

NATIONAL FAMILY HEALTH SURVEY

BULLETIN

INTERNATIONAL INSTITUTE
FOR POPULATION SCIENCES
MUMBAI

EAST-WEST CENTER
PROGRAM ON POPULATION
HONOLULU

Number 6
July 1997
ISSN 1083-8678

The NFHS BULLETIN summarizes findings from the 1992–93 National Family Health Survey. The NFHS collected information from nearly 90,000 Indian women on a range of demographic and health topics. The survey was conducted under the auspices of the Indian Ministry of Health and Family Welfare to provide national and state-level estimates of fertility, infant and child mortality, family planning practice, maternal and child health, and the utilization of services available to mothers and children.

The International Institute for Population Sciences (IIPS), Mumbai, conducted the NFHS in cooperation with various consulting organizations and 18 population research centres throughout India and with the East-West Center in Honolulu, Hawaii, and Macro International in Calverton, Maryland. The U.S. Agency for International Development provided funding for the NFHS and for this publication.

Measuring the Speed of India's Fertility Decline

Fertility has declined in India over the past 15 years, but estimates of precise fertility rates and the speed of fertility decline have varied. Accurate estimates of the speed of fertility decline are important for monitoring the progress of India's national family planning programme and for formulating India's five-year development plans, which are based partly on population projections.

Since the early 1970s, India's Sample Registration System (SRS) has been the authoritative source of fertility estimates for the country. The SRS is, in essence, a demographic sample survey based on a dual-record system, designed to provide national and state-level fertility and mortality estimates. It involves both continuous registration of births and deaths and six-monthly surveys to catch missed events. The system is based on a nationally representative sample of villages and urban blocks. The SRS sample includes 4,149 villages (or segments of villages in the case of large villages) and 2,151 urban blocks, comprising about 6 million population.

India's National Family Health Survey (NFHS), conducted during 1992–93, provides a second source of information for estimating fertility trends. The NFHS collected information from a nationally representative sample of 88,562 households, including 89,777 ever-married women age 13–49 within those households. The fertility estimates presented here from the NFHS have been derived by the "own-children" method, which is a reverse-survival method for estimating numbers of births by mother's age and numbers of women by age in previous years.

This issue of the *NFHS Bulletin* compares fertility trends for the 15-year period 1978 to 1992, as estimated from the SRS and the NFHS. The analysis indicates that fertility since the late 1970s has fallen faster than indicated by the SRS but more slowly than indicated by the NFHS. Current fertility is probably somewhat higher than indicated by either source.

Choosing an appropriate measure of fertility

Some measures of fertility, such as age-specific fertility rates (ASFRs) and the total fertility rate (TFR), require accurate measurement of the ages of women in the population. Because there is considerable misreporting of women's ages in both the SRS

R. L. Narasimhan, Robert D. Retherford, Vinod Mishra, Fred Arnold, and T. K. Roy

R. L. Narasimhan is director (marketing), Ministry of Health and Family Welfare, New Delhi. Robert D. Retherford is a senior fellow at the East-West Center's Program on Population. Vinod Mishra is a visiting fellow at the East-West Center's Program on Population. Fred Arnold is a senior population specialist at Macro International, Calverton, Maryland. T. K. Roy is a professor and head of the Department of Population Policies and Programmes at the International Institute for Population Sciences, Mumbai.

Table 1. NFHS and SRS estimates of the general fertility rate, India, 1978–92 (births per 1,000 women per year)

Time period	NFHS	SRS	NFHS/SRS
1988–92	124	124	1.00
1983–87	159	140	1.14
1978–82	167	140	1.19
1978–92	148	134	1.10

and the NFHS, this analysis is based mainly on another measure of fertility that is less sensitive to age misreporting: the general fertility rate (GFR), calculated as annual births divided by the mid-year population of women age 15–49. The estimated mid-year number of women age 15–49 is biased by age misreporting only to the extent that women are moved across age boundaries at 15 and 50. Bias from this source is small because the number of transfers across these boundaries is small compared with the total number of women in the 15–49 age group.

Comparing fertility estimates

Table 1 compares general fertility rates estimated from the SRS and the NFHS for three five-year periods between 1978 and

1992 (1978–82, 1983–87, and 1988–92) and for the entire 15-year period. Trends for single calendar years are shown in Figure 1. The NFHS estimates in the figure are three-year moving averages of single-year estimates. To some extent, these moving averages smooth irregularities in the single-year estimates that stem from misreporting of children's ages.

The general fertility rates estimated from the two sources agree quite well for the most recent five years, 1988–92, but diverge sharply further back in time. As shown in Table 1, moving backward over the three five-year periods, the ratio of general fertility rates estimated by the NFHS and the SRS increases from 1.00 to 1.14 to 1.19. For the 15-year period as a whole, the general fertility rate estimated from the NFHS is 10% higher than the rate estimated from the SRS. How shall we interpret this?

SRS: Evidence of birth underregistration

There may be some underregistration of births in the SRS, which would result in fertility estimates that are too low. One way to check for this bias is to look at recorded sex ratios at birth.

In the absence of large-scale sex-selective abortion, the sex ratio at birth should

fall in the range of 105 to 107 male births per 100 female births. Because of the high degree of son preference in India, household heads (or other household informants) are more likely to omit female births than male births when interviewed by the SRS. If such omissions are frequent, the estimated sex ratio at birth should be higher than 107.

Indeed, according to the Registrar General, India (1997) the sex ratio at birth reported by the SRS for the period 1981–90 was 110—well above the expected level. This indicates that there was substantial underregistration of female births.

Unfortunately, it is not possible to determine whether the sex ratio at birth recorded by the SRS has declined over time, indicating improvements in registration completeness, because the Registrar General has not published annual estimates. Evaluation studies conducted by the Office of the Registrar General provide evidence that births are, in fact, under-registered in the SRS and that birth registration completeness has improved over time, from 96.8% in 1980–81 to 98.2% in 1985 (Registrar General, India, 1988). However, the extent of underregistration may have been much greater in earlier years than these evaluation studies indicate. An improvement in the registration of births over time would make any decline in fertility over the same period appear slower than it actually was.

NFHS: Evidence of birth displacement and omission

Sex ratios at birth derived from the NFHS were virtually constant over the 15-year period covered by Table 1 and Figure 1. For India as a whole, the NFHS reported a sex ratio at birth of 106.3 for 1987–91, 106.3 for 1982–86, and 106.6 for 1977–81. For 1972–76 the ratio is also 106.6. These values are all within the expected range (IIPS, 1995, p. 325).

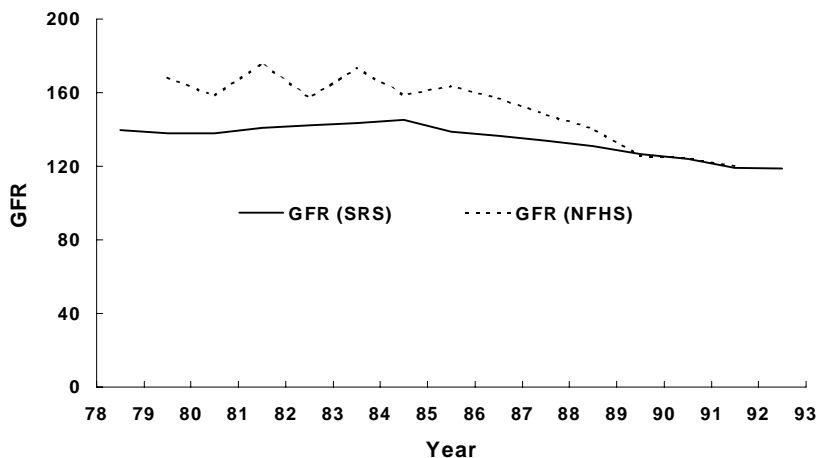


Figure 1. Trends in the general fertility rate, India, 1978–92 (births per 1,000 women per year)

Although the trend in sex ratios at birth suggests that the NFHS data are of good quality, there is nevertheless a pattern of misreporting children's ages that produces a series of artifactual peaks and troughs in estimated numbers of births for any given year. In the NFHS, annual estimates of past births correspond to children of a particular age at the time of the survey. For example, births in the year before the survey correspond to children age 0 (i.e., below age 1), births during the second year before the survey correspond to children age 1, and so on. If children are overreported at some ages and underreported at others, there will be peaks and troughs in the estimated fertility rates for the corresponding years before the survey. This problem does not arise in the SRS, because births are registered when they occur.

Some of this overreporting and underreporting at particular ages occurs because of heaping on preferred ages, most notably in the NFHS at ages 5, 8, 10, and 12. In addition, some interviewers were undoubtedly occasionally motivated to leave out a child below age 5, or to assign an age of 5 or higher to such a child, in order to avoid having to ask a large block of extra questions pertaining only to young children (those born since 1 January of the fourth year before the survey). This kind of intentional omission and displacement of births by interviewers, to the extent that it occurred, would be unrelated to son preference and thus would not be revealed by trends in the sex ratio at birth.

Table 1 and Figure 1 suggest that this kind of intentional omission and displacement occurred. The sharp increase in the general fertility rate from the most recent five-year period (1988–92) to the previous period (1983–87) suggests that interviewers omitted some more recent births or displaced them to the earlier period. Some of this displacement may have occurred because of a

tendency to heap children's ages on age 5. A tendency to heap ages on age 10 has the further effect of shifting births from the second to the third five-year period before the survey. This would offset some of the displacement of births from the first to the second period, reducing the inflation in the general fertility rate for 1983–87 but contributing to inflation for the period 1978–82.

As shown in Table 1, the ratio of general fertility rates estimated by the NFHS and the SRS increases from 1.00 in 1988–92 to 1.14 in 1983–87 and 1.19 in 1978–82. It seems likely that birth registration in the SRS improved much too gradually to account for these abrupt changes.

The jump from 1.00 to 1.14 is also too great to be explained entirely by displacement of births in the NFHS. It suggests that the NFHS interviewers may have intentionally omitted some births that occurred during the most recent five-year period. If, indeed, the NFHS underestimated births for the five-year period just before the survey but overestimated births for the two previous five-year periods, then the fertility decline estimated by the NFHS would be more rapid than in fact it was.

A look at contraceptive use rates

The trend in fertility can also be estimated using a third source of information, contraceptive use rates from family planning service statistics. The Ministry of Health and Family Welfare provides information on couple protection rates (CPRs) among currently married women age 15–49. In India as a whole, the couple protection rate increased from 23% in 1978 to 44% in 1992. The annual series of couple protection rates can be used to predict total fertility rates using a statistical model based on data from more than 90 countries around the world. The model is $TFR = 7.2931 - 0.0700 \text{ CPR}$. The total fertility rate, defined as the number of children a woman would bear throughout her reproductive years at current age-specific fertility rates, is used here because a similar model is not available for the general fertility rate.

Figure 2 compares the total fertility rates predicted from couple protection rates and estimated by the SRS and the NFHS. As in Figure 1, the NFHS rates are three-year moving averages. The total fertility rates estimated from the SRS and the NFHS converge over time much like the general fertility rates shown in Figure 1. The total fer-

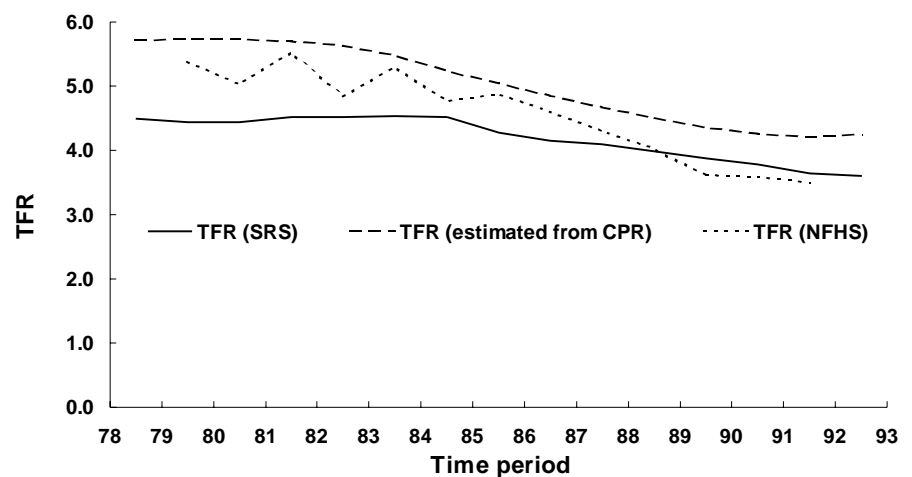


Figure 2. Trends in the total fertility rate, India, 1978–92 (births per woman)

tivity rates predicted from couple protection rates decline more steeply than the rates estimated from the SRS but not as steeply as those estimated from the NFHS. This finding provides additional indirect evidence that registration of births by the SRS has improved in recent years and that the NFHS omitted some recent births and displaced some to previous years.

The total fertility rates predicted from couple protection rates are higher than the fertility rates estimated from either the SRS or the NFHS. Contraceptive users in India rely more heavily on sterilization than do users in other countries, implying that a given level of contraceptive use results in lower fertility in India than elsewhere, since sterilization is more effective than other methods. Thus in India, the fertility rates predicted from couple protection rates may be too high.

What do the comparisons tell us?

Taken together, the various pieces of evidence indicate three main reasons for the convergence of general fertility rates from the NFHS and the SRS between 1978 and 1992: a higher rate of underregistration of births in earlier years in the SRS, backward displacement of births in the NFHS, and omission of births in the NFHS in the first, but not in the second or third, five-year periods before the survey.

The **International Institute for Population Sciences** was established at Mumbai in 1956 as the regional institute for training and research in population studies for the Asia and Pacific region of the United Nations. Now also a deemed university, it is an autonomous institution sponsored jointly by the Government of India, the United Nations Population Fund, and the Sir Dorabji Tata Trust.

The U.S. Congress established the **East-West Center** in 1960 to foster mutual understanding and cooperation among the governments and peoples of the Asia-Pacific region, includ-

If these inferences are correct, the fertility decline estimated from the NFHS is too steep, and the fertility decline estimated from the SRS is not steep enough. The fertility trend predicted by the trend in contraceptive use provides further evidence that the speed of fertility decline is overestimated by the NFHS and underestimated by the SRS.

The general fertility rate estimated from the NFHS for 1988–92 appears to be too low, yet it is identical to the GFR estimated from the SRS for the same period. This suggests that the SRS underregistered births during this period to the same extent that the NFHS displaced and omitted births. The true level of fertility in 1988–92 is probably somewhat higher than indicated by either the SRS or the NFHS.

The NFHS estimated a general fertility rate for the period 1978–92 at 148 births per 1,000 women age 15–49. The births used to calculate this rate were estimated by reverse-surviving children age 0–14 at the time of the survey back to birth. There is no heaping of children's ages on age 15, which suggests that few births were shifted from these 15 years back to an earlier period. This means that the general fertility rate estimated for the full 15-year period should be affected very little, if at all, by displacement of births. It is undoubtedly somewhat too low, however, because of omission of births during the most recent five-year period.

ing the United States. Principal funding for the Center comes from the U.S. Government, with additional support provided by private agencies, individuals, and corporations and more than 20 Asian and Pacific governments.

The *NFHS BULLETIN* Editorial Committee consists of Fred Arnold, B. M. Ramesh, Robert D. Retherford, T. K. Roy, and Sidney B. Westley.

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Yet the NFHS estimate of the general fertility rate for the full 15 years is 10% higher than the SRS estimate. This suggests that the SRS underregistered births during this 15-year period by at least 10%. This level of underregistration is considerably higher than indicated by earlier evaluation studies conducted by the Office of the Registrar General. It suggests that birth registration completeness in the SRS has improved much more sharply over time than previously thought.

This issue of the *NFHS Bulletin* is based primarily on a paper by the same authors, "Comparison of fertility estimates from India's National Family Health Survey and Sample Registration System," which was presented at the IUSSP Seminar on Comparative Perspectives on Fertility Transition in South Asia, held in Islamabad, Pakistan, 17–20 December 1996. It also draws on information from:

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Correspondence addresses:

International Institute for Population Sciences (IIPS)

Govandi Station Road, Deonar
Mumbai - 400 088, India

Fax: 91-22-556-3257

E-mail: iips.nfhs@access.net.in

East-West Center

Program on Population/Publications
1601 East-West Road
Honolulu, HI 96848-1601, U.S.A.

Fax: 1-808-944-7490

E-mail: poppubs@ewc.hawaii.edu