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Declining Fertility in Nepal

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After substantial efforts by population and family planning programmes, fertility in Nepal has begun to decline

The purpose of this article is to assess the trend of fertility in Nepal over the past two decades. Fertility trends are estimated from two national surveys, the 1991 Nepal Fertility, Family Planning and Health Survey (NFFPHS), which was conducted as part of the worldwide Demographic and Health Survey (DHS) programme, and the 1996 Nepal Living Standards Survey (NLSS). Both surveys included retrospective birth histories. The two surveys were taken four years apart, and each yields an estimated fertility trend during the 15-year period immediately preceding the survey. The trend based on the NFFPHS extends over the period 1977-1991, and the trend based on the NLSS extends over the period 1981-1995. The two trends overlap during the period 1981-1991. If the estimation is accurate in both surveys, the two trends should coincide during the period 1981-1991. If they do not coincide, analysis of the discrepancies may yield valuable information about the nature of reporting errors in each of the two surveys and a more accurate assessment of the true trend of fertility than can be obtained from either survey alone.

Data

The 1991 Nepal Fertility, Family Planning and Health Survey

The NFFPHS was a national survey based on a representative sample of households throughout the country (Ministry of Health, 1993). The sample included completed interviews for 24,745 households, and, within these households, 25,384 ever-married women. The sample was de facto, meaning that persons who slept in the household the night before the interview, including visitors, were interviewed. The survey included a household schedule, with the household head or any other knowledgeable adult in the household responding for the entire household. It also included an individual schedule, with each individual ever-married woman as the respondent.

The NFFPHS was conducted over a seven-month period, from August 1991 to February 1992. Most of the interviewing was conducted during late 1991. Accordingly, the year before the survey falls mainly in 1991 and is labelled as such in the tables and graphs presented in this article.

The 1996 Nepal Living Standards Survey

The NLSS was also a national survey based on a representative sample of households throughout the country (CBS, 1996). However, the sample size of the NLSS was considerably smaller than the sample size of the NFFPHS. The sample included 3,373 households (completed interviews) and a somewhat larger number of ever-married women. The sample was de jure, meaning that it included persons for whom the sample household was their usual place of residence.

The NLSS was conducted between April 1995 and June 1996, with most interviews occurring at the end of 1995 or the beginning of 1996. Accordingly, the year before the survey falls mainly in 1995 and is labelled as such in the tables and graphs presented in this article.

Quality of data

Figures 1 and 2 graph the age distributions for females for the 1991 NFFPHS and the 1996 NLSS. Females are shown because age-specific fertility rates are calculated for females. The age distribution of males resembles the age distribution of females on the general features discussed below.

Figure 1: Female age distribution: 1991 NFFPHS

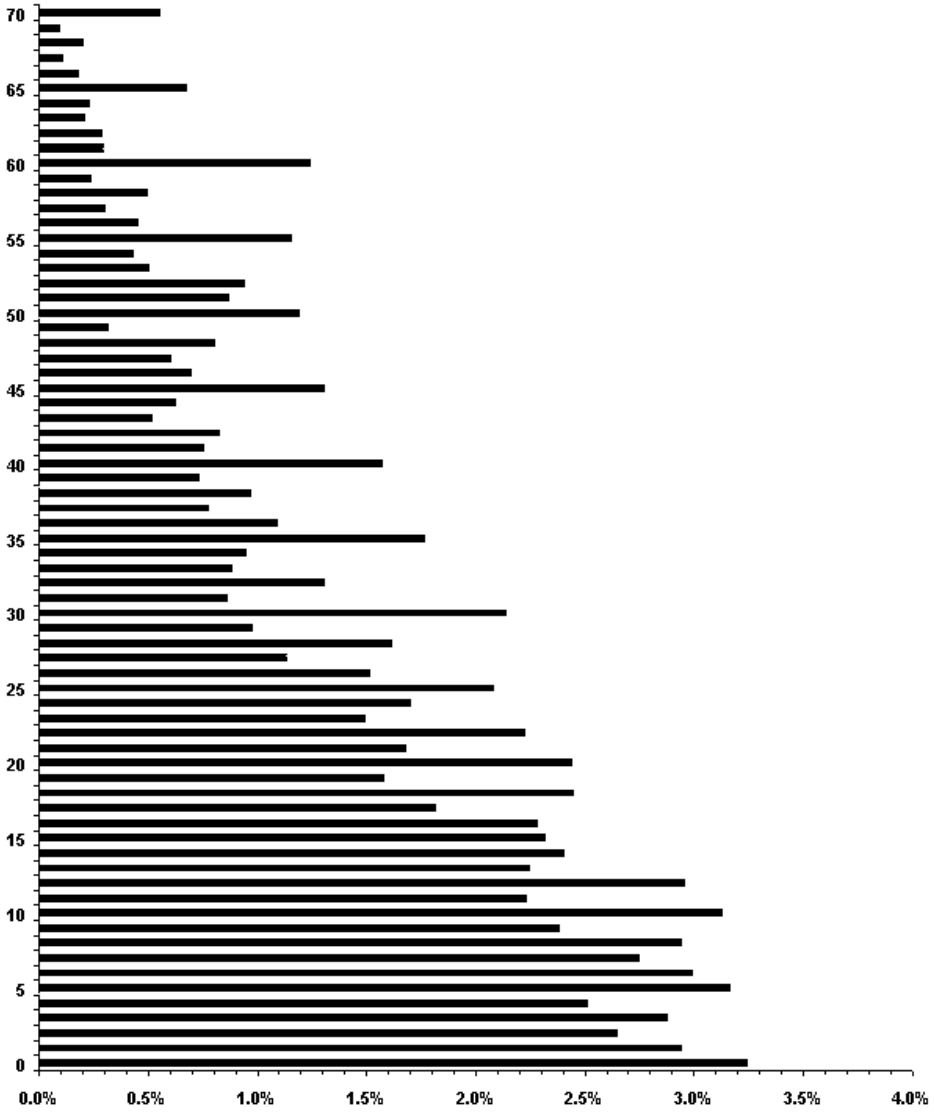


Figure 1 for the NFFPHS shows a higher proportion of infants (children less than one year of age) than of children aged 1, 2, 3, or 4. This may occur not only because of population growth and the cumulative effects of child mortality, but also because of emphasis in the training of interviewers on the importance of complete and accurate identification of infants for purposes of computing infant mortality rates and other measures. There is a big jump in the proportion at age 5. This may occur partly because of a general preference for ages ending in the digits 0 and 5, and partly because some interviewers may tend to move some children age 4 to age 5 in order to avoid having to ask a large block of questions asked of children aged 0-4. (This is a common problem in demographic and health surveys taken in recent years; see, for example, the discussion in IIPS, 1995.) This may occur especially when the respondent is not sure whether the child is age 4 or age 5.

Figure 1 also shows considerable heaping on ages 8, 10 and 12, which is typical in South Asian countries as well as many other developing countries (Retherford and Alam, 1985). At older ages there is a consistent pattern of heaping on ages ending in the digits 0 or 5.

Figure 2: Female age distribution: 1996 NLSS

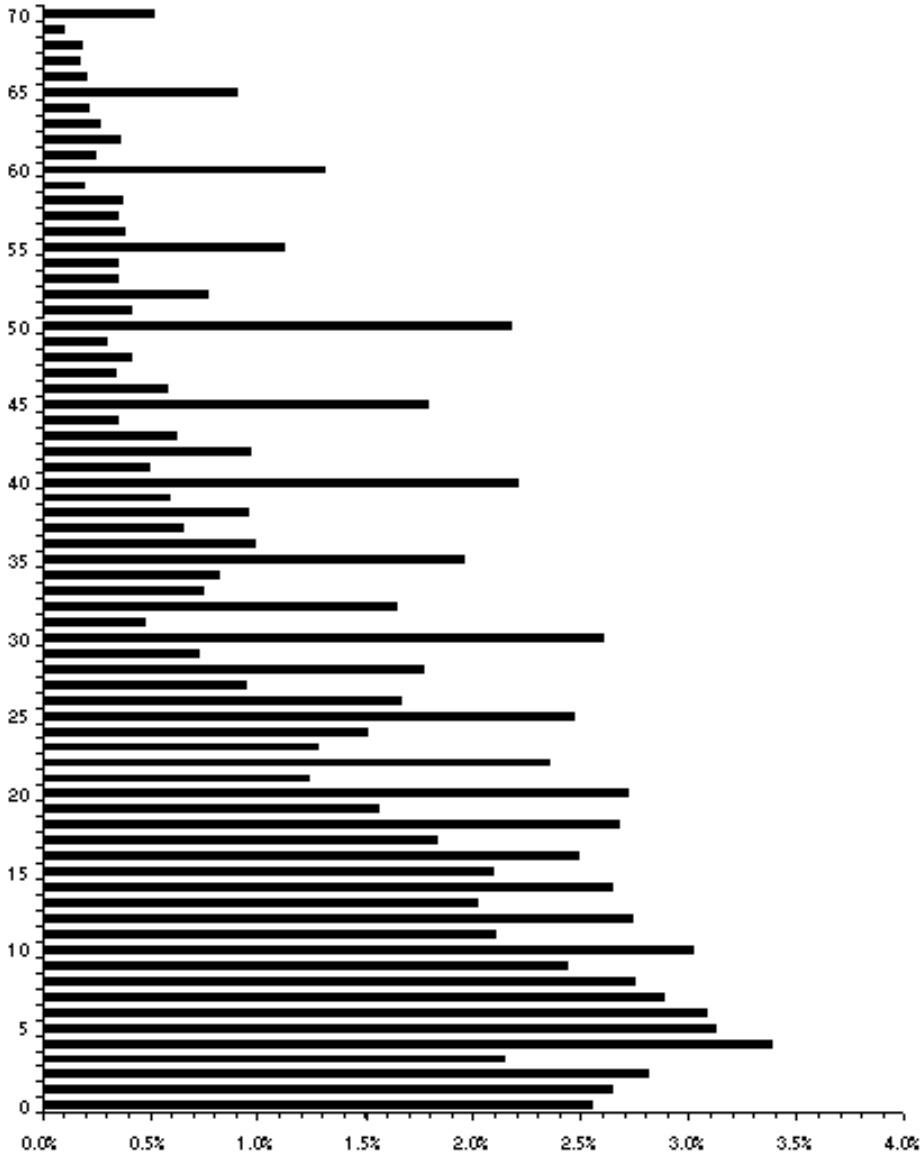


Figure 2 for the NLSS shows a pattern of age heaping for adults that is similar to but more extreme than that observed in the NFFPHS, but a rather different pattern of age misreporting for children. The NLSS, unlike the NFFPHS, shows a lower proportion of infants than of children aged 1 or 2. This could have occurred either because some infants were missed or, more likely, because some children aged 0 or 1 were rounded upward to age 1 or 2. It also shows a large deficit of children aged 3, and a large surplus of children aged 4. The deficit at age 3 probably occurs because some interviewers tend to move children aged 3 to age 4 in order to avoid asking a large block of questions pertaining to children aged 0-3. The surplus at age 4 occurs not only for that reason but perhaps also because of a tendency to move some children from age 5 to age 4 in order to avoid asking another block of questions pertaining to children aged 5 and older. On the whole, age misreporting appears to be worse in the NLSS than in the NFFPHS.

Figure 3: Men number of children ever born by single years of age: ever-married women, 1991 NFFPHS

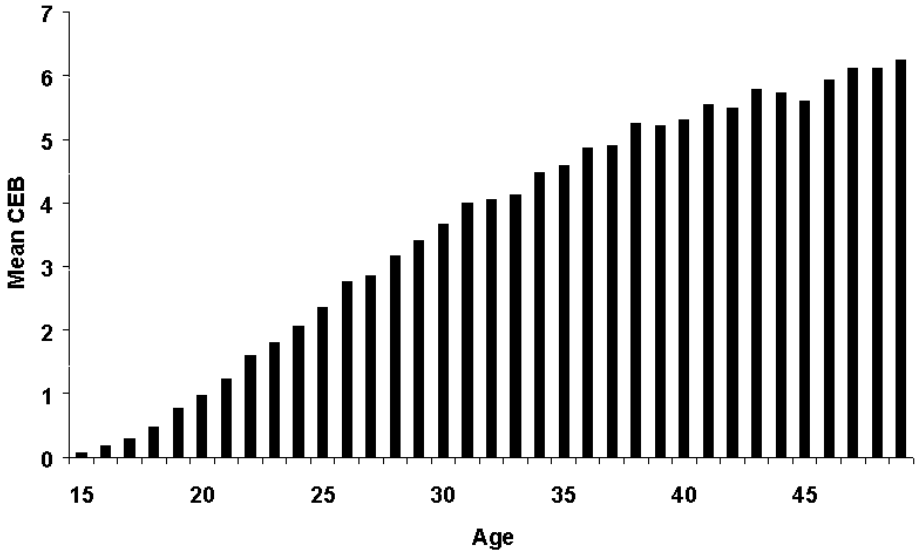
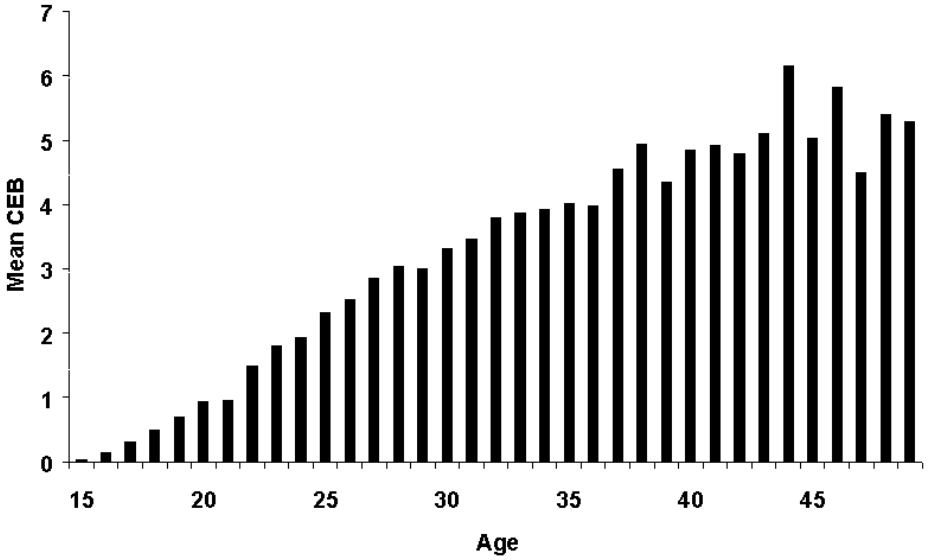


Figure 4: Men number of children ever born by single years of age: ever-married women, 1991 NFFPHS



Figures 3 and 4 examine the quality of reporting of the number of children ever born in the two surveys. Figure 3, pertaining to the NFFPHS, shows mean number of children ever born (CEB) by single years of age of a woman. Mean CEB increases regularly, with minor exceptions, right up to age 49, indicating a high degree of completeness of reporting of children ever born. Figure 4, pertaining to the NLSS, shows a less regular pattern. The decline in mean CEB after age 44 may indicate that older women increasingly tend to omit from the birth histories children who are dead and children who are married and no longer live in the household. On the whole, figures 3 and 4 suggest that reporting of births in the birth histories is somewhat less complete in the NLSS than in the NFFPHS.

Methodology

Birth history method

The birth history (BH) method is one of two methods by which we derive fertility estimates from the NFFPHS and the NLSS. The method is straightforward. One simply counts births by age of mother as reported in the birth histories for each year up to the fifteenth year before the survey. Similarly, woman-years of exposure to the risk of birth are counted by woman's age. Then the births by age of the mother are divided by woman-years of exposure by the woman's age to obtain estimates of age-specific fertility rates (ASFRs). Total fertility rates (TFRs) are obtained by summing ASFRs in five-year age groups and multiplying the sum by five. Birth histories were collected only for ever-married women aged 15-49. It was assumed that never-married women have had no births. Base calculations were done in months. Rates were converted to a yearly basis only at the end of the calculation.

Because birth histories were collected from women only up to the age of 49, we could not calculate a complete set of ASFRs for earlier years. For example, the oldest women in the sample, who were 49 at the time of the survey, were only 44 five years earlier. Therefore, one cannot calculate an ASFR for women 45-49 for years earlier than five years before the survey. We are interested in fertility for the 15-year period preceding the survey. Fifteen years previously, the oldest woman in the sample was 34 years old. If we want comparable fertility measures for each of the 15 years before the survey, we cannot make use of fertility at ages 35 and older. A suitable summary measure of fertility that is comparable over the entire period is CFR(35), i.e. the cumulative fertility rate up to age 35. This measure is calculated by adding ASFRs in five-year age groups from 15-19 to 30-34 and multiplying the sum by five.

Own-children method

The own-children method is a reverse-survival method for estimating ASFRs for years prior to a census or household survey. In the present instance, the method is applied to the NFFPHS and NLSS household samples. Enumerated children are first matched to mothers within households, based on answers to questions on age, sex, marital status and relation to head of household. A computer algorithm is used for matching. The matched (i.e. own) children, classified by their own age and mother's age, are then reverse-survived to estimate the number of births by age of the mother in previous years. Reverse-survival is similarly used to estimate the number of women by age in previous years. After adjustments are made for unmatched (i.e. non-own) children, age-specific birth rates are calculated by dividing the number of reverse-survived births by the number of reverse-survived women. Estimates are normally computed for each of the 15 years or groups of years before the survey. Estimates are not usually computed further back than 15 years because births must then be based on children age 15 or more at the time of enumeration, a substantial proportion of whom (especially girls who leave the household upon marriage) do not reside in the same household as their mother and hence cannot be matched. All calculations are done initially by single years of age and time. Estimates for grouped ages or calendar years are obtained by appropriately aggregating single-year numerators (births) and denominators (women) and then dividing the aggregated numerator by the aggregated denominator. Such aggregation is useful for minimizing the distorting effects of age misreporting on the fertility estimates (Cho and others, 1986).

Reverse-survival requires life tables. Life tables are available for 1981 and 1991 (CBS, 1995). Life tables for other years were obtained by linear interpolation or extrapolation of life-table age-specific probabilities of dying which were then used to calculate complete life tables. Life tables for 1981 and 1991 are published for males and females separately but not for both sexes combined, so we calculated the combined life table from the male and female life tables. Urban-rural breakdowns are not available, so the same life tables by sex were used for urban and rural areas. No adjustments were made for age misreporting.

Findings

Fertility trends for the whole country

Figures 5 and 6 show fertility trends for the entire country, estimated separately from the NFFPHS and the NLSS. Figure 5 compares birth history (BH) and own-children (OC) estimates of CFR(35) derived from the NFFPHS, and figure 6 compares BH and OC estimates of CFR(35) derived from the NLSS. In each figure, the OC and BH estimates agree rather well, and this gives us confidence that the own-children method can be used for estimating trends in TFR. As mentioned previously, it is not possible to obtain estimates of trends in the TFR using the birth history method, because of age truncation in the birth histories, which were collected only for women aged up to 50 years.

Figure 5: Trend in CFR(35), estimated alternatively by the birth history method and the own-children method: 1991 NFFPHS

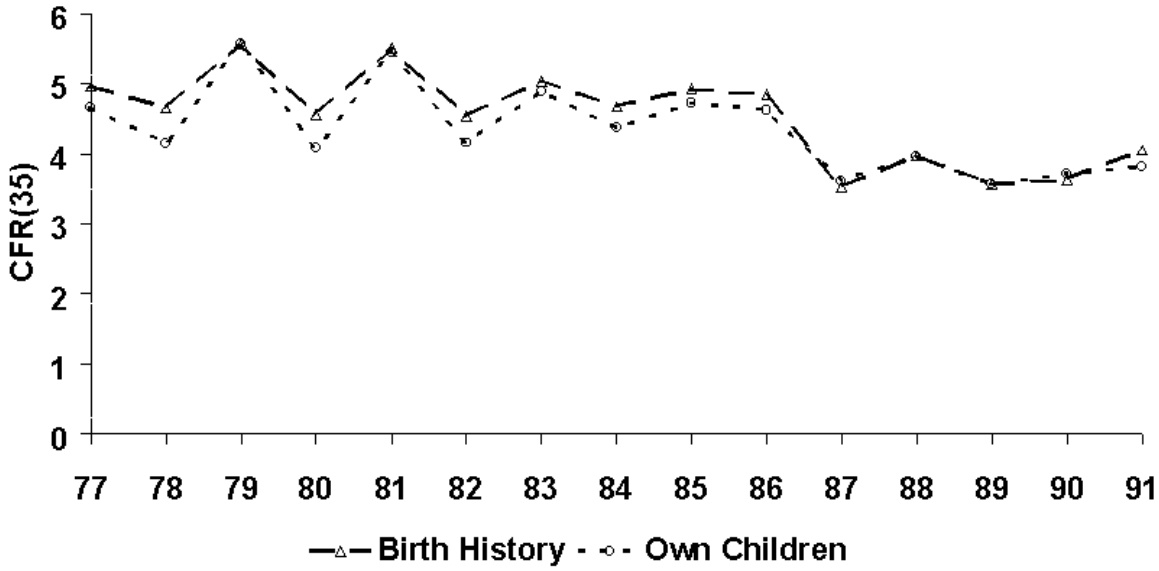


Figure 5, which is based on the NFFPHS, shows that CFR(35) jumps up between the fifth and sixth years before the survey. Births in the sixth year before the survey correspond to children aged 5 at the time of the survey. As mentioned in the discussion of the NFFPHS age distribution in figure 1, there is some heaping of children's ages on age 5, partly because of normal heaping on ages ending in the digits 0 or 5, and partly because of a probable tendency of some interviewers to move some children from age 4 to age 5 in order to avoid having to ask a large block of questions pertaining to children aged 0-4. If this reasoning is correct, the sudden jump in fertility between the fifth and sixth years before the survey is due to age misreporting and is spurious. The peaks in fertility in the ninth, eleventh and thirteenth years before the survey, which stem from heaping of children's ages on ages 8, 10 and 12, are also spurious.

Figure 6: Trend in CFR(35), estimated alternatively by the birth history method and the own-children method: 1991 NFFPHS

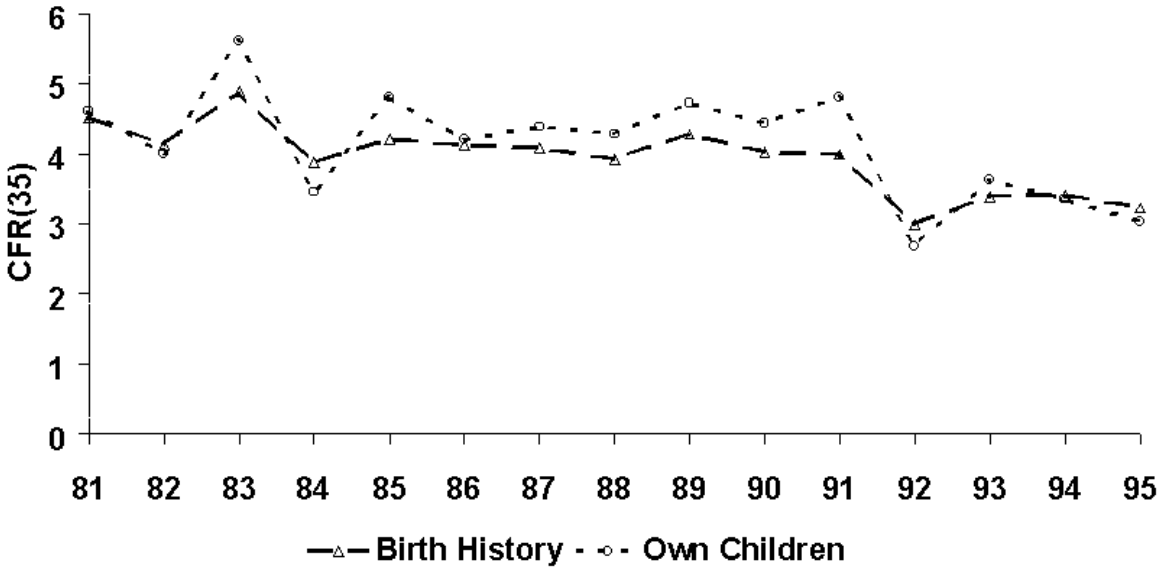


Figure 6, based on the NLSS, shows that CFR(35) increases between the first and third years before the survey, drops substantially in the fourth year before the survey, and then increases greatly in the fifth year before the survey. This pattern can also be traced to the patterns of age misreporting mentioned previously in the discussion of figure 2. The trough in the fourth year before the survey probably occurs because of a tendency of interviewers to move children from age 3 to age 4 in order to avoid having to ask a large block of questions pertaining to children aged 0-3. The other side of the coin is the peak in fertility in the fifth year before the survey, corresponding to children aged 4 at the time of the survey. The peak in the fifth year is perhaps further enhanced by a tendency of some interviewers to move children from age 5 to age 4 in order to avoid having to ask another block of questions pertaining to children aged 5 and older. If this reasoning is correct, the large drop in fertility between the third and fourth years before the survey and the large increase in fertility between the fourth and fifth years before the survey are both due to age misreporting and are spurious.

Figure 7 shows overlapping trends for CFR(35), derived by the BH method applied to the two surveys. The trend based on the NFFPHS is slightly higher than the trend based on the NLSS before 1986 and slightly lower after 1986. Figure 8 shows a similar graph of overlapping trends for the TFR, derived by the OC method. The pattern is rather similar to that in figure 7, although somewhat more affected by irregular fluctuations due to age misreporting, which tends to be worse for women over 35, who are included in the TFR but not in CFR(35). After peaks and troughs due to age misreporting are discounted, the trends overlap fairly well.

Figure 7: Fertility trends derived from the 1991 Nepal Fertility, Family Planning and Health Survey

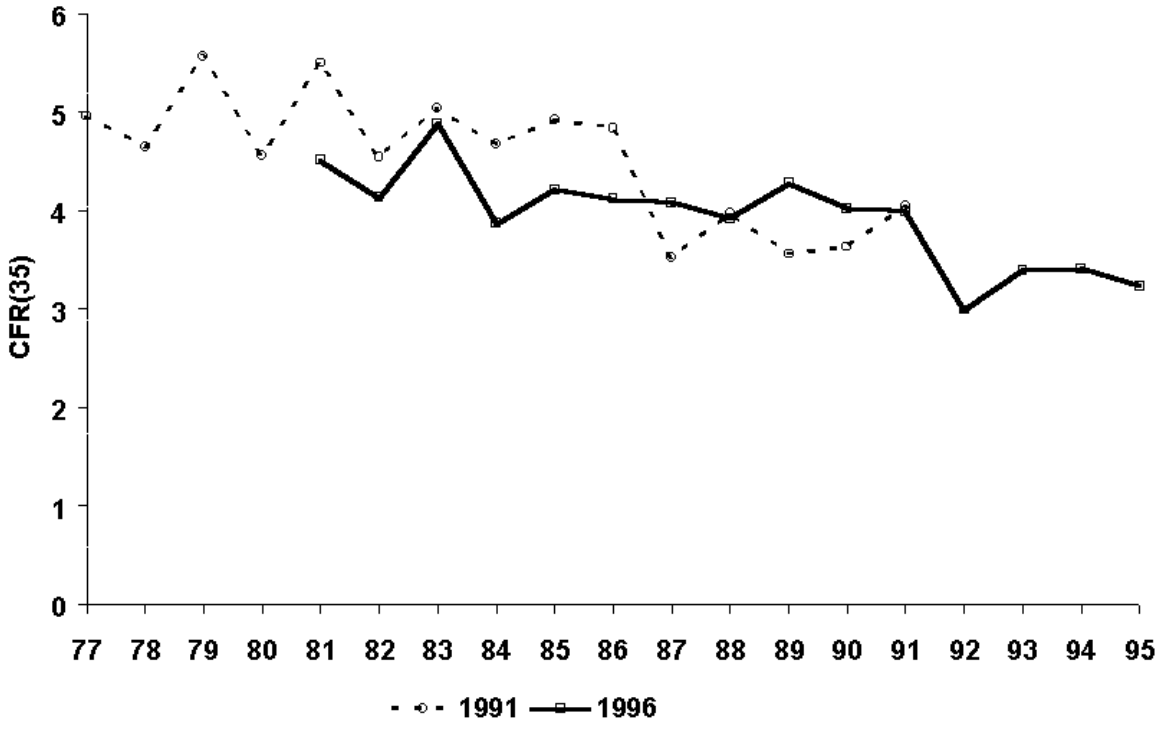
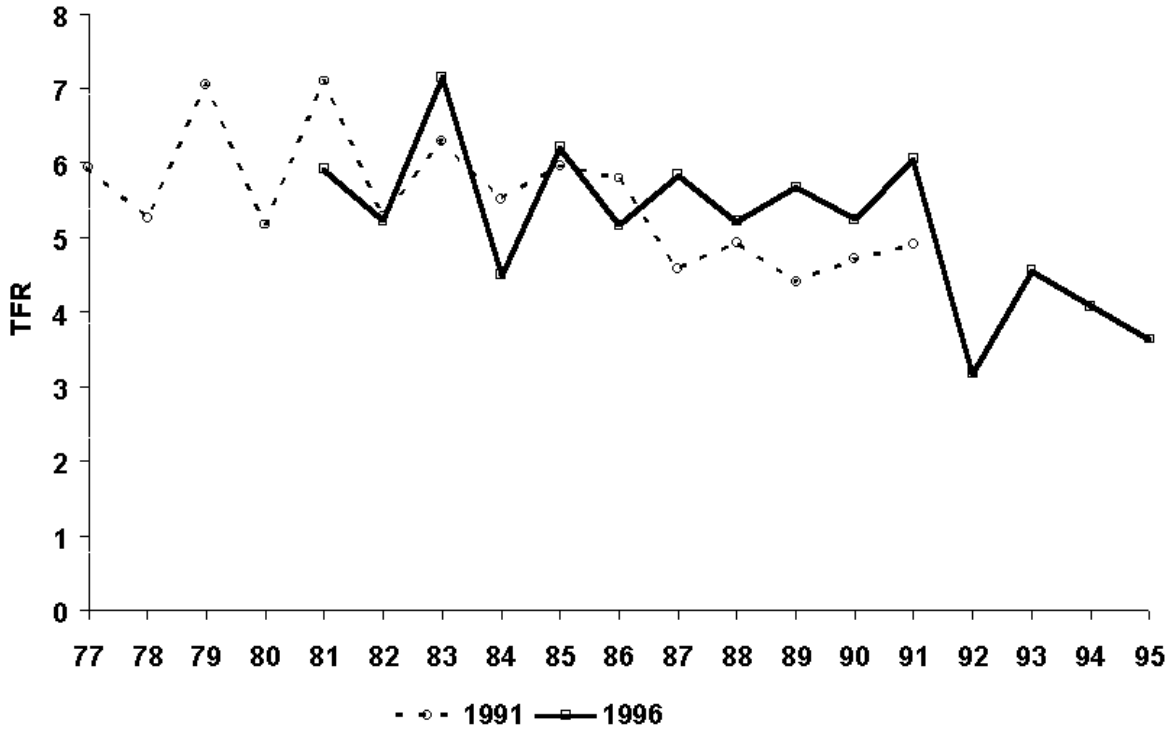


Figure 8: Fertility trends derived from the 1996 Nepal Living Standards Survey



From the analysis so far, it is clear that the fertility trends by single years of time are affected to a considerable extent by annual fluctuations due to age misreporting. One way to lessen the impact of age misreporting is to aggregate results over calendar years. To this end, we have subdivided the 15-year estimation period prior to each survey into three 5-year time periods. Results are shown in figures 9 and 10, and in tables 1 and 2. In figures 9 and 10, points are plotted at the midpoints of the five-year time periods to which they refer.

Table 1: Fertility trends derived from the 1991 Nepal Fertility, Family Planning and Health Survey

1977-1981 1982-1986 1987-1991 1977-1981

Method: ASFR, CFR, or TFR				
Birth history				
15-19	151	149	104	132
20-24	301	299	255	271
25-29	304	284	224	240
30-34	246	228	167	180
CFR(35)	5.01	4.80	3.75	4.14
Own children				
15-19	141	132	97	121
20-24	282	283	244	267
25-29	289	276	231	263
30-34	245	220	176	211
35-39	161	156	119	144
40-44	82	69	61	70
45-49	22	19	15	18
CFR(35)	4.79	4.56	3.74	4.31
TFR	6.11	5.77	4.71	5.47

Note: ASFRs are presented per thousand women; CFRs and TFRs are per woman.

Table 2: Fertility trends derived from the 1996 Nepal Living Standards Survey

1981-1985 1986-1990 1991-1995 1981-1995

Method: ASFR, CFR, or TFR				
Birth history				
15-19	132	134	95	118
20-24	259	272	241	243
25-29	241	231	200	203

30-34	216	180	141	148
CFR(35)	4.24	4.09	3.39	3.56
Own children				
15-19	143	159	110	136
20-24	277	297	245	271
25-29	263	244	194	231
30-34	216	182	147	179
35-39	157	122	101	125
40-44	84	60	47	63
45-49	22	22	11	18
CFR(35)	4.49	4.41	3.48	4.08
TFR	5.81	5.43	4.28	5.11

Note: ASFRs are presented per thousand women; CFRs and TFRs are per woman.

Figure 9: Overlapping trends in CFR(35), estimated for five-year time periods by the birth history method: 1991 NFFPHS and 1996 NLSS

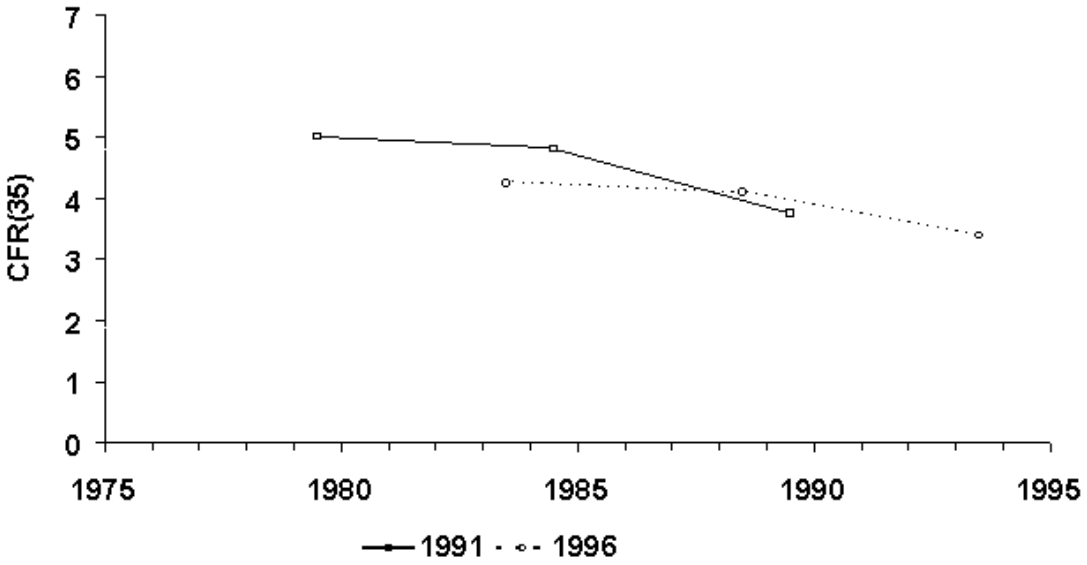


Figure 9 shows the trend in CFR(35) for aggregated time periods derived alternatively from the NFFPHS and the NLSS. Each piecewise-linear curve has two segments. In each case, there is little or no decline in fertility during the first segment, then a steeper fertility decline during the second segment. The period of overlap extends approximately from 1983 to 1989. During this period of overlap, one curve shows virtually no fertility decline, and the other curve shows fairly substantial fertility decline. Our interpretation of this inconsistency is that in each survey, there is some displacement of births from the first five years before the survey to the second five years before the survey. This displacement of births reflects some shifting of children in the age group 0-4 at the time of the survey into the age group 5-9 at the time of the survey. The result is an estimate of CFR(35) that is somewhat too low during the first five years before the survey and somewhat too high during the second five years before the survey.

Figure 10: Overlapping trends in TFR, estimated for five-year time periods by the own-child method: 1991 NFFPHS and 1996 NLSS

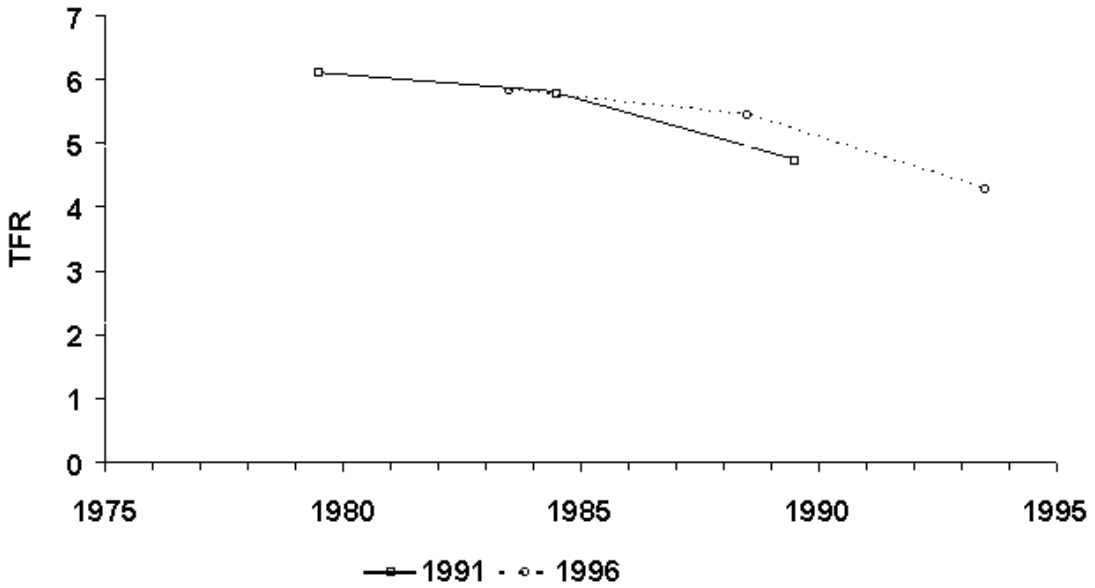


Figure 10 shows a similar pattern in the trend in the TFR derived by the own-children method applied to the two surveys. In this case the fertility decline is a little steeper, as expected, since the TFR includes women at ages above 35 where fertility decline is more concentrated. However, the pattern of too little decline during the first segment of time and too much decline during the second segment of time just before the survey is similar to the pattern for CFR(35) in figure 9. Previously it was mentioned that, in the NLSS, some children aged 5 may have been shifted to age 4. However, figure 9 suggests that some children were also shifted the other way, from age 4 to age 5, perhaps because of a typical tendency to report age at numbers ending in 0 or 5. This latter tendency appears to have predominated, resulting in a net shift of children from the 0-4 age group to the 5-9 age group.

What can we say about the general trend of fertility? It seems reasonable simply to fit a straight line through the six points in figure 9, and also through the six points in figure 10, to ascertain the average rate of fertility decline over the period 1977-1995 examined in the present study. A straight line fit seems reasonable because contraceptive use was increasing steadily over the entire period, implying that fertility was also declining steadily (in contrast with the concentration of fertility decline during the five years immediately preceding each survey, as shown by each survey separately). The proportion of currently married women aged 15-49 who ever used contraception increased from 4 per cent in 1976 to 9 per cent in 1981 to 16 per cent in 1986 to 27 per cent in 1991 and to 38 per cent in 1996 (Ministry of Health, 1993 and 1996).

The fitted lines are:
CFR = 14.140 - .115 T
TFR = 17.066 - .135 T

where T denotes calendar year (just the last two digits, e.g. 1977 is 77).

These equations imply that, between 1977 and 1991, CFR(35) declined by 1.61 children, from 5.29 in 1977 to 3.68 in 1991, and that the TFR declined by 1.90 children, from 6.68 in 1977 to 4.78 in 1991. In as much as the previous discussion of quality of data indicated that births may be less completely reported in the 1996 NLSS than in the 1991 NFFPHS, the extent of fertility decline between 1977 and 1991 may be somewhat less than what is implied by these regression equations. These results do not necessarily mean that fertility started declining as early as 1977. However, the data on which this analysis is based are not accurate enough to date the start of fertility decline, and this is why we present here only the average rate of decline, obtained by regression, for the entire period 1977-1991. As discussed below in the conclusion, there is considerable evidence that fertility started to decline around 1980, in which case the speed of fertility decline after 1980 may be somewhat faster than estimated here. On the other hand, births appear to be somewhat less completely reported in the NLSS than in the NFFPHS, and this tends to exaggerate the speed of fertility decline.

Fertility trends by urban-rural residence

It is also of interest to look at fertility trends separately for urban and rural areas. This is done in figures 11-14 for five-year time periods. The regression equations for urban and rural areas are the following:

Urban:
CFR = 14.858 - .133 T
TFR = 20.962 - .193 T
Rural:
CFR = 14.076 - .113 T
TFR = 16.738 - .131 T

In these equations, the magnitude of the coefficient of T is larger in urban areas than in rural areas, indicating that fertility is declining faster in urban areas. This is a reassuring finding, in as much as it is consistent with prevailing theories of fertility transition, according to which fertility decline usually starts in urban areas and spreads to rural areas.

Figure 11: Overlapping trends in CFR(35) for urban areas, estimated for five-year time periods by the birth history method: 1991 NFFPHS and 1996 NLSS

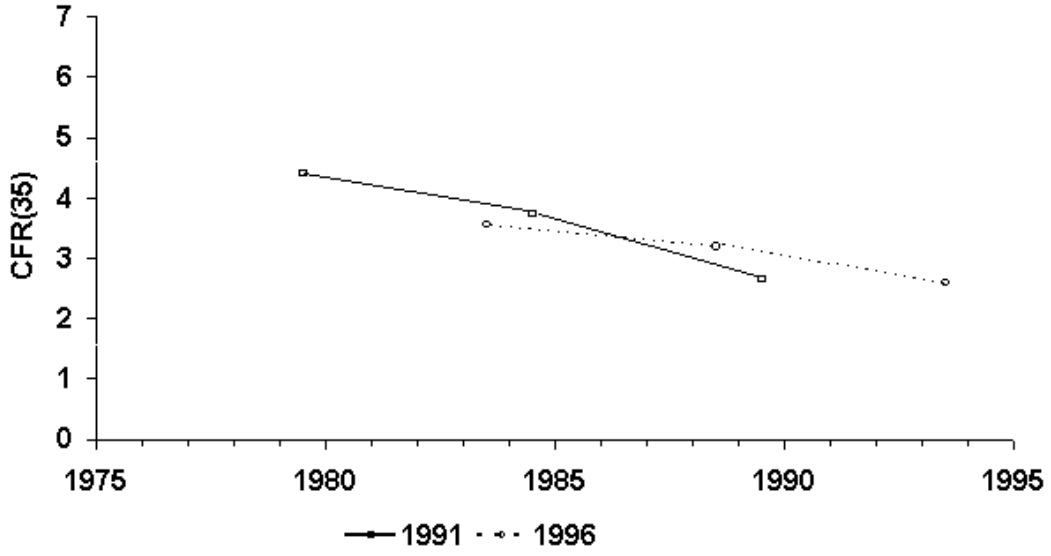


Figure 12: Overlapping trends in CFR(35) for rural areas, estimated for five-year time periods by the birth history method: 1991 NFFPHS and 1996 NLSS

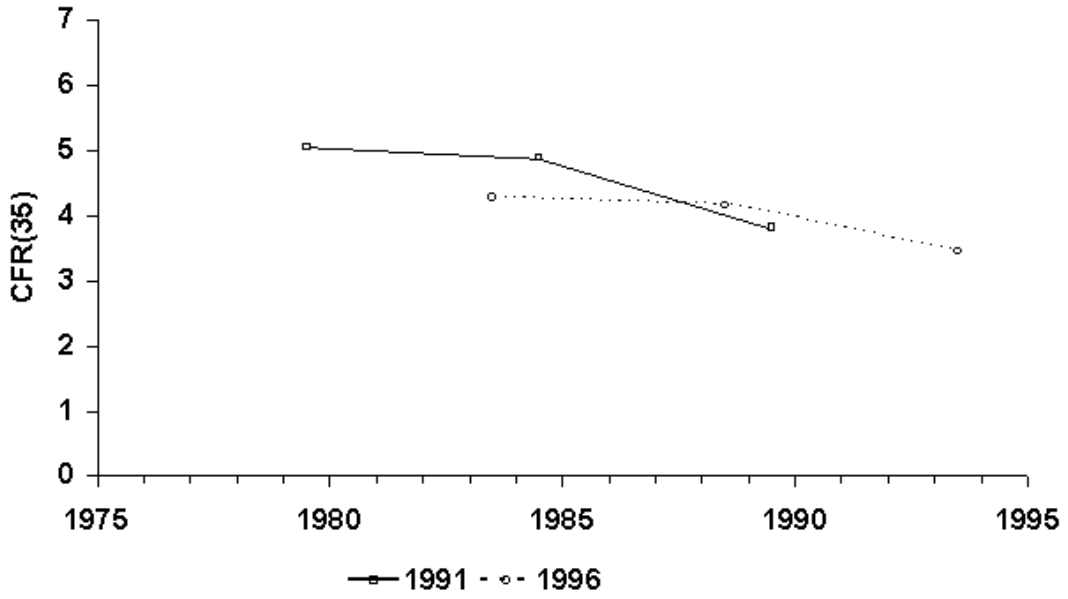


Figure 13: Overlapping trends in TRF for urban areas, estimated for five-year time periods by the own-children method: 1991 NFFPHS and 1996 NLSS

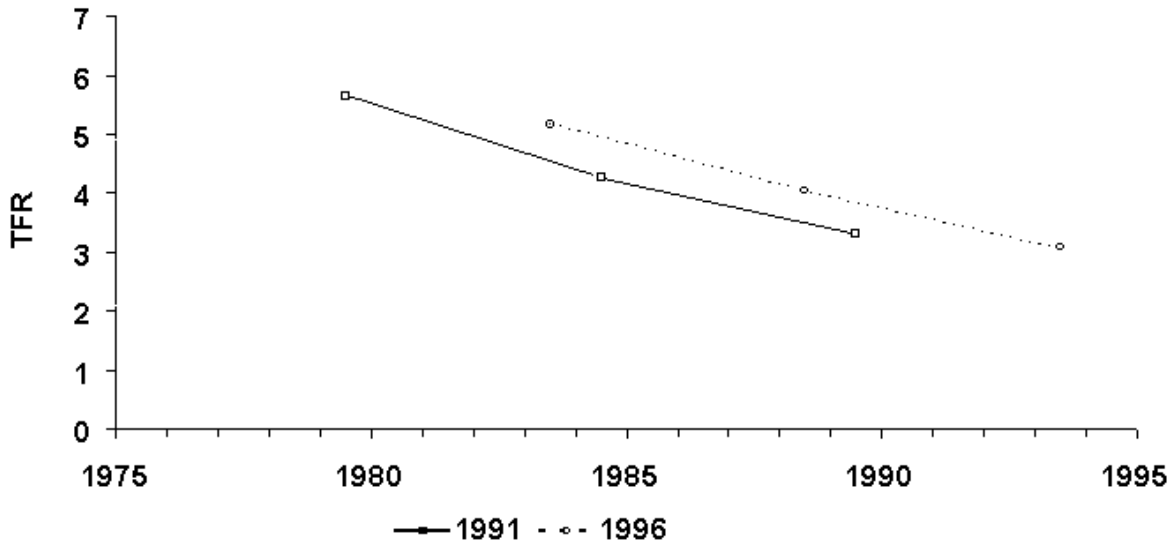
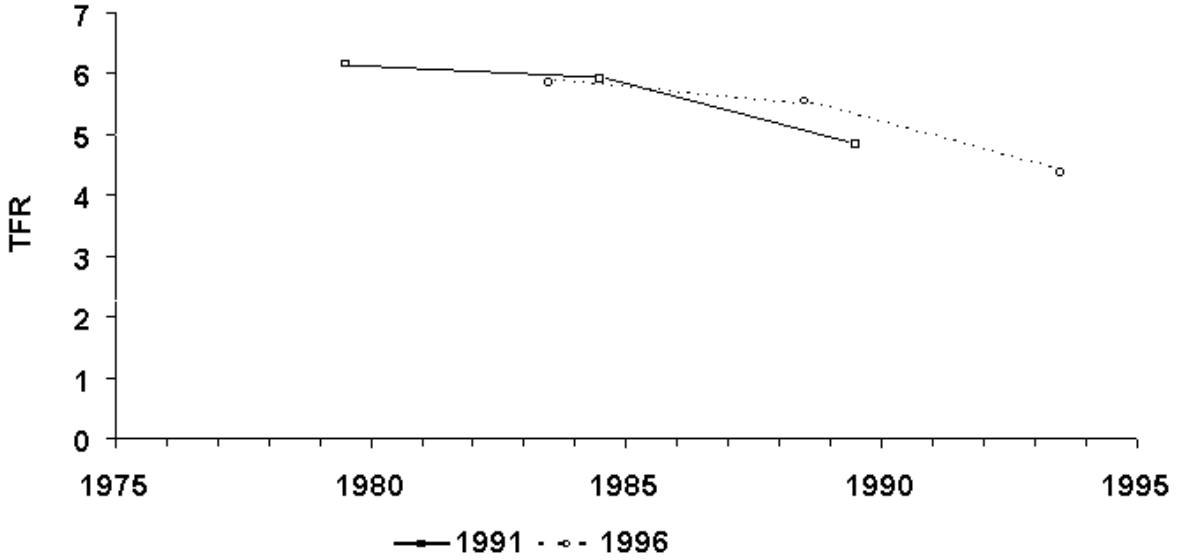


Figure 14: Overlapping trends in TRF for rural areas, estimated for five-year time periods by the own-children method: 1991 NFFPHS and 1996 NLSS



The trend in the TFR is of particular interest, since it is a widely used summary measure of fertility. The regression equations imply that, between 1977 and 1991, the TFR fell by 2.70 children, from 6.10 to 3.40, in urban areas, and by 1.83 children, from 6.65 to 4.82, in rural areas. These results are slightly inconsistent with the results for urban and rural areas combined, given previously, in as much as the 1977 TFR values of 6.10 and 6.65 for urban and rural areas, respectively, are both smaller than the value of 6.68 for urban and rural areas combined. This inconsistency apparently occurs because of the crudity of the regression method used to obtain the estimates.

Discussion and conclusion

In this study we have estimated fertility trends from two sources, the 1991 NFFPHS and the 1996 NLSS. Each of the two surveys suffers from age misreporting, including considerable heaping on certain ages, especially ages ending in the digits 0 and 5. Age misreporting is somewhat worse in the NLSS than in the NFFPHS. Reporting of births in the birth histories appears to be virtually complete in the NFFPHS but somewhat less than complete in the NLSS.

Each of the two surveys yields an estimated trend in fertility for the 15- year period immediately preceding the survey. The trends overlap for the period 1981-1991. The analysis indicates a fairly substantial fertility decline between 1977 and 1995. However, because of the distorting effects of age misreporting, the data are not good enough to identify the year when fertility began to decline. Therefore, a constant rate of decline over the estimation period is assumed. Under this assumption, our best estimate, based on the direct estimates, is that the TFR declined by 1.90 children, from 6.68 in 1977 to 4.78 in 1991. The TFR declined more in urban areas than in rural areas. We estimate that, between 1977 and 1991, the TFR fell by 2.70 children, from 6.10 to 3.40, in urban areas, and by 1.83 children, from 6.65 to 4.82, in rural areas.

It is useful to compare our estimates with preliminary estimates from the recently completed 1996 Nepal Family Health Survey (NFHS), which is part of the international DHS programme. The 1996 NFHS estimates, using the birth history method, a TFR of 4.64 per woman for the three-year period 1994-1996 immediately preceding the survey (Ministry of Health, 1996). The estimate of 4.64 is close to our estimate of 4.78 for 1991. More detailed analysis of the 1996 NFHS is currently under way and, when completed, should provide further comparative evidence of the levels and trends in fertility for the period 1980-1995.

A detailed analysis of the 1976 Nepal Fertility Survey, part of the World Fertility Survey, found that the fertility of Nepalese women in the mid-1970s closely approximated the pattern of "natural fertility", and that the TFR was 6.3 per woman at that time (Goldman and others, 1979). Fertility appears to have declined very little before 1980.

However, there are reasons to believe that a measurable decline in fertility in Nepal began around 1980. During the late 1970s and early 1980s, intensive efforts were made to expand the availability of family planning services. Special outreach programmes for sterilization services and community-based services were launched. By 1981, the availability of and access to contraceptive services had increased significantly (Tuladhar, 1987). Concomitantly, awareness of family planning methods spread rapidly. For example, knowledge of any modern contraceptive method increased from 21 per cent in 1976 to 52 per cent in 1981 and 93 per cent in 1991. Accessibility to family planning services also increased dramatically. For example, knowledge of a family planning service outlet increased from 6 per cent in 1976 to 33 per cent in 1981 and to 74 per cent in 1991. Desired family size also fell, but only after 1981. Desired family size was 4.0 children in 1976, 4.0 in 1981, 3.5 in 1986, and 3.2 in 1991 (Thapa, 1989; Thapa and Pandey, 1994). The number of acceptors of sterilization, which forms the backbone of Nepal's family planning programme, increased especially rapidly during the late 1970s and early 1980s (Thapa and Pandey, 1994). In sum, latent demand for fertility control began to be translated into actual demand with the intensification of the provision of services in the late 1970s, and demand, as measured by desired family size, also increased as availability of services increased (Ministry of Health, 1993 and 1996). It appears that in Nepal, increases in demand for family planning have been driven in part by increases in the supply of family planning services.

Further evidence that fertility decline began in the early 1980s comes from the analysis of another national survey, the 1986 Nepal Fertility and Family Planning Survey. Employing the birth history method, Tuladhar (1989) examined levels and trends of fertility during the 15-year period immediately preceding the survey and found that fertility decline commenced during the first five years preceding the survey.

In a well-known paper, Coale (1973) suggested three preconditions for sustained decline in fertility: fertility must be within the calculus of conscious choice, effective techniques of fertility control must be known and available, and reduced fertility must be perceived as advantageous to the couple. In Nepal, the first and second preconditions appear to have been realized during the late 1970s and early 1980s. The third precondition, that fertility control is advantageous, has emerged with significant improvement in child survival, increasing parental investment in the education of children, worsening pressure on land resources, and increasing awareness that fertility control is within reach.

In conclusion, it is clear from the analysis of the data presented here that, after substantial efforts by the population and family planning programmes, fertility in Nepal has begun to decline. The experience of other developing countries that are further along in the fertility transition suggests that this fertility decline is likely to continue and even accelerate, provided that family planning services expand to meet the increasing demand for them.

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