

Why High Birth Rates Are So Low

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The highest fertility ever recorded reliably in a society is found among the Hutterites, a religious sect living in small communities near the United States-Canadian border. In 1950 Hutterite women who had reached the end of their reproductive years had given birth to an average of 8.9 children. With mortality near national US levels, this high rate of childbearing has resulted in the unprecedented growth of the Hutterite population, which increased nearly 20-fold between 1870 and 1950.

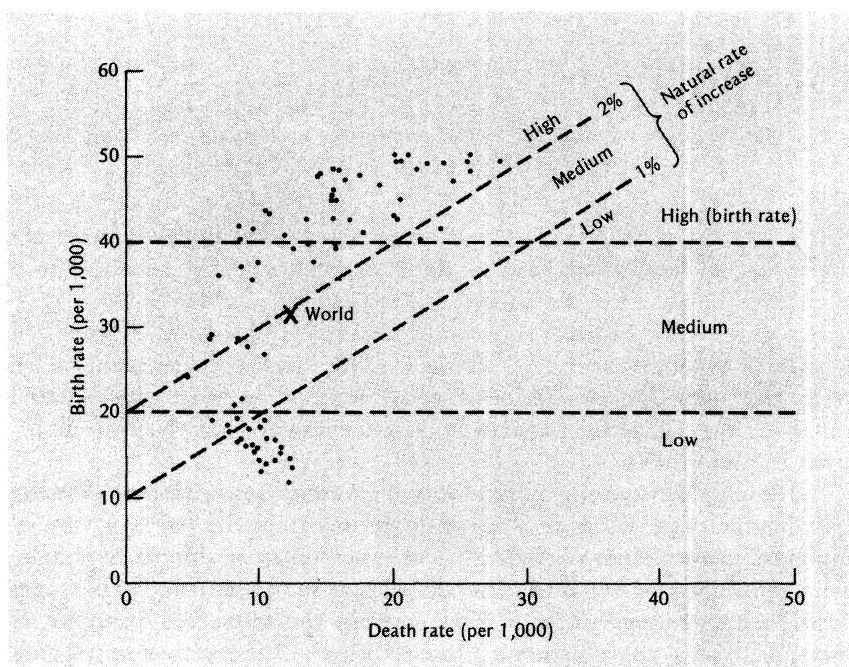
Although Hutterite fertility is very high compared with that of many other human populations, it is surprisingly low from the point of view of biological reproductive efficiency. Clearly, a woman is able to bear more than about nine children during her 30 years or so of reproductive life (ages 15 to 45 approximately), as is evident from the numerous examples of women who have given birth more than 15 times.¹ A theoretical upper limit would be around 40 births per woman during 30 reproductive years, since an interval between two successive births cannot be shorter than about nine months required for a complete pregnancy.

Why then are women in societies such as the Hutterites, where deliberate birth control is absent, reproducing at rates substantially below biological limits? Before discussing the demographic and biological factors responsible for this finding, some aspects of the measurement of fertility and the values of fertility indices in various countries around the world will be presented.

Measuring Fertility

The most widely used measure of fertility is the birth rate, that is, the annual number of births per one thousand persons. The usefulness of this rate stems from the fact that the required data are easily obtained and generally available, so that birth rates for almost all of the world's countries can be estimated. In addition, the difference between a country's birth rate and death rate (the annual number of deaths per one thousand persons) yields the annual rate of natural increase, which is one of the most important demographic indices.

Figure 1 Estimated birth and death rates (1970–75) of 85 countries with over 5 million population



Birth, death, and growth rates vary substantially among countries. Figure 1 plots these rates for 82 countries with populations over 5 million, covering 97 percent of the world's population.² Despite the large variations, countries tend to fall into two clusters: one with high birth and growth rates, the other with low birth and growth rates. The former includes most less developed countries, the latter contains most of the industrialized nations. Differences between the birth rates in the two areas are largely the consequence of differences in the degree of birth control practice.

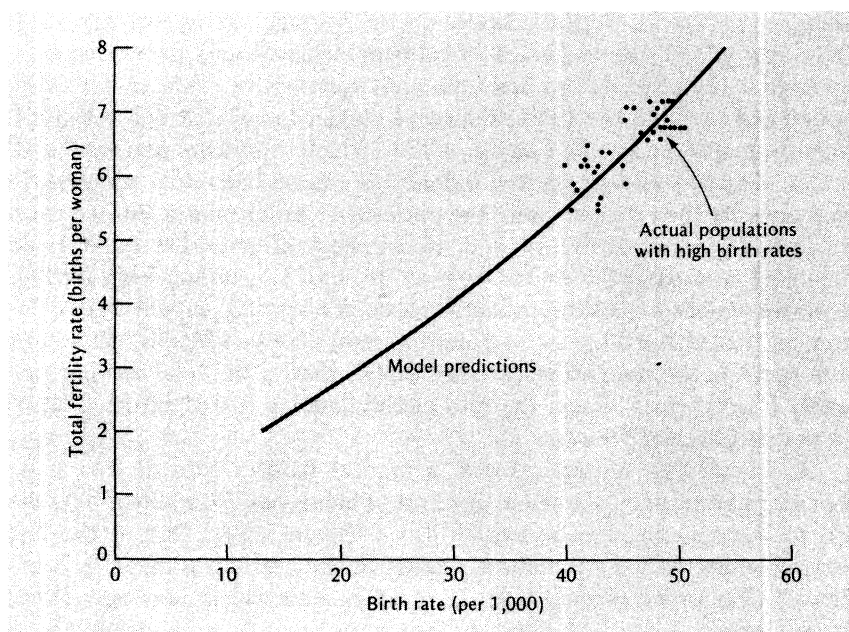
In the countries with the highest levels of fertility, birth rates range

from 40 to 50. From numerous intensive studies it has become clear that in populations with birth rates around 50 the use of deliberate fertility control measures such as contraception and induced abortion is almost completely absent. In the cases where birth rates are near 40, some birth control is usually being applied, mainly among well-educated city dwellers. The term "natural fertility" is used for societies in which no deliberate effort is made to avoid having children. Fertility practices in today's high birth rate countries are close to natural, as they have been historically.

At the other extreme one finds birth rates of around 15 in countries with controlled fertility. This implies that most couples are able to limit the number of their offspring to an average of about two per family.

Although the birth rate has proven to be a valuable indicator of fertility, it has one major drawback: it is influenced by the age composition of the population. For example, the birth rates in two societies where women are bearing the same number of children would differ if the proportions of women in the childbearing ages were not identical. To avoid this problem, demographers now use the "total fertility rate" as a purer measure of fertility. The total fertility rate is equal to the average number of births a woman would have by the end of her reproductive years, if fertility levels at each age during her childbearing period remained constant at the levels prevailing at a given time. The relations between the birth rate, the total

Figure 2 Relationship between the total fertility rate and the birth rate (1970-75) in actual and model populations



fertility rate, and the age composition have been studied extensively with the assistance of mathematical models. It has been demonstrated that the proportions of males and females at different ages are roughly constant over time in populations where, except for minor fluctuations, the birth rate is constant and where the death rate is either constant or declining steadily. Furthermore, one finds that in such populations the relation between the birth rate and the total fertility rate is nearly fixed at levels shown in Figure 2.³ The rates observed in the high birth rate countries, also plotted, are in close conformity with the values predicted by the mathematical models, because the age structure in each of these populations has been rather stable. We can conclude from Figure 2 that current populations with fertility at or near natural levels typically have birth rates around 50 and total fertility rates near 7.

Demographic Factors and Natural Fertility

Marriage is the principal demographic factor affecting the birth rate in populations with natural fertility. For simplicity we will assume that marriage is the starting point of a woman's reproductive career, although this is not the case in every society. For example, in India young brides often stay with their parents for some time after marriage, and in parts of Latin America childbearing is legitimate in consensual unions before the official marriage ceremony. Among younger women the proportions married in different age groups depend mainly on the average age at first marriage, while over age 30 the incidence of celibacy, widowhood, divorce, and remarriage is the chief determinant. In a comprehensive study of nuptiality around the world in the 1950s, Bourgeois-Pichat found that one could distinguish major geographic areas within which marriage patterns were similar, despite some substantial differences among individual countries in each area. At the extremes were the patterns of Africa and of Europe, with averages of, respectively, 10 and 40 percent⁴ of potential marital life remaining unused between the ages of 15 and 45. Among high fertility countries, values for lost reproductive years of about 25 percent were common, so that of the 30 years of potential reproductive life, only 22.5 years were spent in the married state. This implies that, if the total fertility rate equals 7 births per woman, the rate of childbearing is 0.31 births ($7/22.5$) per married woman per year.

It should be emphasized that a marital fertility rate of 0.31 is an average; higher values prevail in age groups below age 30, whereas near the end of the reproductive period fertility is much lower. One of the first analyses of age patterns in natural marital fertility rates was made by Louis Henry,⁵ who collected data from 13 societies with widely varying cultural characteristics in which deliberate birth control could be assumed absent. Averaging the fertility rates in these 13 populations resulted in the

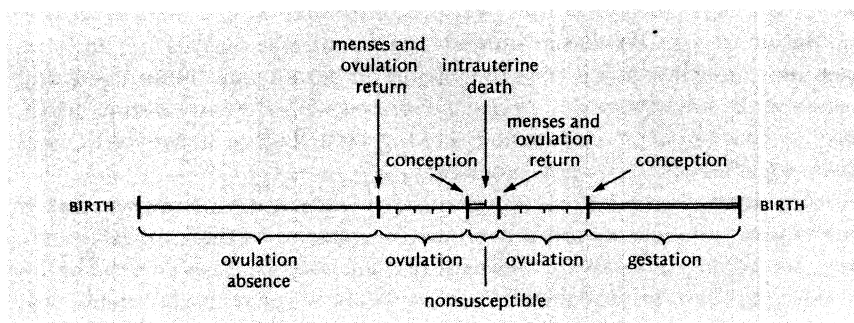
following values: 0.42 for women aged 20–30 years, 0.33 for those aged 30–40, and 0.15 for those women aged 40–45. There is a clear age pattern, but the value of 0.31 for all ages, arrived at by the above crude calculations, appears to be a representative average of observed natural age specific marital fertility rates.

Biological Factors and Natural Fertility

Sterility is the biological factor primarily responsible for the age pattern in natural marital fertility. A distinction is usually made among the following three types: (1) adolescent sterility, present among teenagers who have not yet reached menarche (start of menstruation) or who ovulate irregularly after menarche; (2) primary sterility, among women who are never able to reproduce; and (3) secondary sterility, which sets in after having been fertile. Little is known about the determinants of the prevalence of each of the forms of sterility, but presumably health and nutrition are important. From the few available measurements, it is estimated that in healthy populations the loss of fertile years among all women between the ages of 15 and 45 is probably less than 20 percent,⁶ but in areas where malnutrition and poor health conditions are common, a higher sterility incidence may be observed. One could, therefore, find that in a natural fertility population only 17 or 18 out of the 22.5 years of married life are nonsterile and thus available for reproduction. If the total fertility rate is 7 births per woman, this would mean a rate of 0.4 births ($7/17.5$) per nonsterile married woman per year and an average interval between births of about 2.5 years ($17.5/7$). Obviously, the majority of birth intervals exceed by a large margin the theoretical minimum duration of nine months required for a full-term pregnancy.

Figure 3 outlines how the time between two successive births may be divided into subintervals. Immediately following a birth, women experience

Figure 3 Components of a typical birth interval



“postpartum amenorrhea,” a period during which the normal cyclical pattern of menstruation and ovulation is absent. Observed average durations of this interval range from a few months to more than 1.5 years. There is now excellent evidence that the duration and intensity of breastfeeding are the principal determinants of the length of postpartum amenorrhea, but prolonged breastfeeding cannot be regarded as a reliable contraceptive because menstruation and ovulation usually return months before breastfeeding is terminated.

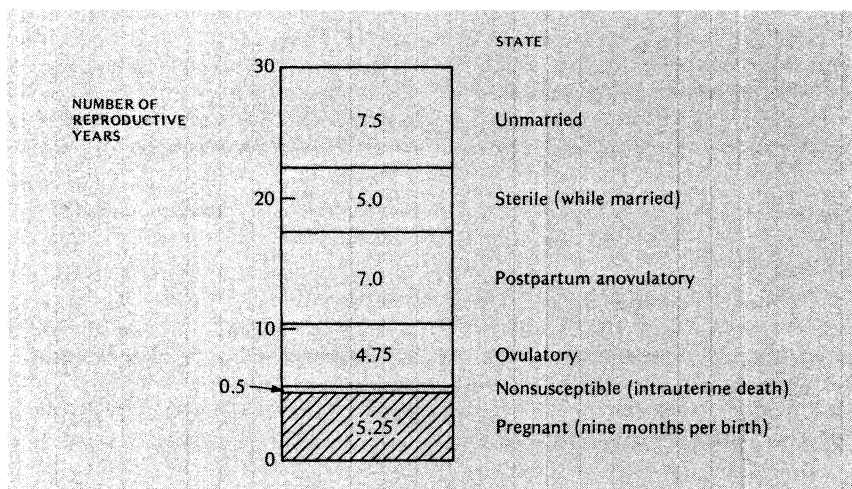
After the regular ovulatory function is restored (at approximately the same time as the first postpartum menses), married women are subject to the risk of conception.⁷ Conception rates have proven difficult to measure, particularly because many conceptions that abort spontaneously shortly after fertilization remain unrecognized. Tentative estimates for the value of the monthly probability of a fertilization range from 0.15 to 0.50 among ovulating women who have intercourse regularly.⁸ The reason why this probability is substantially less than 1.0 is that conception is possible only during a very brief period, probably only two days, in the middle of a woman's cycle. As a consequence, the average waiting time to conception, which is inversely related to the probability of conception, may be several months. The wide range of conception probabilities is largely due to their dependency on the coital frequency, which is affected in turn by various cultural customs.

Once an ovum has been fertilized, it has about a 50 percent chance to survive nine months and yield a live birth, with approximately one-third of the fertilized ova being rejected during the first two weeks after conception.⁹ This high rate of reproductive failure appears to be the result of an effective natural mechanism for eliminating defective embryos, since a high incidence of genetic and other abnormalities has been observed in spontaneously aborted embryos. On average, about two fertilizations are needed to yield one live birth. The implication for the duration of the birth interval is that for every intra-uterine death a brief nonsusceptible period (duration of aborted pregnancy and postabortion anovulation) and a conception waiting time are added.

Given the above rough estimates of the segments of an interval between two births, a typical thirty-month birth interval in a natural fertility population may be divided as follows: twelve months postpartum amenorrhea, four months waiting time to conception before an intrauterine death, a one-month nonsusceptible period associated with the intrauterine death, another four months' conception waiting time before a live birth, and finally a nine-month full-term pregnancy.

In summary, the highest observed birth rates are much lower than is biologically possible because women in natural fertility societies are pregnant during only about one-sixth of their reproductive years. The remainder of these potential childbearing years is spent in the unmarried,

Figure 4 Example of the numbers of childbearing years spent in various reproductive states in a population with a total fertility rate of 7



sterile,¹⁰ postpartum anovulatory, nonsusceptible, or ovulatory states (Figure 4). As a result, birth rates rarely exceed 50 in populations in which no deliberate actions are taken to affect the biological process of reproduction. Voluntary fertility control efforts by couples during the childbearing years are required to reduce birth rates below this natural level.

Notes

1. For simplicity, twins, triplets, etc. are counted as one birth.

2. Data for Figures 1 and 2 are taken from United Nations, Department of Economics and Social Affairs, Population Division, Working Paper No. 55, May 1975.

3. The actual total fertility rates are found by multiplying the available gross reproduction rates by 2.05. The model relationship between the total fertility rate and the birth rate in a stable population varies slightly with the level of mortality. The curve presented in Figure 2 is plotted from data for the female "West" population at mortality level 11 presented in Ansley J. Coale and Paul Demeny in *Regional Model Life Tables and Stable Populations* (Princeton University Press, 1966).

4. These percentages are taken from Colin Clark, *Population Growth and Land Use* (London: McMillan, 1964). Clark simply takes the unweighted average of the percentages of women not married in each five-year age group between 15 and 45, using data originally presented by Jean Bourgeois-Pichat in "Les facteurs de la fécondité non dirigée," *Population* 20, no. 3 (1956): 383-424. A different and more accurate approach to estimating the impact of marriage on fertility is taken by A. Coale in "Factors associated with the development of low fertility: an historic summary," *Proceedings of the World Population Conference, Belgrade, 1965* Vol. 2 (New York: United Nations, 1967), pp. 205-209. Coale calculates an index of the proportion by which fertility is reduced due to years spent outside marriage by weighing each five-

year age group differently, the largest weights being given to women in the most fertile years. This method correctly takes into account the fact that a year of reproductive life lost when a woman is near menopause obviously has a lesser effect on fertility than a year lost when fecundity is at a maximum.

5. Louis Henry, "Some data on natural fertility," *Eugenics Quarterly* 8 (1961):81-96.

6. This percentage is calculated from estimates of the incidence of sterility by age, as given by Louis Henry in "Some data on natural fertility."

7. Following standard medical definitions, the terms "fertilization" and "conception" are used synonymously.

8. Demographers often define a conception as a fertilization that results in a delayed or missed menstruation, i.e., fertilized ova are ignored if they fail to implant or are rejected within the first two weeks after fertilization. The monthly probability of such a conception is called "fecundability." Typical fecundability estimates range from 0.1 to 0.3 in different populations.

9. W. James, "The incidence of spontaneous abortions," *Population Studies*, 24, (1970):241-248.

10. As plotted in Figure 4, the sterile state includes only women who are both sterile and married; nonmarried sterile women are included in the unmarried state.