Fertility Rates
CAROLINE STEN HARTNETT
University of South Carolina, USA

Fertility rates measure the level of childbearing in a population. They are important for determining both the growth rate of a population and its age structure (the proportion of the population that is young compared to the proportion that is old).

Some fertility measures are true “rates,” in that they capture the “risk” of having a birth during a given time period. Such measures include the crude birth rate, the general fertility rate, and age-specific fertility rates (see Preston, Heuveline, and Guillot 2001; Yaukey, Anderton, and Lundquist 2007; Haupt, Kane, and Haub 2011).

The **crude birth rate** (CBR) is the number of people per 1000 who have a birth during a given time period (= the number of births in a given year \( \times \) 1000 / the total population at mid-year). The CBR describes the pace at which new members are born into a population but does not convey information about how many children each woman has. Two advantages of the crude birth rate are that the data requirements are low (which means that the necessary data can be obtained fairly easily) and that the measure is simple and straightforward. The main disadvantage is that the crude birth rate is influenced by the age and sex structure of the population, which means that having a high proportion of the population at peak childbearing ages (e.g., 20–29) will elevate the CBR, while having a low proportion of the population at peak childbearing ages will depress the CBR, even if each of the women in these populations has the same average completed family size. For example, women in both populations each might have an average of 2.0 births during their lifetime and yet the CBR for the first population would be higher.

The **general fertility rate** (GFR) is similar to the crude birth rate but the denominator is limited to the population “at risk” of having a birth, specifically women of childbearing age (defined as ages 15–44 or 15–49). The general fertility rate equals the number of births in a given year \( \times \) 1000 divided by the population of women aged 15–49 at mid-year. Unlike the CBR, which does not account for the age and sex structure of the population, the GFR does partially account for the age and sex structure. In other words, the GFR is not affected by the size of the population of men, the size of the population of girls under the age of 15, or the size of the population of women over the age of 45 (or 49). However, it is still affected by the age distribution within the group of women of childbearing age. For example, a country with a high proportion of women around the age of 25 (when childbearing is typically relatively high) will have a higher GFR than a country with a high proportion of women around the age of 40 (when childbearing is typically quite low), even if the women in these countries have the same completed family size on average.

An **age-specific fertility rate** (ASFR) is the number of births to women in a specific age range per 1000 women in that age range during a given time period. Age-specific fertility rates are usually calculated for five-year age groups and are generally presented as a series representing all age subgroups between the ages of 15 and 44 (or 49). For example, it is common to see the series of ASFRs for ages 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49. The advantage of ASFRs is that they are not affected by the age and sex
structure of the population and they allow for the comparison of fertility rates across ages within a population (to identify the ages at which childbearing is concentrated), as well as for the comparison of the fertility rates of an age group across populations (e.g., childbearing among 20–24-year-olds in Mexico versus the United States). The disadvantage of ASFRs is that they are a series of numbers rather than one simple summary measure.

Other measures of fertility are not true rates but do capture the level of childbearing in a population. The two most important of these measures are cohort completed fertility and the total fertility rate (see Preston, Heuveline, and Guillot 2001; Yaukey, Anderton, and Lundquist 2007; Haupt, Kane, and Haub 2011).

Cohort completed fertility (CFR) is the average number of children ever born to women in a particular birth cohort (e.g., the number of children ever born to the cohort of women aged 50–54 in the present year). Cohort completed fertility can be assessed only for women who are near the end – if not past the end – of their childbearing years, so it is usually calculated only at the ages of 40 and above. The main disadvantage of CFR is that it is inherently outdated. In other words, because it is measured when women are above the age of 40, it mainly describes childbearing experiences that happened at least 15–20 years earlier, when these women were in their peak childbearing years. The advantages of CFR include the facts that it is not affected by the age and sex structure, it is intuitive to understand because it is in the format of “children per woman,” and it is relatively easy to collect the data necessary to calculate it.

The total fertility rate (TFR) is a hypothetical measure (also called a "synthetic cohort" measure) that identifies the average number of children per woman if a group of women were to experience the age-specific fertility rates for a given year. In other words, the TFR for the current year can be thought of as the average number of children that today’s 15-year-olds would have if the current ASFRs were to remain constant over the next 30 years. The TFR is calculated using the series of ASFRs for a given year. The TFR is the principal measure used to describe fertility conditions in a population because of several appealing features. First, it is a period measure, so it describes childbearing for a given year (rather than for a given cohort); this means that the information it provides is more current. Second, it is in the format of “children per woman,” which is intuitive to understand and makes it easy to evaluate whether a population is on course to grow in the long term (in the case of TFRs above 2.1, approximately) or to shrink (in the case of TFRs below 2.1). Third, it is not influenced by the age structure of the population. One drawback of the TFR measure is that it is affected by changes in the timing of childbearing. For example, trends toward later and later childbearing will depress the TFR, that is, the TFR for a given year will be lower than the completed fertility of any of the cohorts of women having children during that year. Likewise, trends toward earlier and earlier childbearing will artificially elevate the TFR.

In order to calculate fertility rates, it is necessary to have information about the number of births (for the numerator) and the number of people in the population (for the denominator). Data on the number of births generally come from birth certificates, which also list the age of the mother and other relevant characteristics. For some fertility measures (such as the ASFRs) it is necessary to know the age of the mother, while for other measures (such as the CBR) it is not. Data on the number of people in the population or subpopulation generally come from census data. For some fertility measures (such as TFR, ASFRs, or GFR) it is necessary to know
the size of the population within specific age and sex groups, while for others (such as the CBR) only the size of the entire population is needed. Cohort-completed fertility is often calculated using a retrospective survey question that asks women how many children they have ever given birth to. Using this question, cohort completed fertility can be estimated for cohorts that are above the ages of 40 or 45.

Fertility rates are often evaluated in reference to “replacement level fertility,” which is the average number of children necessary in order for women (or couples) to exactly replace themselves, taking into account the fact that some individuals die before completing childbearing. In the absence of premature mortality (and with an equal number of daughters and sons), this would be 2.0 children per woman. In reality, for wealthy countries with high life expectancies, replacement-level fertility is generally considered to be 2.1 children per woman (Christenson, McDevitt, and Staneeck 2004; Yaukey, Anderton, and Lundquist 2007, 204–6). In countries with lower life expectancies, replacement-level fertility is higher, with a typical value being 2.3 children per woman. However, it is common for 2.1 to be treated as the universal benchmark of replacement-level fertility, irrespective of variation in mortality. A TFR value below replacement level indicates that a population will shrink in size over the long term, while a TFR value above replacement level indicates that a population will grow in size. A population that maintains a TFR equal to replacement level over the long term will remain the same size.

In historical populations, fertility levels were generally high – above five children per woman – but varied across populations as a result of differences in the “proximate determinants” of fertility (Davis and Blake 1956; Bongaarts and Potter 1983; Livi-Bacci 2012). These include the proportion who never marry, average age at marriage, and factors affecting the length of time between births (birth spacing) such as norms regarding length of breastfeeding and postpartum abstinence. The population with the highest recorded fertility was the Hutterites, a religious group residing in the United States and Canada. This group had a fertility rate of almost nine births per woman (Bongaarts and Potter 1983, 8–9). The large-scale decline in fertility began first in western Europe in the late nineteenth century (Coale and Watkins 1986). The decline was due to industrialization and urbanization, which reduced the benefits of having many children and increased the cost of each child (see Hirschman 1994 for a review). In particular, children’s labor became less valuable and less necessary as a form of informal insurance in old age for their parents. Further, there was a rise in wages so there were increased incentives for women to spend time working outside the home (and an increased opportunity cost of staying home to care for children). In addition, the returns to education rose, so parents increasingly sought to invest heavily in each child, making each additional child very expensive. Compounding these changes was a decline in the authority of religious institutions over people’s lives and, with increasing affluence, an increased value was placed on individualism and self-fulfillment. Jointly, these factors pushed fertility levels in Europe and North America down from around five children per woman in the mid-nineteenth century to two children per woman or lower in the late twentieth century (Livi-Bacci 2012, 130–31). The majority of this reduction was achieved without the assistance of highly effective methods of contraception (Lee 2003). Fertility levels fell, first, among couples who were more educated or lived in urban areas and, soon after, among those with lower levels of education or who
lived in rural areas (Yaukey, Anderton, and Lundquist 2007, 195–96).

In more developed countries, fertility levels are currently quite low, with TFRs around 2.0 or below. The countries with very low fertility rates include South Korea (TFR of 1.2), Japan (1.4), Poland (1.3), Italy (1.4), Spain (1.4), Germany (1.4), and many others (Population Reference Bureau 2012). The wealthy countries with the highest fertility levels include the United States (1.9), France (2.0), Sweden (1.9), and the United Kingdom (2.0). The factors that are important in determining the fertility levels in low-fertility contexts include people’s desired parity (i.e., the number of children people want), the age at which people start childbearing, the level of unwanted pregnancy and birth, and the degree of competition with work and other activities that are appealing alternatives to childbearing (Morgan 2003). There are varying explanations for why a particular country falls on the low end or the high end of wealthy countries (for more on these explanations, see Caldwell and Schindlmayr 2003; Kohler, Billari, and Ortega 2006). Fertility levels are said to be particularly low in East Asian countries (e.g., South Korea, Japan) and southern European countries (e.g., Spain, Italy) due to a pattern of gender relations which make it difficult for women to combine a heavy burden of labor within the home with paid employment outside the home. High unemployment and low starting wages in southern and eastern European countries, in particular, may result in delayed childbearing, which depresses fertility levels in those countries. In many of these low-fertility countries, it may be challenging for couples to have a second (or higher order) birth, even though people in most low-fertility countries commonly say they would like to have two children. In contrast, in Germany and Austria, a high proportion of people express a desire to be childless or to have only one child (Goldstein, Lutz, and Testa 2003). Fertility levels may be relatively high for Europe (closer to two children) in countries like France and Sweden as a result of strong governmental supports for childbearing, which seek to reduce the costs of childrearing on individual families. In the United States, relatively high fertility may be due to a flexible labor market which facilitates combining work and family, the presence of high-fertility subgroups (particularly Latinos), and possibly higher religiosity.

In less developed countries, the picture is more mixed, with TFRs ranging from around two up to around six. A large number of countries have a total fertility rate of around 2, including Brazil (TFR of 1.9), Mexico (2.3), Indonesia (2.3), and Vietnam (2.0; Population Reference Bureau 2012). In these countries, fertility levels fell later and more rapidly, compared to European countries. Specifically, fertility in these less developed countries had been fairly high until the second half of the twentieth century (in the six to seven range), at which point they fell quickly (Lee 2003). There is a second group of less developed countries – generally the poorest countries – in which fertility levels remain high. This includes much of sub-Saharan Africa – such as Mali (6.1) and Mozambique (5.9) – as well as countries like Afghanistan (6.2), Yemen (5.2), and Guatemala (3.6; Population Reference Bureau 2012). In countries where fertility remains high, it is commonly attributed to two main factors. First, in less developed economies, individuals often express a preference for larger families because the costs of children are lower and the benefits of children are higher, compared to wealthier countries (Pritchett 1994). Second, effective modern methods of contraception are often less available or less socially acceptable. It is common for women in many regions (particularly in
Africa) to have an "unmet need" for contraception; this means that women say they do not want to become pregnant but they are not using any form of contraception (Sedgh et al. 2007).

SEE ALSO: Aging of the World's Population; Censuses of Population; Conception; Contraception in the United States; Demographic Transition; Family Size; Nonmarital Births in the United States; One-Child Policy; Reproduction; Teen Parenting in the United States; Teen Pregnancy

REFERENCES


