $X^2 = 118$, $P = 0.005$) suggesting that the initially highly statistically significant result obtained by using the run test is substantiated and that the determination of sex in a family is not a chance effect and it appears that there is good evidence to suggest a positive association between the sexes of successive children in a family.

Schützenberger (1949) made a study of the distribution of sex in families that had five or more children. He found that the sex of one child influences the sex of the next. If Renkonen's (1964) suggestion of maternal incompatibility with a male foetus is acting in some or all populations, then there is the possibility that after a male stillbirth, the next live infant to be born would be a female. Edwards and Fraccaro (1960) comparing the discrepancy of their results with those of Schützenberger point out that the interval between successive births is shorter for larger families than for smaller ones and it therefore might be expected that with shorter intervals between children, the effect of the sex of the previous child upon the subsequent one would be stronger. Edwards (1961) suggests that a foetus of the same sex as that of its predecessor might have a better chance of survival than one of a different sex. It would follow, therefore, that the interval between similar sexes would be less than that of different ones since the latter two would probably be separated by a miscarriage or a stillbirth. Therefore, the latter

type of event should be preceded by a birth of the opposite sex. The York data do not show enough stillbirths to test this hypothesis. Turpin and Schützenberger (1952) found the interval between births of the same sex to be shorter than between unlike sexes when one of the pair of births was a twin birth.

Table 8 shows the interval between pairs of last children for like and unlike sexes and the interval between pairs of children of similar and dissimilar sexes in families having more than five children and in those having less than five. The interval between successive children in families having more than five is statistically significantly less (in all cases beyond the 10 per cent level) than in families composed of less than five children. There appears to be a trend in both these groups of families of having a somewhat larger spacing between pairs of females, pairs of opposite sex having an interval lying between the other two. Though there is no significant difference, the trend remains apparent. In the case of the interval between last children, the spacing between pairs of males exceeds those of others, suggesting that Renkonen's (1964) suggestion may be operating in at least part of the population. Again, the pairs of dissimilar sex show an interval lying between those of male pairs and female pairs.

It is worth commenting that Sheps (1963) has suggested that parents' desire for children of a specific sex, as long as the wish remains constant, appears to have some effect on the gender of the child. Since enough people want children of both sexes, this has no effect on the sex-ratio. Edwards (1962) found that the correlation coefficients between the last two births of complete families were all negative. He suggests that this effect is surely due to birth control, families being more likely to end with children of the opposite sex. If one compares the number of similar pairs (MM and FF) with the dissimilar ones for last children, whether it be in families composed of less than five or more than five, no statistical significance is obtained, suggesting that, as would be expected, this sub-population of York was not practicing family limitation in any way.

One of the interesting questions that might be posed is whether or not the sex-ratio of children is affected when children are born before the completion of the first year of marriage or after the first year. Similarly, whether or not there is a difference in the sex ratio in children born less than one year after the previous sibling and those born more than one year after the previous child. Initially a comparison of means was made with a t-test. These means are shown in Table 9 and are separated into those children born less than a year after marriage or after the previous sibling and those born more than a year after. Data from significant t-tests unfortunately showed that a comparison of the variance differences using the F-test was significant suggesting that the two populations being studied showed departures from normality or differences in relative spread. A solution to this statistical problem has been offered by Siegel and Tukey (1960). This is a nonparametric approach that tests the null hypothesis that two independent samples come from the same population. This test is effective against the alternative hypothesis that the samples were taken from populations differing in variability or spread. It is insensitive to the hypothesis that the two populations differ mainly in location. The test is sensitive to differences in variability even when the means of the populations are equal or nearly so. This test avoids any assumption concerning normal distribution in the population and therefore avoids the problem of obtaining significant F-tests as a result of the two samples coming from a slightly skewed population.

The null hypothesis that two independent samples come from the same population is accepted for all pairs of means shown in Table 9 with the exception of the more than one year group for the period between marriage and the first child, and the interval between the fourth and fifth child. There is a significant difference ($z = 2.71$, significant at 1.5 per cent) in the interval between the population of male and female children when they are fifth children and are born more than one year after the fourth child. If the fifth child is a male, the interval between him and his fourth sibling is longer than it would have been had the fifth

child been female. There is also a significant difference ($z = 2.03$, significant at 2.12 per cent) in the interval between the population of male and female children when they are the first child after marriage and born more than one year after the event. In this instance, female children show a greater span of time after marriage than male. The suggestion that with increasing parity, there is more male foetal wastage appears to be borne out by these data. Similarly, there is less male foetal wastage with a first born than a further order so that there is a greater chance that a first baby will be male.

THE INTERVAL BETWEEN CHILDREN

Figures 2, 3 and 4 show data concerning the spacing between children. Figure 2 shows the distribution of time between marriage and the first birth in thirty day intervals for the populations of York and Ile-de-France (Ganiage 1963) and Helsinki (Renkonen and Lehtovaara 1963). The data are clearly rather different. In the case of children conceived prior to marriage, the peak for baptisms in York is at four months which shows a minimum in the Ile-de-France data while that of the Helsinki parishes is rising rapidly during this period. The legitimate peak for York is eleven months; for the French data, interestingly enough, exactly nine months; for Helsinki, the same as York. The Finnish data are strictly bimodal with the major peak at six months. The old data for York and the Ile-de-France are clearly very different from modern Helsinki where 33.4 per cent of the children are pre-maritally conceived. If it is assumed that the York peak of eleven months is reflective of marital behavior, then the French peak at nine months suggests behavior in the last two months prior to marriage comparable to that of the York couples directly after marriage.

Recent data from Sweden (Linnér and Littell 1967) indicate that 30 to 35 per cent of Swedish brides are pregnant on their wedding day and furthermore that this situation has hardly changed in the past fifty years. Somewhat more ancient data from Colyton (Wrigley 1966a) show that a third

or more of the brides were pregnant at the time of their marriage. Hair (1966) discussing a rather complete study of bridal pregnancy in rural England suggests that in earlier centuries about 20 per cent of the brides were with child while in later centuries it was about 40 per cent. In England today (Registrar General 1968) 8.43 per cent of all maternities were premaritally conceived but legitimatized later by marriage.

Figure 3 shows the distribution of time between children for various birth orders for all families. The histogram that is uppermost is the sum of all children of birth order one through five. A plot of this data on semi-log paper shows a distinct skew to the right, the mode being about sixteen or seventeen months. The semi-log plot does show definitely that the distribution of time is not bimodal. It would appear in the case of all intervals here depicted, that those couples who tend to have children within four years of the previous child tend to have then within two years. The data are a bit too meager to allow more than suggestive comments.

Figure 4 shows York data by month for the interval between children in families composed of more than six children. In order to make the York data comparable with that of Ganiage (1963) and Gautier and Henry (1958), the data were summed into six month intervals with the exception of the first interval which is three months. The data of these two French studies are shown in this figure. The Ile-de-France data are composed of 82 families while those of Crulai contain 106. In all cases these are families that are composed of more than six children. The majority of these people tend to have children within four years of the previous child. This is not the case with such families in York. About 20 per cent of the York families are composed of more than six children. However, their spacing of children does not always lie within the first four years. In any case, the peak of those who have a child within four years of the previous one is in the 12 to 17 month interval for the first through the fourth child. The maximum for the interval between the fourth and fifth child appears during the 30 to 35 month period and the last

interval spans the 18 to 29 month period. Both of the French studies show a peak for the interval between the first and second child at the 12 to 17 month span. Crulai has a 12 to 17 month maximum for the interval between the second and third child. The interval between the third and fourth, the antepenultimate (the one before the last) and the last interval all peak during the 24 to 29 month period, while the population of the Ile-de-France villages shows a consistent maximum at the 18 to 23 month span for the interval between the second and third, third and fourth, fourth and fifth, one before the last interval and the last interval but the antepenultimate interval spans a broad maximum extending from 18 to 29 months.

The consistency of the 12 to 17 month maximum for the interval between the first and second child for all three sets of data is rather interesting. It would appear that ovulation began about the same time for all three populations. It is rather well known (Sharman 1955) that mensis follows pregnancy after a rather variable interval which is prolonged by lactation. Generally, it is presumed that lactation tends to retard the resumption of ovulation, but the data are too scanty to establish that this is more than a trend. Since the populations under discussion were presumably all nursing their babies for some time, the mean (cf. Table 10) of around two to two and a half years between infants may well be set by the length of the lactation period. Mensis is resumed more quickly after gestation is completed in primiparas than in multiparas (Sharman 1955). Presumably this is true of ovulation as well, suggesting an explanation for the increase in the time interval between children of higher birth orders. This effect is probably coupled with the decreased number of oocytes produced with increasing age.

Table 10 shows the geographical variation in birth interval in families composed of six or more children. "York total" refers to all families of six or more children while "York corrected" consists of only data that omit all cases where the first of a pair of infants dies within one year of birth. The Ile-de-France data are for completed families,

i.e., married women who have attained the age of 45. The Crulai and Geneva (Henry 1956) data refer to total. The Ile-de-France data are very close to those of Geneva. Crulai is clearly different from the other populations listed, the interval rising systematically however the data are treated. The York corrected and the Geneva data are rather similar in that they tend to remain the same for the first three intervals and then begin to rise, York more abruptly than Geneva. In the last interval Geneva continues to rise but York drops back to the same level of the first three intervals. The French workers suggest that if a baby dies within less than one year of its birth, the interval between that child and the next will be less than if it had not died. This general hypothesis appears to be true of all the data discussed here. If lactation tends to retard the onset of mensis, the death of a baby would in time cause lactation to cease, and presumably ovulation would reoccur at an earlier period than if the baby had not died and was still being nursed. As a result the next baby would come sooner. The variations in the last interval are far greater than in the others, presumably because of the difference in family size, the increasing maternal age, and the approach of menopause in the case of the larger families that this span involves. Larger families, as has been shown earlier, tend to have smaller intervals between their infants than smaller ones. The rather striking difference between Crulai and the other localities presumably reflects some psychophysiological difference which would be most interesting to ascertain,but at present it is quite obscure.

MIGRATION

It is of interest to offer some comments on the matter of migration. Let us consider the number of marriages that were actually traced. Of 780 such marriages, 292 had recorded progeny of which 66 women had complete life histories, and 488 had only baptismal and marital statistics for the bride, 17 of which also had burial dates. In other words, 60.4 per cent could not be found after marriage either in terms of recorded progeny or burials for the bride. Essentially, 60 per cent

of the married women moved presumably to their husband's parish which was either located outside the City of York or possibly in records that as yet have not been published. Unquestionably some of these married women could not be traced either because matrimony had made their names similar to others or their husbands had names such that separation from other similar names in other parishes was impossible. The number of women whose baptismal dates are absent, but who married, had children and died in York is not known. Such data for men remains equally obscure. It is clear that 8,510 couples became married in York between 1538 and 1751. During this period 27,956 children were baptized. If all of these couples had remained in York and left progeny behind them when they died, the average family size for this period would have been 3.29. The average family size for the sub-population studied here is 3.56. There are comments in the parish records of people coming from London, presumably for the games, and having children during their stay, who were baptized in York, never to be found again in a York register. Also one obtains the distinct impression that some people had houses in London as well as York so that though the surname is familiar half the demographic information about the family is missing. It would be extremely difficult to ascertain how many people fall into this category. Foster (Tillott 1961:122, 162, 212) comments that the marked preponderance of burials over baptisms in the 17th century is so great that the small increase in population between 1600 and 1700 could only have occurred as a result of substantial immigration (cf. Table 11).

SUMMARY

1. As has been shown by data from elsewhere, the age at marriage of both men and women increases steadily from 1538 to 1751. Thirty per cent of the women of the sub-population studied were still bearing children after the age of 40. It is suggested that the onset of menopause is clocked by the age of menarche so that the menopausal age would always be the more variable of the two, and when menarche began late, there would be a selection acting in the population for late menopause. In this

fashion, an effective fertility span would always be maintained in such populations as are able to replace themselves.

2. The age of marriage is of great importance in estimating the number of children. The younger a woman was at marriage, the larger her family would be and the later the century in which she married, the fewer children she would have. The size of the family decreased as the centuries proceeded over the time span studied.

3. Neither the age of the mother at her infant's baptism nor the size of the family into which a child was born had an effect on his longevity.

4. As the age of the mother increased or as the order of birth increased the sex-ratio decreased.

5. The determination of sex in a family is not a chance effect. There is good evidence to suggest a positive association between the sexes of successive children in a family.

6. The interval between successive children in families having more than five children is less than in families composed of less than five children. Spacing between pairs of children of opposite sex lies between the interval between two females and that of two males. In the case of the York sub-population, the number of terminal pairs of children that were of the opposite sex was not significantly different from the number of terminal pairs of the same sex. It has been suggested that if the last two children in a family tend to be of opposite sex, then some form of family limitation is being practiced.

7. There is a significant difference in the interval before male and female children when they are fifth children and are born more than one year after the fourth one. If the fifth child is male, the interval between him and his fourth sibling is longer than had the fifth child been female. There is also a significant difference between occurrence of male and female children when they are the first children after marriage and born more than one year after the event. In this instance, female children show a greater span of time since the marriage than males.

8. There appears to be a consistent time interval for the first three intervals between births in the sub-population of York. It is suggested that this is the result of lactation which apparently, though variably, retards ovulation. If a child dies within less than a year of his birth, the spacing between the baptism of this child and the next is shorter than had the child remained alive. If lactation tends to retard ovulation, the death of a baby would cause lactation to eventually cease and the resumption of ovulation would permit conception to take place at an earlier date.

9. It is suggested on the basis of estimated population studies from the City of York that migration during the 1600's and early 1700's was substantial.

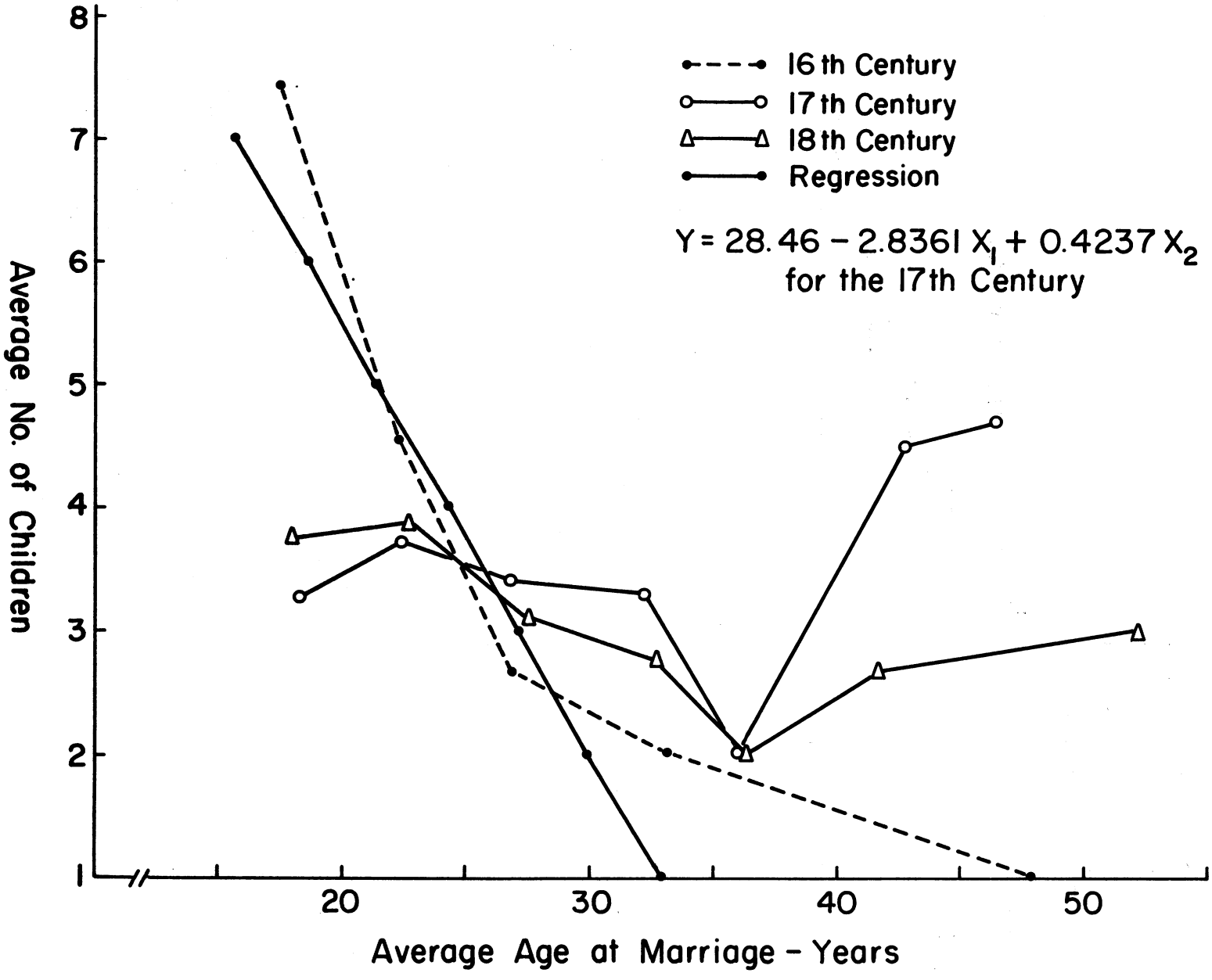

Figure 1. The relationship between the average age of marriage grouped in the following categories: less than 20, 20 to 24, 25 to 29, 30 to 34, 34 to 39, 40 to 44, 45 to 49 years, and the number of children born.

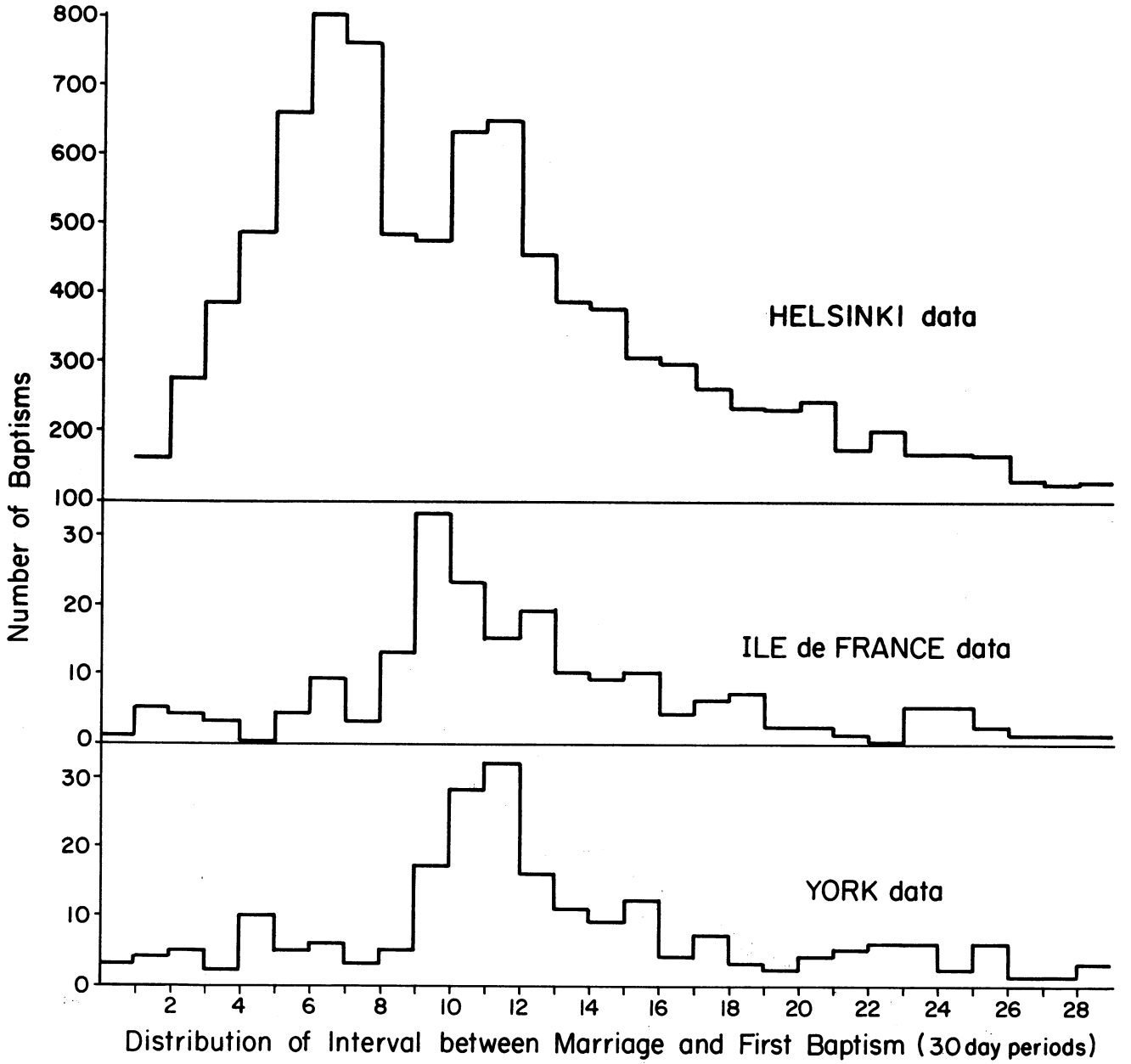

Figure 2. The distribution of the interval between marriage and the first child in relation to the number of children. Data are from York, Ile-de-France and Helsinki.

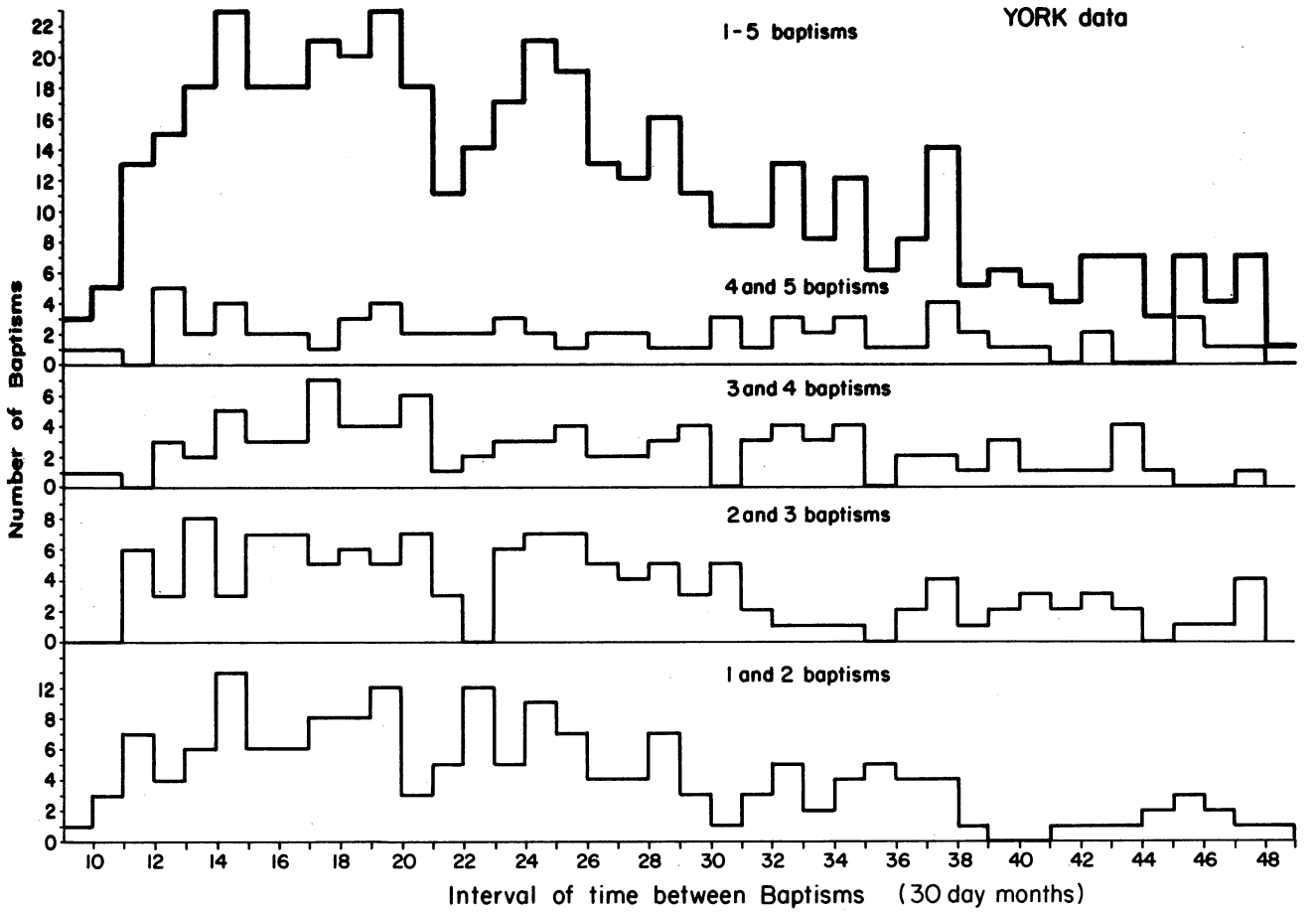

Figure 3. The interval of time between children in relation to the number of children for all families for the following categories: 1 - 2 child, 2 - 3 child, 3 - 4 child, 4 - 5 child, and a compilation of 1 - 5 children.

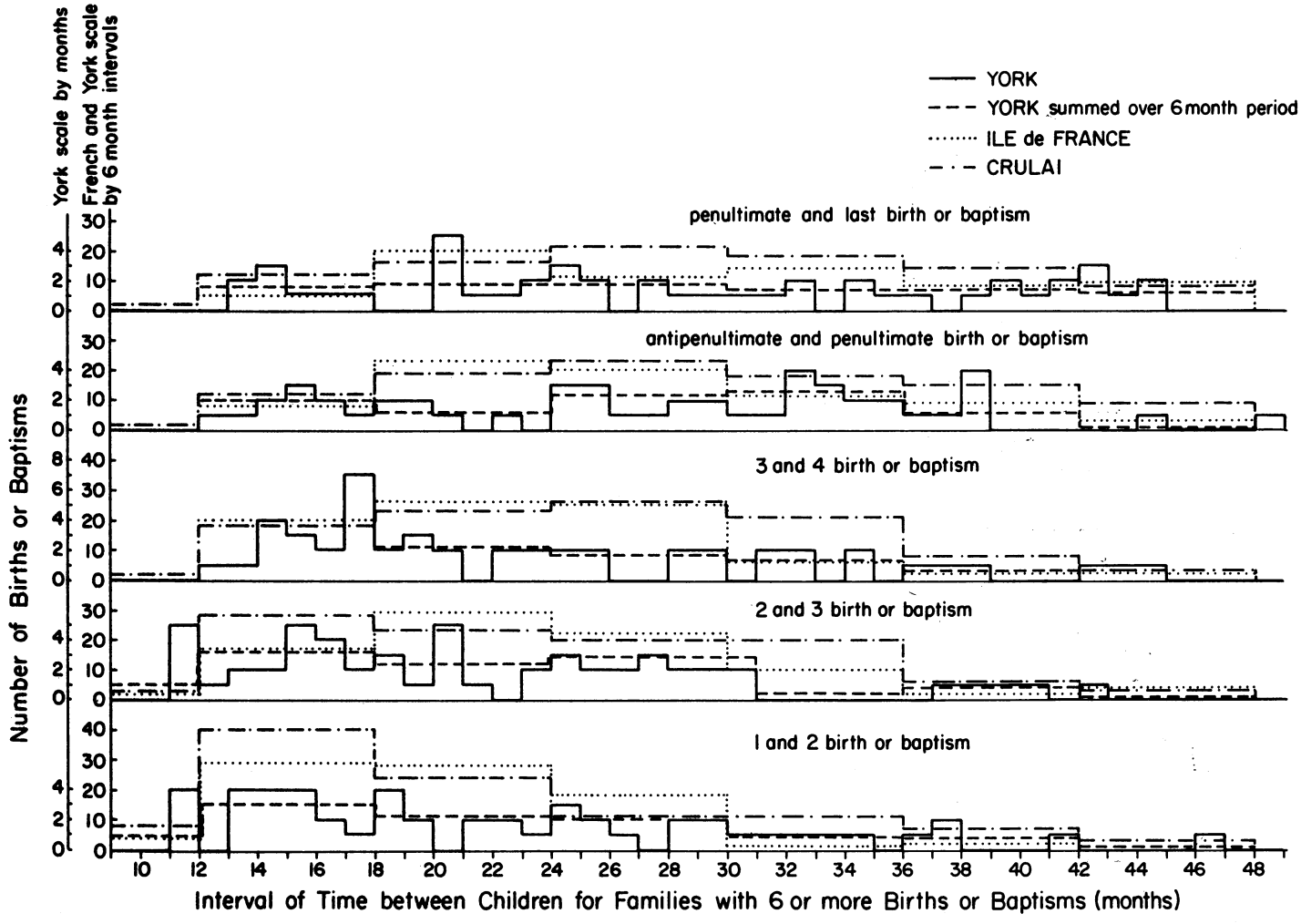

Figure 4. The interval of time between children in relation to the number of children for families composed of six or more infants for the following categories: 1 - 2 child, 2 - 3 child, 3 - 4 child, antipenultimate to penultimate child, penultimate to last child. Data from Crulai and Ile-de-France are included.

Table 1. Summary data for the subpopulation of York studied.

Parish	Dates	Total	Marriages		Total number of			Average age of				Number of
			Theoretically traceable	Actually traced	♂ Baptisms	Marriages with progeny	Children	♀ marriage	♂ marriage	♀ at first child	♀ at last child	last children
1538-1601												
St. Olave	1538-1644	366	304	22	0	8	23	24.8	-	28.8	31.5	6
Holy Trinity, Goodramgate	1573-1812	95	0	0	0	0	0	-	-	-	-	0
All Saints, Pavement	1554-1783	154	82	13	0	5	38	21.7	-	23.1	38.1	4
St. Martin, Coney Street	1557-1812	187	119	11	0	4	34	23.4	-	23.4	35.4	3
St. Crux	1539-1716	322	231	25	1	5	17	24.0	25.2	29.0	39.9	4
St. Michael-le-Belfrey	1565-1772	502	255	16	0	4	21	23.0	-	23.8	33.5	4
Gilling	1573-1812	83	24	2	0	2	3	18.7	-	23.2	27.9	1
TOTAL		1709	1015	89	1	28	136	23.5	25.2	25.9	35.0	22
1602-1701												
St. Olave	1538-1644	361	361	31	2	14	41	25.5	25.2	31.5	40.7	8
Holy Trinity, Goodramgate	1573-1812	786	786	31	3	9	35	24.4	22.2	24.1	30.1	6
All Saints, Pavement	1554-1738	467	467	45	6	22	62	24.8	35.2	26.6	34.4	16
St. Martin, Coney Street	1557-1812	538	538	58	5	14	46	28.0	33.2	27.5	36.3	9
St. Crux	1539-1716	486	486	56	4	27	107	24.3	24.0	26.5	37.5	19
St. Michael-le-Belfrey	1565-1772	1366	1366	180	17	68	250	25.4	24.2	26.4	34.8	49
Gilling	1573-1812	158	158	19	3	8	29	22.9	24.7	29.6	38.3	8
St. Lawrence	1606-1812	153	95	4	1	1	1	30.0	39.2	36.3	-	0
St. Mary, Bishophill Junior	1602-1812	386	381	25	3	15	46	27.0	28.0	26.9	36.5	11
TOTAL		4701	4638	449	44	178	617	25.5	27.2	27.1	35.8	126
1702-1751												
Holy Trinity, Goodramgate	1573-1812	466	466	49	5	21	73	28.9	29.3	28.3	37.1	17
All Saints, Pavement	1554-1738	176	176	19	0	9	38	27.1	-	27.1	34.8	6
St. Martin, Coney Street	1557-1812	247	247	15	1	5	12	27.7	22.3	25.8	29.4	2
St. Michael-le-Belfrey	1565-1772	580	580	69	8	16	28	30.3	31.8	30.7	37.7	6
Gilling	1573-1812	183	183	29	5	12	49	26.8	25.3	27.0	35.3	10
St. Lawrence	1606-1812	203	203	10	0	5	28	25.7	-	26.7	38.2	4
St. Mary, Bishophill Junior	1602-1812	245	245	51	6	18	58	28.0	30.7	29.8	40.5	14
TOTAL		2100	2100	242	25	86	296	28.5	29.4	28.5	37.2	59
GRAND TOTAL		8510	7753	780	70	292	1089					207

Table 2. The number of mothers with recorded burial dates and the period of time between the baptism of their last child and their burial dates.

Grouped burial ages (Average)	Number	Average Number of Children	Number Primiparas	Time elapsed after last child Years <1	1-4	4-9	>9	Average time
Childbed (31.48)	12	2.7	2					
<34 years (28.23)	18	2.4	3	2	5	1	1	2.46
34-38 years (36.32)	10	3.9	2	1	3	2	2	4.96
38-40 years (38.39)	3	3.7	1	1	0	1	1	8.23
>40 years (56.18)	35	4.7	5	1	3	6	24	17.43

Table 3. The number of children by sex for whom mortality data were present or absent in the parish registers.

Average age at marriage	Number of children	Children's mortality data Absent		Present	
		♂	♀	♂	♀
25.93	<4	129	137	95	56
24.92	>4	185	187	137	113
Total		314	324	232	169
♂/100 ♀		96.91		137.28	

Table 4. Live baptisms to all married women by sex, age of mother at her infant's baptism and the number of her previous live baptisms.

1538-1751 Age of mother at baptism Years	Average age of mother Years	♂ / 100 ♀	Total number of children		Number of previous live baptisms 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<20	18.64	70.00	♂	14	13	1														
			♀	20	17	3														
20-24	22.87	117.07	♂	96	55	26	11	1	3											
			♀	82	42	21	12	6	1											
25-29	27.42	133.90	♂	158	41	46	34	23	4	4	4	2	0							
			♀	118	40	26	21	10	9	6	3	2	1							
30-34	32.30	103.36	♂	123	20	16	21	22	20	9	4	3	3	1	1	3				
			♀	119	24	19	15	15	14	10	6	2	4	6	3	1				
35-39	37.29	106.25	♂	85	14	13	11	9	6	8	5	3	5	2	1	0	2	3	2	1
			♀	80	11	11	12	9	7	5	10	7	1	0	2	2	2	1	0	0
40-44	42.23	111.11	♂	40	4	7	3	4	6	3	3	3	1	3	0	2	1			
			♀	36	6	3	2	4	6	6	1	4	2	0	2	0	0			
45-49	47.24	89.47	♂	17	3	6	0	4	0	2	1	1	0	0	0					
			♀	19	0	3	6	1	2	2	2	0	0	1	2					
50-54	52.19	66.67	♂	8	0	1	2	2	0	1	1	0	1							
			♀	12	2	1	2	1	3	1	0	1	1							
55-59	57.04	71.43	♂	5	0	1	0	0	3	0	0	1								
			♀	7	1	1	1	1	0	0	2	1								
TOTAL			♂	546	150	177	82	65	42	27	18	13	10	6	2	5	3	3	2	1
			♀	493	143	88	71	47	42	30	24	17	9	7	9	3	2	1	0	0
♂ / 100 ♀				110.75	104.90	132.95	115.49	138.30	100.00	90.00	75.00	76.47	111.11	85.71						

Table 5. The distribution of twins in the sub-population studied.

Period	♂♂	♂♀	♀♀	Total
1538-1601	1	1	0	2
1602-1701	1	3	1	5
1702-1751	5	2	2	9
Total	7	6	3	16
No./1000	6.7	5.8	2.9	15.4
No./1000*	3.5	3.4	3.6	11.2

*Registrar General, The Statistical Review of England and Wales for the Year 1965, Part II, Tables, Population (London, 1967), 143.

Table 6. The number of children of unisex and bisex families.

Number of children	Number of unisex families ♂	♀	Total	Number of bisex families
1	43	48	91	
2	12	7	19	30
3	6	4	10	30
4	2	1	3	25
5	0	1	1	26
6	2	0	2	14
7	0	1	1	10
8				12
9				6
10				2
11				3
12				2
13				2
14				2
15				0
16				2

Table 7. The sex order of families.

Sex order of families	Number of families	Total	Sex order of families	Number of families	Total
M	43		MMFFF	1	
F	48	91	FMFMM	1	
MF	17		FFFFM	2	
FM	13		MFMMM	1	
MM	12		FFFFF	1	27
FF	7	49	FMFMMF	1	
MMM	6		MMMMMM	2	
FFF	4		FFMFMM	1	
MMF	11		MMMMFM	1	
MFF	1		MMMFMF	1	
FMM	4		FFMMFF	1	
FFM	6		MFMFFF	1	
MFM	4		MMFFFF	1	
FMF	4	40	FFMMMF	1	
MMMM	2		MMFMMF	1	
FFFF	1		FFMFFF	1	
MMMF	2		MFMMMM	1	
MMFF	3		MMMMMF	1	
FMFM	4		FMMMMM	1	
MFMF	1		MMMMFF	1	16
FMMM	1		FMMFFFM	1	
FFMM	1		FMFMFFF	1	
FFFM	3		MMMMMFF	1	
FFMF	1		MFFFFMF	1	
MFMM	3		MMFFMFF	1	
MFFM	1		MMFMFFM	1	
FMFF	1		FFFFMFF	1	
MMFM	3		FFMMMMM	1	
FMMF	1	28	FMMFFFM	1	
MFMFF	3		FMMMMFM	1	
FMMMM	1		FFFFFFF	1	11
MMFMM	1		MMFMMMMF	1	
FFFMM	2		FMMMFFFM	1	
FMFMF	2		MMFMMMMM	1	
MMMFF	1		FMFMMMFF	3	
FFMMM	2		MMMMFMMM	1	
FMMFF	1		FMMFMFFF	1	
FFMMF	1		MFMFFMFM	1	
FMFFF	2		FFFMMFFM	1	
MFFMF	1		FMMFMMFM	1	
MMFMF	2		FMMFMFFF	1	12
MFFFF	1		FFMMMMFFM	1	
FMMMF	1		FFMMFFFMF	1	
			FMMFMMMFM	1	

(continued)

Table 7 (continued). The sex order of families.

Sex order of families	Number of families	Total	Sex order of families	Number of families	Total
MFMMMFMMF	1		MFMMMFFMFFFF	1	
MFFFFFMFM	1		FMMMFMFFFFFF	1	2
FFFMMMMMM	1	6	FMFFFFMFFFMFM	1	
MMMMFFMMFM	1		FFMMMMMMMMFMM	1	2
FMFMMMFFFM	1	2	MFMFFMMFFFFMMF	1	
MFFMMMFMFFF	1		MMFFMFMMMMMFFM	1	2
MFMMFFMMFMF	1		FFFFFFMFMFFFMFMM	1	
MFMMFMFFMMM	1	3	MMMFMFFMFFMMMMMM	1	2

Table 8. The interval between similar and dissimilar pairs of children grouped into families composed of more than five and less than five children and the interval between similar and dissimilar pairs of last children.

	MM	FF	MF
		Mean years	
Interval between similar and dissimilar pairs of children			
families with <5	2.98	3.23	2.67
families with >5	2.27	2.43	2.33
Interval between similar and dissimilar pairs of last children			
families with <5	3.33	2.54	2.73
families with >5	3.04	2.60	2.78

Table 9. The interval between marriage and the birth of the first child or between successive children grouped into those baptized less than one year after marriage or the birth of the previous child and those baptized more than one year after marriage or the birth of the previous child.

	0-1		1-2		2-3		3-4		4-5	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
				Less than one year						
Number of children	74	71	6	12	6	3	3	3	3	4
Mean years	0.65	0.72	0.89	0.82	0.89	0.95	0.75	0.94	0.92	0.88
				More than one year						
Number of children	76	72	107	74	73	67	59	44	37	39
Mean years	3.15	3.65	2.83	3.06	2.37	2.67	2.53	2.70	2.94	2.57

Table 10. Geographical variations in intervals between baptisms in families composed of six or more children.

	Mean Months					
Location	1-2	2-3	3-4	4-5	Last interval	Period
York: total	21.7	21.6	23.3	26.8	28.3	1538-1751
York: corrected*	20.1	20.4	18.8	19.2	19.2	1538-1751
Ile-de-France	19.8	23.4	23.3	35.2	35.2	1740-1799
Geneva	23.6	24.1	23.9	37.5	37.5	1575-1870
Crulai: total	22.4	25.3	27.2	33.0	33.0	1674-1742

*Corrected figures omit all cases where the first of a pair of infants dies a year or less after birth.

Table 11. Estimated population, marriages, baptisms and burials for the City of York, 1549 to 1760 (Tillott 1961).

Period	Estimated Population	Marriages	Population from Baptisms	Burials
1549	10,000			
1600	10,136	9,591	11,166	9,652
1630	12,013	10,890	11,782	13,367
1670	12,286	8,392	12,110	16,358
1700	12,402	10,989	12,397	13,820
1760	12,000			

NOTE

The general study of which this paper is the most recent part, was initiated by a grant-in-aid from the Society of Sigma Xi. Further work was generously supported by the Wenner-Gren Foundation for Anthropological Research. Dr. Hilary Seal of the Department of Biology, Yale University, kindly provided statistical advice and agreed to read this paper prior to submission for publication. I am grateful to Professor G. E. Hutchinson of the Department of Biology, Yale University, for his discussion and advice on many matters concerning the ancient population of the City of York. Mrs. Mary Poulson helped in checking the computer program results and assisted in the accumulation of statistical data. I gratefully acknowledge the continuous support of the National Science Foundation (Grant No. 4309).

REFERENCES

Backman, G.
1948 Die beschleungite Entwicklung der Jugend, Verfrühte Menarche, Verspätete Menopause, Verlängerte Lebensdauer. Acta Anatomica 4:421-480.

Ber, A. and C. Brocinar
1964 Age of puberty in Israeli girls. Fertility and Sterility 15:640-647.

Bernstein, M.E.
1948 Recent changes in the secondary sex ratio of man. Human Biology 20:182-194.

1954 Studies of the human sex ratio. Journal of Heredity 45:59-64.

Ciocco, A.
1938 Variations in the sex ratio at birth in the United States. Human Biology 10:36-64.

Cowgill, U. M.
1966 Historical study of the season of birth in the City of York, England. Nature 209:1067-1070.

1967 Life and death in the sixteenth century in the City of York. Population Studies 21:53-62.

1969 The season of birth and its biological implications. Journal of Reproduction and Fertility Supplement 6:89-103.

Day, L.
1965 Differentials in age of women at completion of childbearing in Australia. Population Studies 18:251-264.

Edwards, A. W. F.
1961 A factorial analysis of sex ratio data. Annals of Human Genetics 25:117-121.

1962 A factorial analysis of sex ratio data: a correction to the article in Vol. 25, 117. Annals of Human Genetics 25:343-345.

Edwards, A. W. F. and M. Fraccaro
1960 Distribution and sequences of sexes in a selected sample of Swedish families. Annals of Human Genetics 24:245-252.

Finch, B. E. and H. Green
1963 Contraception Through the Ages. Springfield, Illinois: C. C. Thomas.

Ganiage, J.
1963 Trois Villages d'Ile-de-France au XVIIIe Siècle. Paris: Institut National d'Etudes Démographiques.

Gautier, E. and L. Henry
1958 La Population de Crulai Paroisse Normande. Paris: Institut National d'Études Démographiques.

Hair, P. E. H.
1966 Bridal pregnancy in rural England in earlier centuries. Population Studies 20:233-243.

Henry, L.
1956 Anciennes Familles Genèvoises. Étude démographique: XVIe-XXe Siècle. Paris: Institut National d'Études Démographiques.

1968 Some comments on Ursula M. Cowgill's article "Life and death in the sixteenth century in the City of York". Population Studies 22:165-169.

Henry, L. and C. Levy
1960 Ducs et Pairs sous l'ancien regime. Population Studies 5:807-830.

Hollingsworth, T. A.
1964 The demography of the British peerage. Population Studies 18:1-108 (suppl.)

Hopkins, M.K.
1965 Age of Roman girls at marriage. Population Studies 18:309-327.

Koren, Z.,H. Zuckerman and A. Brzezinski
1963 Pregnancy and delivery after forty. Obstetrics and Gynecology 21:165-169.

Lawrence, P. S.
1951 The sex ratio fertility and ancestral longevity. Quarterly Review of Biology 16:35-79.

Linnér, B. and R. J. Litell
1-67 Sex and Society in Sweden. New York: Pantheon.

Lowe, R. and T. McKeown
1950 The sex-ratio of human births related to maternal age. British Journal of Social Medicine 4:75-85.

Lyster, W. R. and M. W. H. Bishop
1965 An association between rainfall and sex ratio in man. Journal of Reproduction and Fertility 10:35-47.

MacMahon, B. and T. F. Pugh
1953 Influence of birth order and maternal age on the human sex ratio at birth. British Journal of Preventive and Social Medicine 7:83-86.

McMahan, C. A.
1951 An empirical test of three hypotheses concerning the human sex ratio at birth in the United States, 1915-1948. Milbank Memorial Fund Quarterly 29:273-293.

Meyers, R. J.
1954 The effect of age of mother and birth order on sex ratio at birth. Milbank Memorial Fund Quarterly 32:275-281.

Montague, Ashley M. F.
1957 The Reproductive Development of the Female. New York: Oxford University Press.

Pearl, R.
1937 Variation in parity in women bearing children in the U.S. Birth Registration Area in 1930, Part I. Human Biology 9:79.

Peller, S.
1943 Studies on mortality since the Renaissance. Bulletin of the History of Medicine 13:427-461.

1944 Studies on mortality since the Renaissance. Bulletin of the History of Medicine 16:362-381.

1947 Studies on mortality since the Renaissance. Bulletin of the History of Medicine 21:51-101.

1948 Mortality, past and future. Population Studies 1:405-456.

Registrar General
1968 Statistical Review of England and Wales for the Year 1966. Part II, Tables, Population: 62, 148-150, 166, 190. London: H. M. S. O.

Renkonen, K. O.
1964 Problems connected with the birth of male children. Acta Genetica (Basel) 14:177-185.

Renkonen, K. O. and R. Lehtovaara
1963 The time interval from the wedding to the birth of the first child. Annales Medicinae Experimentalis et Biologia Fenniae 41:560-564.

Schützenberger, M. P.
1949 Resultats d'une enguête sur la distribution de sexe dans les familles nombreuses. Semaine des Hôpitaux de Paris 25: 2579-2582.

Sharman, A.
1955 Aspects of the reproductive physiology of the post-partum period. In Modern Trends in Obstetrics and Gynecology, K. Bowes, ed. London: Butterworth & Co., Ltd.: 216-227.

1962 The menopause. In The Ovary, S. Zuckerman, ed. New York: Academic Press: 539-550.

Sheps, M. C.
1963 Effects on family size and sex ratio of preferences regarding the sex of children. Population Studies 17:66-72.

Siegel, S. and J. W. Tukey
1960 Nonparametric sum of ranks procedure for relative spread in unpaired samples. American Statistical Association Journal 55:429-445.

Snyder, R. G.
1961 The sex ratio of offsprings of pilots of high performance military aircraft. Human Biology 33:1-10.

Swed, Frieda S. and C. Eisenhart
1943 Tables for testing randomness of grouping in a sequence of alternatives. Annals of Mathematical Statistics 14:66-87.

Takahasi, E.
1954 The effect of the age of the mother on sex ratio at birth in Japan. Annals of the New York Academy of Science 57: 531-550.

Tanner, J. M.
1963 Growth at Adolescence. Oxford: Blackwell Scientific Publications.

Tillott, P.M., ed.
1961 The Victoria History of the Counties of England, the History of the County of Yorkshire. The City of York. London: Oxford University Press.

Turpin, R. and M. P. Schützenberger
1952 Sexe et gémellité. Semaine des Hôpitaux de Paris 28:1844-1848.

U. S. Department of Health, Education and Welfare
1966 Age at Menopause. Washington: National Center for Health Statistics, No. 19, Series 11:1-20.

Wrigley, E. A.
1966a Marriage and fertility in pre-industrial England. Listener 10 (February): 199-201.

1966b Family limitation in pre-industrial England. Economic History Review 19:82-109.

1968 Mortality in pre-industrial England: the example of Colyton, Devon over three centuries. Daedalus 97:553.

Yorkshire Parish Record Society
1899 St. Michael-le-Belfry I.
1901 St. Michael-le-Belfry II.
1909 St. Martin, Coney Street 36.
1911 Holy Trinity, Goodramgate 41.
1915 St. Mary Bishopill Junior 52.
1922 St. Crux 70.
1923 St. Olave 73.
1935a All Saints' Pavement 100.

Yorkshire Parish Record Society.
1935b St. Lawrence 97.
1936 All Saints' Pavement 102.
1942 Gilling 113.