Factors Affecting Sex-Selective Abortion in India and 17 Major States

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India's first and second National Family Health Surveys (NFHS-1 and NFHS-2) were conducted in 1992–93 and 1998–99 under the auspices of the Ministry of Health and Family Welfare. The surveys 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, Mumbai, coordinated the surveys in cooperation with selected population research centres in India, the East-West Center in Honolulu, Hawaii, and ORC Macro in Calverton, Maryland. The United States Agency for International Development (USAID) provided funding for the surveys, and the United Nations Population Fund (UNFPA) provided support for the preparation and publication of this report.

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Abstract. *This report examines the effects of demographic and socioeconomic factors on the prevalence of sex-selective abortion in India and 17 major states. Because reliable statistics on sex-selective abortion do not exist, the analysis employs the sex ratio at birth (defined as the ratio of male births to female births) as an indirect indicator of sex-selective abortion. Data on births come from retrospective birth histories collected in India's first and second National Family Health Surveys (NFHS-1 and NFHS-2), which were conducted during 1992–93 and 1998–99, respectively. Estimates of the sex ratio at birth (SRB) are calculated from births in the 15-year time period preceding each survey. The two 15-year time periods correspond approximately to 1978–92 and 1984–98.*

According to NFHS-1 and NFHS-2, the SRB increased from 1.06 to 1.08 between 1978–92 and 1984–98 in India as a whole. The values of 1.06 and 1.08 are slightly higher than the naturally occurring SRB of about 1.05. There is, however, considerable variation in the SRB by state. In many states, especially in the south of India, the SRB is close to 1.05, indicating that sex-selective abortion is rarely practiced. But in some states, mostly in the north, SRBs are high, indicating a great deal of sex-selective abortion. In 1984–98 the SRB was 1.14 in Haryana and 1.20 in Punjab. Compared with other countries, Punjab (although it is a state and not a country) has one of the highest sex ratios at birth in the world.

The variable with the strongest effect on the SRB is a composite variable that includes child's birth order and mother's number of living sons just prior to the birth of the index child (i.e., the child of specified birth order). Analysis of the effect of this variable indicates considerable sex-selective abortion of girls in many states as well as some sex-selective abortion of boys in the states of Punjab, Delhi, and Maharashtra. In these latter three states, sex-selective abortion of boys is indicated by very low SRBs for third-order births to women who already have two living sons. For these births, the SRB was 0.99 in NFHS-1 and 0.90 in NFHS-2 in Punjab, 0.79 in NFHS-1 and 0.87 in NFHS-2 in Delhi, and 0.93 in NFHS-1 and 0.87 in NFHS-2 in Maharashtra, reflecting strong preference for a daughter for the third birth when the first two children are sons. There is, of course, even stronger preference for sons in these three states, as indicated by extremely high SRBs for third-order births to women who have no living sons. In NFHS-2, the SRB for these births was 1.72 in Punjab, 1.56 in Delhi, and 1.28 in Maharashtra. In Haryana it was also very high, at 1.57. In the case of Haryana, however, our analysis of SRBs by child's birth order and mother's number of living sons does not indicate any sex-selective abortion of boys.

Analysis of the ideal sex ratio (the ratio of ideal number of sons to ideal number of daughters) indicates that states with high son preference do not necessarily practice much sex-selective abortion. Uttar Pradesh, Bihar, and Rajasthan, for example, have some of the highest ideal sex ratios among the states of India, but their SRBs by child's birth order and mother's number of living sons indicate that not much sex-selective abortion is practiced.

The analysis of ideal sex ratios also indicates that son preference is declining in almost all states and all socioeconomic groups within states. In most instances the decline was substantial over the six years between NFHS-1 and NFHS-2. But ideal sex ratios still substantially exceed the naturally occurring SRB of about 1.05, implying that considerable potential exists for further increases in the prevalence of sex-selective abortion. The potential for further increase is greatest in states that currently have very strong son preference, as indicated by high ideal sex ratios, but very low actual sex ratios at birth, indicating not much sex-selective abortion—states such as Uttar Pradesh, Bihar, and Rajasthan.

Socioeconomic status differentials in the ideal sex ratio and in the actual sex ratio at birth tend to be opposite in direction in all regions of the country except the South, where sex-selective abortion is rare. Outside the South, the tendency is that the higher the socioeconomic status, the lower the ideal sex ratio but the higher the actual sex ratio at birth. This is especially true when status is measured by mother's education and mother's media exposure. This finding of differentials in the opposite direction indicates that the propensity to use sex-selective abortion to realize one's gender preferences tends to rise with socioeconomic status, usually more than compensating for the fall in son preference with higher status, so that the actual SRB tends to rise with higher status. This higher propensity to use sex-selective abortion among those of higher status no doubt reflects both greater awareness of and greater access to sex determination and abortion services, as well as greater ability to afford those services. It also reflects a mentality that is more open to planning births, consistent with greater use of contraception and lower fertility among those of higher status. Insofar as sex-selective abortion is innovative behavior that diffuses from those of higher socioeconomic status to those of lower socioeconomic status, it is possible that SRBs could increase further in most parts of India, despite declining son preference.

Evidence of sex-selective abortion is stronger when the analysis is confined to SRBs in each of the following subgroups: births to urban women, births to women with middle school complete or higher education, and births to women living in households with a high standard of living. Women in these groups are more likely to use sex-selective abortion perhaps because they are more likely to be aware of and have access to sex determination and abortion services and more likely to be in the habit of planning births due to greater use of contraception and lower fertility. In the case of births to women with a high standard of living, all four groups of states examined—West, North, East, and South—show at each birth order a pattern of mostly declining SRBs with increase in the number of living sons just prior to the birth of the child of specified birth order. The pattern suggests some sex-selective abortion of boys as well as girls, although there is far more of the latter

than the former. In the case of births to women with middle complete or higher education, the pattern of variation by birth order and number of living sons is similar, except for the South group of states, where the pattern is absent. Overall, the evidence indicates considerable sex-selective abortion in these high-status groups among women in the West, North, and East groups of states, but not much in the South group of states. These conclusions for the high-status women must be viewed as tentative, because many of the differentials in SRBs by child's birth order and mother's number of living sons are not statistically significant, as a consequence of small numbers of births in some categories.

In a few states where the prevalence of sex-selective abortion is already high and son preference is falling rapidly—including Punjab, Delhi, Haryana, and Maharashtra—it seems likely that the prevalence of sex-selective abortion will soon begin to fall, if it is not falling already. Although our analysis indicates that SRBs in these states are still increasing, our estimates of the SRB are for 15-year time periods before each survey, so that it is not possible to draw firm conclusions about the trend in the SRB over single calendar years close to the survey date of NFHS-2. More definitive conclusions about current trends could be drawn if the Sample Registration System would publish estimates of the SRB on an annual basis.

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1 Introduction

This report examines the effects of demographic and socioeconomic factors on the prevalence of sex-selective abortion in India and 17 major states. Because reliable statistics on sex-selective abortion do not exist, the analysis employs the sex ratio at birth as an indirect indicator of sex-selective abortion. The report extends earlier work that analyzed the effects of demographic and socioeconomic factors on prevalence of sex-selective abortion in the state of Punjab, in which the practice of sex-selective abortion is more widespread than in any other state of India (Retherford and Roy 2002).

The first section of the report provides background information on laws and policies relating to sex-selective abortion and their implementation. Subsequent sections cover data, methods of analysis, and findings.

2 Background on Sex-Selective Abortion in India

Prior to 1971, abortion was illegal in India. As early as 1964, however, the Central Family Planning Board recommended legalization of abortion. This was done in 1971, when the Medical Termination of Pregnancy (MTP) Act was enacted as a health measure to protect women. The MTP Act, as revised in 1975, allows medical termination of pregnancy (i.e., abortion) for any of the following reasons: (1) the pregnant woman has a serious medical disease or condition that would endanger her life if the pregnancy were to continue; (2) continuation of the pregnancy would entail a substantial risk of physical or mental handicap to the newborn child; (3) the pregnancy resulted from rape; (4) the socioeconomic circumstances of the mother would endanger the health of the newborn child; or (5) the pregnancy occurred because of failure of a contraceptive method. This last reason legalizes abortion on demand, in effect. Contraceptive failure is not grounds for abortion for unmarried women, however—only for married women.

The Medical Termination of Pregnancy Act requires that abortions take place in government-approved facilities. Largely because these facilities are in short supply, this requirement is not enforced. Moreover, the availability of approved MTP facilities varies considerably from state to state, with facilities concentrated in a few states that are more advanced on most indices of development. In the early 1990s, for example, Maharashtra had 23 percent of total approved MTP facilities in the country but only 9 percent of the country's population, and Gujarat had 10 percent of MTP facilities but only 5 percent of population. In contrast, Uttar Pradesh had only 6 percent of MTP facilities but 17 percent of population, and Bihar had only 2 percent of MTP facilities but 10 percent of population. In the country as a whole, about 5 to 6 million abortions occur annually, and roughly 90 percent of them take place in unapproved facilities (Khan, Barge, and Philip 1996; see also Ganatra 2000 and Arnold, Kishor, and Roy 2002).

There is a shortage not only of approved MTP facilities but also of physicians who have received the MTP training that the government requires in order to perform the procedure. Chhabra and Nuna (1994) have estimated that there were only about 3,000 MTP-trained doctors in the country in 1992, compared with a need for about

21,000 in rural Primary Health Centers alone. As a consequence of this shortage, most abortions in India are performed by physicians who have not received the legally required MTP training.

Sex-selective abortion is a two-step process involving an initial determination of the sex of the fetus followed by abortion if the fetus is not of the desired sex. Methods for determining the sex of a fetus became available in the 1970s. Three such methods are commonly used: amniocentesis (normally performed after 15–17 weeks of pregnancy), chorionic villus sampling (more expensive and normally performed around the 10th week of pregnancy), and ultrasound (least expensive and normally performed around the 12th week of pregnancy[1]). Shortly after the introduction of these tests in India in the 1970s, availability and advertisement of the tests began to spread. Kusum (1993) reports hoardings (billboards) saying "Invest Rs. 500 now, save 50,000 later," designed to encourage prospective parents to abort female fetuses in order to avoid future dowry expenses. In some parts of India, posters in train stations advertised sex-determination tests together with an abortion for as little as Rs. 70 (about US$ 10 at the time). In many parts of India today, ultrasound is offered by traveling vans. Ultrasound is used much more often than either amniocentesis or chorionic villus sampling (Arnold, Kishor, and Roy 2002).

The Indian government opposes sex-selective abortion, but it took a long time to pass legislation to combat it. In 1976 the government banned sex-determination tests in government facilities but not in private facilities. In 1984, a broad-based coalition of women's groups, civil liberties groups, and health organizations established the Forum Against Sex Determination and Sex Pre-selection, headquartered in Mumbai. This organization monitored the growing use of sex determination tests for the purpose of sex-selective abortion and agitated to outlaw the use of the tests for this purpose. As a result of these and other efforts, the state government of Maharashtra passed the Regulation of the Use of Prenatal Diagnostic Techniques Act in 1988. The states of Punjab, Gujarat, and Haryana subsequently followed Maharashtra's lead.

In 1994 the central government in Delhi passed the Prenatal Diagnostic Techniques Regulations and Prevention of Misuse Act, covering all India. The major provisions of this Act (referred to henceforth as the PNDT Act) are:

[1]The test is not entirely reliable as early as the 12th week of pregnancy. It is, however, quite reliable (although not 100 percent) at 16–19 weeks of pregnancy. It can be fairly reliable at 12 weeks, although there is not much consensus on this, and the reliability at this stage usually depends to a considerable extent on both the quality of the equipment and the experience of the practitioner.

- No genetic counseling center, genetic laboratory, or genetic clinic (including clinics or laboratories or centers having ultrasound or imaging equipment), unless registered under the Act, shall conduct, associate with, or help in conducting activities relating to diagnostic techniques that can be used to assess the sex of a fetus.
- No person, including specialists in the field of infertility, shall conduct or cause to be conducted or aid in conducting a pre-conception sex-selection technique on a woman or a man or both or on any tissue, conceptus, fluid, or gametes derived from either or both of them.
- No prenatal diagnostic technique shall be used or conducted unless the person qualified to do so is satisfied that at least one of the following conditions is fulfilled: (i) the age of the pregnant woman is above 35 years; (ii) the pregnant woman has undergone two or more spontaneous abortions; (iii) the pregnant woman has been exposed to potentially teratogenic agents such as drugs, radiation, infection, or chemicals; (iv) the pregnant woman has a history of mental retardation or physical deformities such as spasticity or other genetic disease; (v) any other condition as may be specified by the Central Supervisory Board designated by the Act.
- No person conducting prenatal diagnostic procedures shall communicate to the pregnant woman concerned or her relatives the sex of a fetus by words, signs, or in any other manner.

The law contains loopholes, however. Government laboratories and clinics are monitored much more closely than private laboratories and clinics, which are only required to register under the Act if they perform prenatal diagnostic procedures. Also, genetic tests are monitored much more closely than ultrasound tests. The result of such partial regulation is that facilities for prenatal testing have become mostly privatized and commercialized as the practice of sex-selective abortion has spread. Despite the restrictions and bans imposed by the PNDT Act, many doctors continue to communicate the sex of the fetus to parents who want to know. They do so verbally rather than in writing, and they often raise the cost of the test to compensate for the legal risk. Thus the law is easy to circumvent for both physicians and clients.

So far, the PNDT Act appears to have had little impact on the spread of sex-selective abortion (see, for example, Kishwar 1995), and in some parts of the country sex-selective abortion appears to have become a socially accepted practice. For example, a 1982 study in the Punjab city of Ludhiana questioned 126 randomly selected men and women and found that all respondents had heard of amniocentesis; 66 percent thought that the procedure was intended for sex determination; 73 percent of the women and 59 percent of the men said that a girl should be aborted if the couple already had two or more daughters, whereas only 25 percent of respondents said that a boy should be aborted if the couple already had two or more sons; and 71 percent of

the respondents said that the use of amniocentesis for sex determination should not be banned (Singh and Jain 1985). The fact that a substantial minority of respondents say that a boy should be aborted if the couple already has two or more sons suggests that some sex-selective abortion in Punjab is of boys, a possibility that is examined in more detail later in this report.

According to Jeffery, Jeffery, and Lyon (1984), clinical services offering sex determination and abortion had already appeared in villages adjacent to Bijnor town in Uttar Pradesh by the early 1980s. Newspaper reports of private clinics offering sex selection appeared in 1982–83 in cities such as Amritsar, Mumbai, and Delhi. Within two or three years, the number of these clinics rose to several hundred in the larger cities and several dozen in the smaller towns of Maharashtra, Uttar Pradesh, and Gujarat. Although some clinics offered sex selection from the late 1970s onward, it was only in the 1980s that these services received widespread publicity and formed the subject of a Parliamentary debate, after a senior official's wife underwent an abortion of a male fetus that was mistakenly diagnosed as female (Ahluwalia 1986).

During the 1980s sex-selective abortion spread to rural areas, especially areas with access to transport to a nearby town. Newspaper reports in the mid-1980s describe mobile sex-selection clinics in the smaller towns of Haryana, offering ultrasound detection and immediate abortion if the fetus was not of the desired sex. The clientele included farmers who had come from villages a half-hour away by road (Vishwanathan 1991). With the spread of ultrasound, sex-selective abortion is now observed in all segments of rural society in Bihar (Srinivasan et al. 1995).

Based partly on evidence from India's 1992–93 and 1998–99 National Family Health Surveys (NFHS), Arnold, Kishor, and Roy (2002) estimate indirectly that more than 100,000 sex-selective abortions, following ultrasound or amniocentesis, have been performed annually in India in recent years. As the authors acknowledge, this is probably an underestimate. But it is the best estimate available, given that statistics on sex-selective abortion do not exist at either the state or national level.

Because statistics on sex-selective abortion do not exist, our analysis uses the sex ratio at birth as an indirect indicator of sex-selective abortion. Sex-selective abortion manifests itself in an altered sex ratio at birth (defined here as the ratio of male births to female births), which in the absence of sex selection is about 1.05. Statistics on the sex ratio at birth are available at both the state and national levels from India's Sample Registration System and NFHS surveys. In the case of the NFHS surveys, it is possible to tabulate and analyze sex ratios at birth by social and economic characteristics. Thus it is possible to study trends and differentials in prevalence of sex-selective abortion indirectly through an analysis of trends and differentials in the sex ratio at birth. Using NFHS data, it is also possible to analyze ideal sex ratios and sex ratios of wanted next births.

3 Data

Our analysis relies mainly on data from India's first and second National Family Health Surveys—NFHS-1, conducted in 1992–93 (IIPS 1995), and NFHS-2, conducted in 1998–99 (IIPS and ORC Macro 2000). Both surveys were designed along the lines of the Demographic and Health Surveys (DHS) that have been conducted in many developing countries since the 1980s. Both NFHS-1 and NFHS-2 are nationally representative surveys that include a household sample, covering everyone in the sampled households, and an individual sample, covering all ever-married women age 15–49 (13–49 in NFHS-1) within those households. Corresponding to these two samples are a household questionnaire and an individual questionnaire. In the case of the household questionnaire, the household head or other knowledgeable adult in the household responded for the entire household. In the case of the individual questionnaire, each ever-married woman responded for herself and her children. NFHS-1 and NFHS-2 were designed to provide state-level estimates as well as national-level estimates. In each of the two surveys, the sampling fraction varies from state to state, in order to assure that the sample size in each state is large enough to provide statistically meaningful estimates.

In general, each household is assigned a state-level weight and an all-India weight. Weights are needed to correct for over-sampling of some groups and under-sampling of others (e.g., urban areas may be over-sampled). At the state level, the state-level weights are normalized so that the total sample size calculated with weights is the same as the unweighted sample size for a particular state. State-level weights are used when generating estimates for a particular state. All-India weights are used when generating estimates for groups of states or for all India. The all-India weights additionally take into account variability in sampling fractions among the states. The all-India weights are normalized so that the total sample size for all India calculated with the all-India weights is the same as the unweighted sample size for all India. The calculation of weights takes into account nonresponse.

NFHS-1 comprises 88,562 households and 89,777 ever-married women, and NFHS-2 comprises 91,196 households and 89,199 ever-married women.[2] Details of sample design are contained in the basic survey reports for NFHS-1 and NFHS-2 (IIPS 1995; IIPS and ORC Macro 2000).

4 Methods

UNITS OF ANALYSIS

The statistical methods used in this report are the same as those used in the earlier paper on Punjab (Retherford and Roy 2002). As already mentioned, the sex ratio at birth is used as an indirect indicator of sex-selective abortion. Births are therefore the units of analysis. The analysis focuses on births that occurred during the 15-year period before each of the two NFHS surveys. A 15-year period is used in order to minimize bias resulting from sex-selective displacement of births to earlier years in the retrospective birth histories. The distorting effects of displacement on estimates of fertility and the sex ratio at birth for all India are apparent in Figures 1 and 2.

Figure 4.1 shows overlapping 15-year trends in the total fertility rate (TFR) estimated by the own-children method of fertility estimation applied to the two surveys, NFHS-1 and NFHS-2. The TFR is defined as the number of births that a woman would bear if, hypothetically, she lived through the reproductive ages 15–49 experiencing the age-specific fertility rates pertaining to a particular time period. In the two figures, the plotted points pertain to 5-year time periods. Each trend is piecewise-linear, based on three TFR estimates pertaining to three consecutive 5-year time periods before each survey. The two trends overlap for part of the estimation period. Of particular interest are the second 5-year period before NFHS-2 and the first 5-year period before NFHS-1. The TFR estimates for these two periods should coincide, but they do not. Instead, the TFR estimate from NFHS-2 is considerably higher than the corresponding TFR estimate from NFHS-1. The reason for this discrepancy is that, in the retrospective birth histories, births in the first 5-year period before each survey tend to be displaced into the second 5-year period, leading to a TFR estimate that is too low for the first 5-year period and too high for the second 5-year period. Such

[2]In NFHS-2, the small northeastern state of Tripura was surveyed about a year later than other states. In this report, the data from NFHS-2 exclude Tripura.

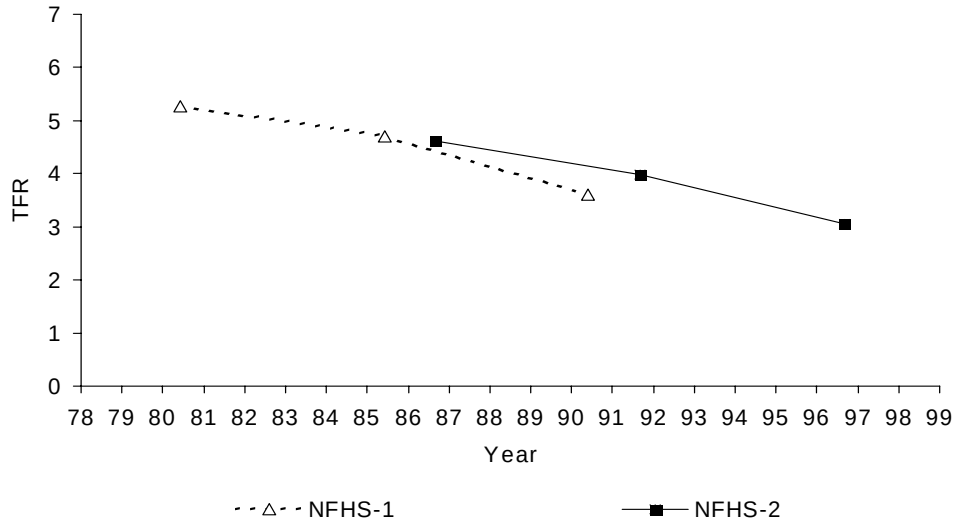

Figure 4.1 Trends in the total fertility rate in India, estimated from NFHS-1 and NFHS-2

Source: Underlying TFR estimates are from Retherford and Mishra (2001, Table 7).

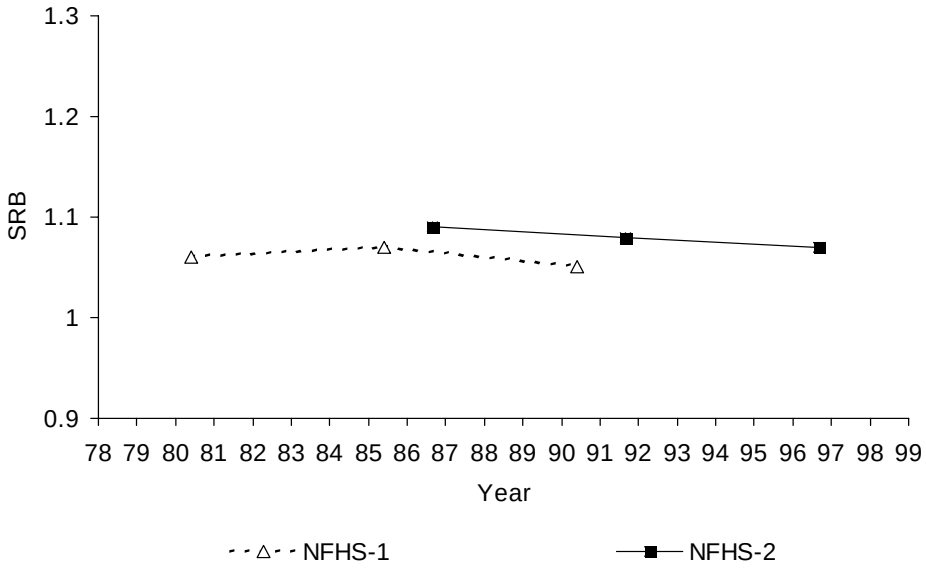

Figure 4.2 Trends in the sex ratio at birth (SRB) in India, estimated from NFHS-1 and NFHS-2

Source: Underlying SRB estimates are from Retherford and Mishra (2001, Table 6).

displacement of births is common in retrospective fertility surveys in many developing countries, particularly in the large countries of South Asia where many respondents have only approximate knowledge of their own birth dates and the birth dates of their children. (For a more extensive discussion of the problem of displacement in fertility estimates based on NFHS-1 and NFHS-2, see Retherford and Mishra 2001.)

Figure 4.2 shows a similar graph, with the sex ratio at birth (SRB) in place of the TFR. Again, one expects the estimated SRB for the second 5-year period before NFHS-2 to coincide with the estimated SRB for the first 5-year period before NFHS-1, but it does not. Instead, the SRB estimate from NFHS-2 substantially exceeds the corresponding SRB estimate from NFHS-1. Evidently male births tend to be displaced backward in time to a greater extent than female births. Why this should be so is not clear, although the strong preference for sons in India undoubtedly has something to do with it. The tendency for displacement to be greater for male births than for female births in India has also been noted by Coale and Demeny (1967) and by Bhat (2002).

Bias from displacement is minimized if one aggregates births over a 15-year period before each survey, because then a higher proportion of the displacements that occur are contained within the time period and do not appreciably affect the accuracy of the estimates. For this reason we aggregate births over 15-year periods rather than 5-year periods in our analysis. Coale and Demeny (1967) and Bhat (2002) have also concluded that in India the 15-year period before a survey is most appropriate for fertility estimates, inasmuch as the proportion of population age 0–14 tends to be least affected by age misreporting, compared with other age groups.

METHOD OF MULTIVARIATE ANALYSIS

The underlying response variable in the multivariate analysis of the sex ratio at birth is binary, coded 1 if the birth is male and 0 if it is female. Logistic regression is an appropriate multivariate method when the response variable is binary. It is used here to analyze the effects of selected demographic and socioeconomic factors on the sex ratio at birth. Levels of statistical significance of logistic regression coefficients take into account one level of clustering at the level of the primary sampling unit (rural village or urban block).

Separate logistic regressions are run for NFHS-1 and NFHS-2. In each logistic regression, the units of analysis are births of order 2 or higher that occurred during the 15 years immediately preceding the survey. First births are omitted in the multivariate analysis because the sex composition of earlier children is one of the predictor variables, and there are no earlier children in the case of first births.

The basic form of the logistic regression is:

$$\log [p/(1 - p)] = a + b_1 X_1 + b_2 X_2 + ... + b_k X_k \quad (1)$$

where the variables X_i on the right-hand side of the equation denote the predictor variables. The predicted value of the sex ratio at birth is specified by the odds of a male birth, $p/(1 - p)$, where p denotes the predicted proportion of births that are male.

When calculating predicted values of the SRB from the logistic regression, the constant term in the fitted regression is first adjusted so that, when mean values are substituted for all the predictor variables, the regression yields a predicted value of the SRB that is identical to the observed value of the SRB.[3] (In ordinary multiple regression, substitution of mean values for the predictors always yields the mean value of the response variable, but this is not generally true in logistic regression.) In the present instance, the predictor variables in the logistic regression are all categorical variables specified in terms of dummy variables, as will be discussed in more detail later.

We present regression results as predicted values of SRB, without showing the underlying regression coefficients. The predicted values of SRB are obtained as follows: First, predicted values of log(SRB)—equal to log $[p/(1-p)]$—for categories of a particular predictor variable are calculated from the logistic regression equation by setting the dummy variable(s) representing that predictor variable to appropriate combinations of ones and zeros while controlling for the other predictors by holding them constant at their mean values in the sample of births on which the regression is based. The predicted value of SRB is then calculated by taking the anti-log of log(SRB).

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[3]Adjustment of the constant term is done as follows: First the logistic regression model in equation (1) is fitted to the data, so that we know the values of the coefficients b_i of the predictor variables X_i. As already noted, when mean values of the predictor variables X_i are substituted into the right side of the fitted equation, it is not generally true that the predicted value of p (obtained by solving the equation for p) is the same as the observed p (the proportion male in the sample), denoted here as p'. But we can force predicted p to equal observed p' by substituting p' for p and mean values for the predictor variables in equation (1) and then solving the equation for a new value of a, denoted here as a^*:

$$a^* = \log [p'/(1 - p')] - (b_1 \bar{X}_1 + b_2 \bar{X}_2 + ... + b_k \bar{X}_k)$$

We then use a^* instead of a in the original equation to predict values of SRB. Thus equation (1) is modified to become:

$$\log [p/(1 - p)] = a^* + b_1 X_1 + b_2 X_2 + ... + b_k X_k$$

When the predictor variables are set to their mean values in this equation, the predicted value of SRB equals $p'/(1 - p')$, which is the observed SRB. (The coefficients of the predictor variables, representing effects, are not adjusted.) This is the equation used in this report for generating predicted values of the SRB. For further methodological details, see Retherford and Choe (1993).

It should be noted that sample sizes must be fairly large for two estimates of the SRB to differ significantly at the 5 percent level of statistical significance. For example, to distinguish between an SRB of 1.05 and an SRB of 1.10, the sample must be in the neighborhood of 14,000 births.[4] Even with aggregation of births over a period of 15 years prior to each survey, the number of sample births for all India is only 184,808 in NFHS-1 and 171,194 in NFHS-2. In the logistic regression analysis, of course, we are dealing with a number of categorical predictor variables, and the number of births in each category of each variable is smaller than the total number of births. The problem of small numbers becomes more acute when the analysis is done for individual states.

Because of the small-sample problem, our survey-based estimates of the SRB are in many cases substantially affected by sampling variability and are therefore highly approximate. Differences between SRBs that are not statistically significant (and even some of those that are, since some significant differences occur purely by chance) must be interpreted with caution.

[4]To see this, consider the highly simplified hypothetical case of the difference between two SRBs, calculated from two samples of the same size, selected independently and randomly from two subgroups of births. Suppose that the SRBs in the two subgroups are 1.05 and 1.10. These SRBs are equivalent to proportions male of .512 and .524, the average being .518. Thus the question of whether the two SRBs differ significantly is equivalent to the more familiar question of whether the two proportions differ significantly. The sample size necessary for the difference between .512 and .524 to be statistically significant at the 5 percent level may be ascertained by solving the following equation for the sample size N (Wallis and Roberts 1956, p. 429):

$$1.96 = \frac{.524 - .512}{\sqrt{\frac{(.518)(.482)}{N} + \frac{(.518)(.482)}{N}}}$$

The required sample size (calculated using more exact values than those shown in the equation) is 14,221 births. Although this example involves only a simple difference in proportions, similarly large samples sizes are needed to distinguish differences in SRBs derived by logistic regression.

5 Findings for All India

Based on 15 years of births before each survey (including first births), one can calculate a sex ratio at birth from each survey. According to this calculation, the SRB in India increased from 1.06 to 1.08 between NFHS-1 and NFHS-2.

These estimates can be compared with estimates from India's Sample Registration System (SRS), as shown in Table 5.1, but the comparison is rough, because the SRS has not published data that would enable estimation of the SRB for the same 15-year time periods. The SRS has published or made available estimates of the SRB for the whole country and major states of India for only two time periods: 1981–90 and 1996–98 (Premi 2002). In the case of all India, these estimates are 1.10 for 1981–90 and 1.11 for 1996–98. The SRS estimate for 1981–90 is roughly comparable with NFHS-1 estimate for 1978–92, but the SRS estimate for 1996–98 is not very comparable with the NFHS-2 estimate for 1984–98.

The estimates from NFHS-1 and NFHS-2 for the 15-year period before each survey (1.06 and 1.08) are substantially lower than the estimates from the SRS. Retherford and Mishra (2001) have analyzed and interpreted this discrepancy as indicating underregistration of births in the SRS, especially female births. The apparently more complete reporting of births in the two NFHS surveys provides additional justification for basing the analysis in this report mainly on data from NFHS-1 and NFHS-2.

Table 5.1 Trend in the sex ratio at birth in India, estimated from India's Sample Registration System (SRS) and first and second National Family Health Surveys (NFHS-1 and NFHS-2)

Data source and time period	Sex ratio at birth
Sample Registration System (SRS)	
1981–90	1.10
1996–98	1.11
National Family Health Surveys	
1978–92 (NFHS-1)	1.06
1984–98 (NFHS-2)	1.08

Note: SRBs estimated from the SRS (Premi 2002) are based on continuous registration of births. SRBs from the NFHS surveys are based on retrospective birth histories.

SEX RATIO AT BIRTH BY BIRTH ORDER

If sex-selective abortion is occurring, one would expect it to be less common for first-order births than for births of higher orders, because the sex of the child becomes more critical if one is planning to stop having children soon.[5] Table 5.2 confirms this expectation indirectly by showing that the sex ratio at birth in India (for the 15-year period preceding each survey) is higher for births of order 2 or more than for first-order births. The differentials by birth order are small, however. In NFHS-1 the SRB increases from 1.05 for first births to 1.07 for third births and then falls off slightly to 1.06 for births of order four and higher. In NFHS-2 it increases slightly from 1.07 for first births to 1.08 for births of order 2 and higher. Between the two surveys, the SRB increased slightly but consistently at every birth order shown in the table.

Table 5.2 also shows comparable estimates for South Korea, a country known for having one of the highest levels of son preference in the world. In South Korea, the overall SRB increased from 1.05 in 1980 to 1.17 in 1990 and then fell to 1.10 in 1998 (Cho and Lee 2000). Comparison values by birth order are shown only for 1990 in the table. These values increase from 1.09 for first-order births to 2.19 for births of order 4 and higher. Clearly the values of the SRB are much higher and increase much more steeply by birth order in Korea in 1990 than in India in 1984–98. We shall see later, however, that there is considerable diversity among Indian states, with Punjab attaining an overall SRB even higher than that of Korea in 1990.

Of course, SRBs by birth order only do not tell the whole story. For example, among women who want two children, with one child of each sex, some may practice sex-selective abortion to get a boy if the first child and the next pregnancy are both girls, and some may practice sex-selective abortion to get a girl if the first child and the next pregnancy are both boys. In this case, sex-selective abortion of girls and sex-selective abortion of boys will cancel each other to some extent in terms of their effects on the SRB, so that the pattern of SRBs by birth order fails to capture some of the sex-selective abortion that is occurring. To capture more completely the sex-selective abortion that is occurring, it is necessary to examine SRBs by both birth order and the sex composition of previous children. In the analysis that follows, this is done by

[5]Note that births are specified by birth order and not by parity of mother at the time of the survey. Even in the absence of sex-selective abortion, the sex ratio at birth by parity (i.e., the sex ratio of all previous births to women of specified parity at the time of the survey) tends to be high at parity 2 and declining at higher parities. This can occur if there is a preference for at least two sons in the population and women stop childbearing when they get the number of sons that they want. If, for example, the only women who stop at parity 2 are those who have two sons, this will tend to raise the SRB of previous births to women who were parity 2 at the time of the survey (Arnold, Kishor, and Roy 2002). SRBs specified by birth order are not affected by this kind of stopping rule.

Table 5.2 Estimates of the sex ratio at birth for births occurring during the 15 years before the survey, by birth order: India, NFHS-1 and NFHS-2

	NFHS-1 1978–92		NFHS-2 1984–98		Comparison with South Korea 1990
Birth order	SRB	N	SRB	N	SRB
1	1.05	48,192	1.07	46,985	1.09
2	1.07	42,273	1.08	41,801	1.17
3	1.07	32,977	1.08	30,785	1.91
4+	1.06	61,367	1.08	51,623	2.19
Total	1.06	184,808	1.08	171,194	1.17

Source: South Korean comparison data are from Cho and Lee (2000).

Note: When determining child's birth order and mother's number of living sons for births in NFHS-1 and NFHS-2, all births to a woman (including any twins or other multiple births that she may have had) were taken into account. After birth order and mother's number of living sons were determined for each birth, multiple births were then deleted from the birth files. Births to women who were aged 13–14 at the time of NFHS-1 were also excluded from the birth files before sex ratios at birth were calculated. (NFHS-2 did not collect birth histories from women age 13–14 at the time of the survey.)

tabulating estimates of the SRB by child's birth order and mother's number of living sons just prior to the birth of the index child (i.e., the child of specified birth order).

PREDICTOR VARIABLES USED IN THE MULTIVARIATE ANALYSIS

The following predictor variables are included in the logistic regression analysis of factors affecting the sex ratio at birth: child's birth order × mother's number of living sons, urban/rural residence, mother's education, religion, caste/tribe, mother's media exposure, household standard of living, mother's age at childbirth, and five-year period in which the birth occurred. Birth order × number of living sons is defined as a composite, cross-classified variable because birth order and number of living sons interact in their effects on the SRB (i.e., because the effect of number of living sons on the SRB varies by birth order). Each of these predictor variables is defined as a categorical variable, and the categories are shown in Table 5.3. These particular predictor variables are chosen for inclusion in the regression because each of them is likely to have an effect on the sex ratio at birth, and each of them is possibly correlated with the composite variable birth order × number of living children, which is the principal variable of interest inasmuch as it has the largest effect on the SRB, as will be seen later.

Some of the predictor variables require further explanation. In the categorization of mother's education, "middle complete" is defined as eight or more completed years of education, and "less than middle complete" does not include illiterate. Scheduled

Table 5.3 Percent distribution of the samples over categories of the predictor variables included in the logistic regressions, in which the units of analysis are births of order 2 and higher during the 15 years before each survey: India, NFHS-1 and NFHS-2

Variable	NFHS-1	NFHS-2
Birth order × number of living sons[a]		
Order 2, 0 son	17	18
Order 2, 1 son	14	15
Order 3, 0 son	8	8
Order 3, 1 son	12	12
Order 3, 2 sons	4	5
Order 4+, 0 son	7	7
Order 4+, 1 son	16	15
Order 4+, 2 sons	13	11
Order 4+, 3+ sons	9	9
Residence		
Urban	22	21
Rural	78	79
Mother's education		
Illiterate	73	70
Less than middle complete[b]	16	17
Middle complete or higher	11	13
Religion		
Hindu	80	79
Muslim	15	16
Other	5	5
Caste/tribe		
Scheduled caste/tribe	23	31
Other	77	69
Mother's media exposure		
Low	79	76
High	21	24
Standard of living		
Low	43	39
Medium	39	47
High	17	14
Mother's age at childbirth[c]		
15–24	50	54
25–34	43	41
35–49	6	5
Five-year period in which birth occurred		
0–4 years before survey	32	32
5–9 years before survey	37	36
10–14 years before survey	31	33

Note: When determining child's birth order and mother's number of living sons, all births to a woman (including any twins or other multiple births that she may have had) were taken into account. After birth order and mother's number of living sons were determined for each birth, multiple births were deleted from the birth files on which the logistic regressions were run. Births to women who were age 13–14 at the time of NFHS-1 were also excluded from the birth files. (NFHS-2 did not collect birth histories from women age 13–14 at the time of the survey). See text for explanation of how categories of mother's media exposure and household standard of living are defined. See Appendix 1 for the distributions in individual states.

[a]Refers to the number of living sons that the mother had just before she delivered the birth of the specified birth order.

[b]Does not include illiterate.

[c]"Childbirth" pertains to the births that are the units of analysis in the logistic regressions. The 15–24 age group includes one woman who had her second birth at age 14.

castes and scheduled tribes are castes and tribes identified by the Government of India as socially and economically backward and in need of special protection from social injustice and exploitation.[6] Regarding media exposure, NFHS-1 asked questions about exposure to radio (at least once a week), television (at least once a week), and cinema (at least once a month), and NFHS-2 asked not only about these three media but also about reading newspapers and magazines (at least once a week). In our analysis, low media exposure is defined as positive responses on none or one of these four types of exposure, and high media exposure is defined as positive responses on two, three, or four types. Standard of living is defined in terms of an index of ownership of various household goods, with index values grouped into high, medium, and low standard of living.[7] The categories of the remaining predictor variables shown in Table 5. 3 are self-explanatory.

Table 5. 3 also shows, for each survey, how the sample of births (births of order 2 and higher born during the 15 years before the survey) is distributed among the categories of each of the predictor variables included in the logistic regressions. Regarding the composite variable, birth order × number of living sons, the distribution of third births by the number of living sons that the mother had just before the third birth is of particular interest, because the total fertility rate in India is close to three children, which means that many women go on to have a third birth only in order to get a child

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[6]In NFHS-1, respondents were asked to report their caste/tribe, and their answers were compared with the official government list of scheduled castes/tribes before coding the response as scheduled caste, scheduled tribe, or "other." In NFHS-2, there was no checking against the official government list. Instead, respondents were first asked the name of their caste/tribe, if any. Then, if they belonged to a caste/tribe, they were asked whether the caste/tribe was a scheduled caste, a scheduled tribe, an "other backward caste," or none of these. Because of these differences in the way the questions were asked, the caste/tribe variable is not precisely comparable between the two surveys.

[7]In NFHS-1, the standard of living index (SLI) is calculated by adding the following scores: house type: 4 for *pucca* (high-quality construction materials throughout), 2 for semi-*pucca*, 0 for *kachha* (low-quality construction materials throughout); toilet facility: 4 for own flush toilet, 2 for public or shared flush toilet or own pit toilet, 1 for shared or public pit toilet, 0 for no facility or other facility; source of lighting: 2 for electricity, 1 for kerosene, gas, or oil, 0 for other source of lighting; main fuel for cooking: 2 for electricity, liquid petroleum gas, or biogas, 1 for coal, charcoal, or kerosene, 0 for other fuel; source of drinking water: 2 for pipe, hand pump, or well in residence/yard/plot, 1 for public tap, hand pump, or well, 0 for other water source; separate room for cooking: 1 for yes, 0 for no; ownership of agricultural land: 4 for 5 acres or more, 3 for 2.0–4.9 acres, 2 for less than 2 acres or acreage not known, 0 for no agricultural land; ownership of irrigated land: 2 if household owns at least some irrigated land, 0 if no irrigated land; ownership of livestock: 2 if own livestock, 0 if not own livestock; durable goods ownership: 4 for a car or tractor, 3 each for a scooter/motorcycle or refrigerator, 2.5 for a television, 2 each for a bicycle, electric fan, radio/transistor, sewing machine, water pump, bullock cart, or thresher, 1 for a clock/watch. Index scores range from 0–10 for low SLI to 10.5–20 for medium SLI and 20.5–55 for high SLI.

of the desired gender, which is usually male. In both surveys, the category of third births and no living sons (implying two living daughters in most cases) is much larger than the category of third births and two living sons, implying that mothers with no living sons among the first two births are much more likely to go on to have a third birth than are mothers with two living sons. Later we shall see that results from the logistic regressions confirm this interpretation.

Regarding the other predictor variables, the table shows that the sample is about four-fifths rural. In NFHS-2, about seven-tenths of the mothers of the births are illiterate. About four-fifths of the mothers are Hindu, about one-fifth are Muslim, and 5 percent have some other religion. Thirty-one percent are from a scheduled caste or scheduled tribe, up from 23 percent in NFHS-1. (The increase probably occurs partly because fertility has declined less among scheduled castes and tribes than among others, partly because caste/tribe was measured differently in the two surveys, as explained earlier in footnote 6, and partly because of increased government benefits to these disadvantaged groups, which have increased the likelihood that respondents report belonging to them). The proportion of mothers with high media exposure increased from 21 to 24 percent between the two surveys. Surprisingly, the proportion living in households with a high standard of living declined from 17 to 14 percent, while the proportion living in households with a low standard of living declined from 43 to 39 percent and the proportion living in households with a medium standard of living increased from 39 to 47 percent. These anomalies in the trend in standard of living probably occur because of differences in the way the standard of living index was defined in the two surveys (see footnote 7). About half of the births occurred to mothers age 15–24, somewhat less than half to mothers age 25–34, and the remaining

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In NFHS-2, the standard of living index is calculated by adding the following scores: house type: 4 for *pucca*, 2 for semi-*pucca*, 0 for *kachha*; toilet facility: 4 for own flush toilet, 2 for public or shared flush toilet or own pit toilet, 1 for shared or public pit toilet, 0 for no facility; source of lighting: 2 for electricity, 1 for kerosene, gas, or oil, 0 for other source of lighting; main fuel for cooking: 2 for electricity, liquid petroleum gas, or biogas, 1 for coal, charcoal, or kerosene, 0 for other fuel; source of drinking water: 2 for pipe, hand pump, or well in residence/yard/plot, 1 for public tap, hand pump, or well, 0 for other water source; separate room for cooking: 1 for yes, 0 for no; ownership of house: 2 for yes, 0 for no; ownership of agricultural land: 4 for 5 acres or more, 3 for 2.0–4.9 acres, 2 for less than 2 acres or acreage not known, 0 for no agricultural land; ownership of irrigated land: 2 if household owns at least some irrigated land, 0 for no irrigated land; ownership of livestock: 2 if own livestock, 0 if not own livestock; durable goods ownership: 4 for a car or tractor, 3 each for a moped/scooter/motorcycle, telephone, refrigerator, or color television, 2 each for a bicycle, electric fan, radio/transistor, sewing machine, black and white television, water pump, bullock cart, or thresher, 1 each for a mattress, pressure cooker, chair, cot/bed, table, or clock/watch. Index scores range from 0–14 for low SLI to 15–24 for medium SLI to 25–67 for high SLI.

Because the standard of living index is calculated slightly differently in NFHS-1 and NFHS-2, comparisons of this index between NFHS-1 and NFHS-2 are not exact.

5–6 percent to older mothers. In each survey, approximately one-third of the births occurred in each of the three 5-year periods before the survey, with a slightly larger proportion occurring in the second 5-year period before the survey, probably mainly because of displacement of births from the first to the second 5-year period before the survey.

MULTIVARIATE ANALYSIS

Table 5.4 shows logistic regression estimates of the sex ratio at birth by child's birth order and mother's number of living sons for births of order 2 and higher occurring in the 15 years before NFHS-1 and NFHS-2. As already mentioned, first births are omitted in the multivariate analysis because the sex composition of earlier children is one of the predictor variables, and there are no earlier children in the case of first births. The overall sex ratio at birth (SRB) for births of order 2 or higher is 1.06 in NFHS-1 and 1.08 in NFHS-2.

The first two columns of Table 5.4 show predicted values of the SRB cross-classified by birth order and number of living sons, calculated from logistic regressions in which the composite variable, birth order × number of living sons (specified by eight dummy variables representing the nine categories of this variable), is the only predictor variable included in the regression. These predicted values of the SRB are identical (to two decimal places) to the raw (i.e., observed) values of the SRB (not shown in the table) calculated directly for each category of the composite variable.

The last two columns of the table show values of the SRB based on logistic regressions that include, in addition to birth order × number of living sons, all the other demographic and socioeconomic predictor variables shown earlier in Table 5.3. These other predictors are set at their mean values (specific to each survey) when calculating predicted values of the SRB by birth order and number of living sons, as shown in these two columns.

Statistical significance of underlying logistic regression coefficients is indicated in Table 5.4 by asterisks. Statistical significance is interpreted to mean that the SRB in a given category differs significantly from the SRB in the reference category (birth order 2, one living son) at the 5 percent level or better.

The predicted SRBs in the last two columns of Table 5.4, based on logistic regressions that include all the predictor variables, differ little from the SRBs shown in the first two columns, which are the same as the raw values. The close agreement occurs because the dummy variables representing the main predictor variable, birth order × number of living sons, are either uncorrelated or correlated at very low levels with the other demographic and socioeconomic predictors, and this is true in both surveys. As a general rule, when two predictors are uncorrelated or correlated at a very low level, one predictor can be dropped out of the regression without appreciably

Table 5.4 Predicted values of the sex ratio at birth by child's birth order and mother's number of living sons for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regression: India, NFHS-1 and NFHS-2

	Predicted values from logistic regression without controls[b]		Predicted values from logistic regression with controls[c]	
Birth order x number of living sons[a]	NFHS-1 1978–92	NFHS-2 1984–98	NFHS-1 1978–92	NFHS-2 1984–98
Birth order 2				
0 son	1.07	1.10	1.07	1.10*
1 son[†]	1.07	1.05	1.07	1.05
Birth order 3				
0 son	1.06	1.12*	1.06	1.13*
1 son	1.08	1.07	1.08	1.06
2 sons	1.03	1.05	1.03	1.06
Birth order 4+				
0 son	1.09	1.12	1.08	1.11
1 son	1.07	1.09	1.07	1.09
2 sons	1.05	1.04	1.05	1.04
3+ sons	1.03	1.07	1.04	1.08

Note: The overall sex ratio at birth for births of order 2 or higher is 1.06 in NFHS-1 and 1.08 in NFHS-2. Birth order × number of living sons is a composite variable (with "birth order 2, 1 son" as the reference category) in the underlying logistic regressions. Multiple births and births to women who were age 13–14 at the time of NFHS-1 are excluded from this table (see note to Table 5.2). NFHS-2 did not collect birth histories from women age 13–14 at the time of the survey.

[a]Refers to the number of living sons just before the mother delivered the birth of the specified birth order.

[b]Predictor variables are eight dummy variables representing the nine categories of the composite variable indicating child's birth order cross-classified by mother's number of living sons (as shown in the row labels of the table), with birth order 2 and one living son as the reference category. Predicted values of the SRB in these two columns are the same (to two decimal places) as the raw values of the SRB (not shown), calculated directly for each category of the composite variable.

[c]Predictor variables include, in addition to birth order x number of living sons, the following control variables: urban/rural residence, mother's education, mother's religion, mother's caste/tribe membership, mother's exposure to mass media, household standard of living, mother's age at the time of the birth, and 5-year period before the survey in which the birth occurred. In the last two columns of the table, these variables are controlled by holding them constant at their mean values (specific to each survey) in the underlying logistic regressions used to calculate predicted values of the sex ratio at birth. See text for how these variables are specified. The underlying logistic regression coefficients of all the predictor variables in the full model are shown in Appendix 2.

[†]Indicates the reference category for the nine-category variable that specifies birth order × number of living sons in the logistic regressions.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

affecting the coefficient of the remaining predictor variable. In other words, the two predictors have statistically independent effects on the SRB. Because the correlations of the composite variable with the other predictors are nonexistent or small, predicted values of the SRB derived by logistic regression with the full set of predictors are very close to the raw values of the SRB.

The next-to-last column of Table 5.4 shows that there was not much variation in the SRB by birth order and number of living sons in NFHS-1. There is more variation in NFHS-2. As shown in the last column, in NFHS-2 the SRB is 1.10 for second-order births whose mothers had no living son and 1.13 for third-order births whose mothers had no living son, and in each case the underlying logistic regression coefficient is statistically significant. The SRB for births of order 4 and higher whose mothers had no living son increased to 1.11 in NFHS-2, but in this case the underlying coefficient is not statistically significant. Overall, these results indicate an increasing tendency to use sex-selective abortion to get a boy among women who have no living son.

Table 5.5 elaborates the last two columns of Table 5.4 by showing results for the socioeconomic predictor variables that are included in the underlying logistic regressions. Each column of Table 5.5 is based on a single logistic regression, and these two regressions are the same ones that underlie the last two columns of Table 5.4. For each predictor variable shown in Table 5.5, the differentials in the SRB between categories of that variable are net of the effects of all the other predictor variables, which are held constant at their mean values when comparing categories of the specified predictor variable.

Table 5.5 indicates a significantly higher SRB in urban than in rural areas in NFHS-1 but not in NFHS-2. The decline of the urban/rural differential between the two surveys suggests that the practice of sex-selective abortion has been spreading from urban to rural areas. It also suggests that the diffusion had progressed far enough by the time of NFHS-2 that there is no longer a significant urban/rural differential in the practice of sex-selective abortion, once the other socioeconomic predictor variables are controlled.

Differentials in the SRB by mother's education increased between the two surveys. There is no evidence of significant differentials in the SRB by mother's education in NFHS-1, but in NFHS-2 the SRB varies substantially by education, reaching 1.12 among women who have completed middle school or higher. Differentials in the SRB by mother's media exposure similarly increased between the two surveys, with the SRB also reaching 1.12 among births to mothers with high media exposure in NFHS-2. The effect of mother's media exposure is over and above the effect of mother's education, inasmuch as the other predictor variables, including mother's education, are controlled when looking at the effect of media exposure. The effect of standard of living is rather small and inconsistent in the two surveys, once the other predictor variables, including mother's education and mother's media exposure, are controlled.

Table 5.5 also shows that the "other religion" group experienced a major increase in the SRB between the two surveys, reaching 1.15 in NFHS-2. Part of the reason for this is that Sikhs are included in "other religion," and Sikhs are concentrated

Table 5.5 Predicted values of the sex ratio at birth by selected socioeconomic characteristics for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: India, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.10*	1.08
Rural†	1.05	1.08
Mother's education		
Illiterate†	1.07	1.07
Less than middle complete[a]	1.07	1.10
Middle complete or higher	1.04	1.12*
Religion		
Hindu†	1.07	1.08
Muslim	1.02*	1.04
Other	1.09	1.15*
Caste/tribe		
Scheduled caste/tribe	1.07	1.07
Other†	1.06	1.08
Mother's media exposure		
Low†	1.07	1.07
High	1.05	1.12*
Standard of living		
Low†	1.06	1.10
Medium	1.06	1.06*
High	1.09	1.08

Note: Results in this table are predicted values from logistic regressions that incorporate all the predictor variables shown earlier in Table 5.3. There are two regressions, one for NFHS-1 and one for NFHS-2. These two regressions are the same as those underlying the last two columns of Table 5.4. Only the socioeconomic predictor variables are shown in the present table. When calculating predicted values of SRBs for categories of any given predictor variable shown in the table, all the other predictor variables (including those not shown) are held constant at their mean values in the underlying logistic regression.

[a]Does not include illiterate.

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

in Punjab and other western states where sex-selective abortion is most prevalent, as we shall see later. Caste/tribe differentials in the SRB are small in both surveys after the other predictor variables are controlled.

SEX RATIO OF IDEAL NUMBER OF SONS TO IDEAL NUMBER OF DAUGHTERS

Further insight into the factors that are driving the increase in the SRB can be obtained by examining trends in the ideal numbers of sons and daughters, as shown in Table 5.6.

Both NFHS-1 and NFHS-2 asked questions on ideal family size. Women with living children were asked, "If you could go back to the time you did not have any

children and could choose exactly the number of children to have in your whole life, how many would that be?" Women with no living children were asked, "If you could choose exactly the number of children to have in your whole life, how many would that be?" All the women were then asked, "How many of these children would you like to be boys, how many would you like to be girls, and for how many would the sex not matter?"

As shown in the upper part of Table 5.6, the mean ideal number of children fell by 0.21 child between the two surveys, from 2.86 to 2.65 children. The mean ideal number of boys fell more than the ideal number of girls, and the mean number of children for whom the sex did not matter to the respondent increased.

Computation of the sex ratio of ideal number of boys to ideal number of girls involves assigning values of 0.5 son and 0.5 daughter for an ideal child of either sex, reflecting equal preference. Calculated in this way, the sex ratio of ideal number of boys to ideal number of girls (which for simplicity we shall call the "ideal sex ratio") fell from 1.43 to 1.35 between the two surveys, indicating that son preference is declining. The values of 1.43 and 1.35 are still high, however, and indicate that considerable son preference remains. If parents are increasingly resorting to sex-selective abortion to realize their preferences, the actual sex ratio at birth may still be increasing, despite the falling preference for sons. (Whether the actual SRB is still increasing is obscured by the fact that our SRBs are estimated for 15-year periods prior to each survey, so that we do not have an accurate indication of what is happening right at the time of the survey. As seen earlier, the SRBs for 15-year periods increased between the two surveys.)

The lower part of Table 5.6 shows the percent distribution of ever-married women age 15–49 by ideal family size and ideal number of sons. In the case of ideal children for whom the sex of the child does not matter to the woman, we again assigned values of 0.5 son. This implies that, in the case of women with an ideal family size of one child, possible values of the ideal number of sons are 0, 0.5, or 1. Similar increments of half a child are shown at higher ideal family sizes. Percentages are shown to a hundredth of a percent because many percentages are well below 1 percent.

The most striking aspect of the distributions is the concentration of preferences at "2 children, 1 son," "3 children, 2 sons," and "4+ children, 2 sons." These three categories encompass 77 percent of the women in NFHS-1 and 81 percent of the women in NFHS-2. Another striking feature is that the percentage who consider two children, one son (i.e., one child of each sex) to be ideal increased from 38 to 47 percent between the two surveys. Thus, in NFHS-2 almost half of the women prefer only two children, with an equal preference for sons and daughters. Among women who consider three children to be ideal, almost no one considers three sons to be ideal,

Table 5.6 Among ever-married women age 15–49, mean ideal number of children, mean ideal numbers of boys and girls, ideal sex ratio, and percent distribution by ideal number of children and ideal number of sons: India, NFHS-1 and NFHS-2

Indicator	NFHS-1	NFHS-2
Mean ideal number of children	2.86	2.65
Mean ideal number of boys	1.56	1.36
Mean ideal number of girls	1.05	0.97
Mean ideal number of either sex	0.25	0.32
Ideal sex ratio	1.43	1.35
Percent distribution of women by ideal number of children and ideal number of sons		
0 child	0.02	0.13
1 child		
0 son	0.30	0.38
0.5 son	1.91	2.89
1 son	1.29	1.51
2 children		
0 son	0.12	0.12
0.5 son	0.04	0.02
1 son	37.89	47.30
1.5 sons	0.56	0.49
2 sons	2.63	2.59
3 children		
0 son	0.02	0.01
0.5 son	0.00	0.00
1 son	1.42	1.17
1.5 sons	2.89	2.63
2 sons	26.96	22.36
2.5 sons	0.19	0.12
3 sons	0.56	0.28
4+ children		
0 son	0.02	0.00
0.5 son	0.00	0.00
1 son	0.16	0.10
1.5 sons	0.01	0.02
2 sons	12.36	10.97
2.5 sons	0.91	0.43
3 sons	6.82	4.68
3.5 sons	0.28	0.09
4+ sons	2.63	1.72
Total	100.00	100.00

Note: In the calculation of ideal sex ratios and percent distributions, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

and among women who consider four or more children to be ideal, only about a third consider more than two sons to be ideal.

Table 5.7 shows additional detail on the ideal sex ratio by socioeconomic characteristics. Because the ideal SRBs shown in the table are calculated directly, without using logistic regression or some other multivariate method, the differentials shown for

Table 5.7 Among ever-married women age 15–49, mean ideal number of children, mean ideal numbers of boys and girls, and ideal sex ratio by selected socioeconomic characteristics: India, NFHS-1 and NFHS-2

Characteristic	NFHS-1					NFHS-2				
	Ideal no. boys	Ideal no. girls	Ideal no. either sex	Ideal no. children	Ideal sex ratio[a]	Ideal no. boys	Ideal no. girls	Ideal no. either sex	Ideal no. children	Ideal sex ratio[a]
Residence										
Urban	1.23	0.91	0.37	2.52	1.29	1.06	0.82	0.43	2.32	1.24
Rural	1.68	1.11	0.20	2.99	1.48	1.47	1.02	0.28	2.77	1.39
Mother's education										
Illiterate	1.80	1.16	0.19	3.15	1.50	1.60	1.08	0.25	2.93	1.43
Less than middle complete	1.37	0.98	0.29	2.64	1.35	1.20	0.89	0.37	2.47	1.28
Middle complete or higher	1.02	0.79	0.40	2.21	1.23	0.92	0.75	0.45	2.12	1.17
Religion										
Hindu	1.55	1.03	0.23	2.81	1.45	1.35	0.95	0.31	2.60	1.36
Muslim	1.77	1.22	0.36	3.34	1.39	1.56	1.12	0.41	3.09	1.33
Other	1.40	1.04	0.29	2.74	1.30	1.19	0.93	0.37	2.49	1.24
Caste/tribe										
Scheduled caste/tribe	1.76	1.17	0.18	3.12	1.47	1.51	1.05	0.28	2.84	1.38
Other	1.51	1.02	0.27	2.80	1.42	1.30	0.93	0.34	2.57	1.34
Mother's media exposure										
Low	1.74	1.13	0.20	3.07	1.49	1.56	1.06	0.26	2.87	1.42
High	1.15	0.87	0.36	2.39	1.27	1.02	0.80	0.44	2.26	1.21
Standard of living										
Low	1.72	1.15	0.21	3.07	1.45	1.54	1.07	0.27	2.88	1.40
Medium	1.63	1.08	0.23	2.93	1.46	1.38	0.97	0.32	2.67	1.36
High	1.21	0.87	0.35	2.43	1.32	1.04	0.80	0.42	2.26	1.24

[a]In the calculation of the ideal sex ratio, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

any particular characteristic are not net of the effects of the other characteristics on the ideal SRB. The table shows that the ideal SRB declined across the board between the two surveys. It declined not only for every characteristic shown in the table but also by about the same amount for every characteristic shown in the table, so that differentials in the ideal SRB by characteristics changed little between the two surveys.

SEX RATIO OF WANTED NEXT BIRTHS

Sex ratios based on ideal numbers of sons and daughters are not the only indicators of gender preference. Questions asked in NFHS-1 and NFHS-2 also allow calculation of the sex ratio of wanted next births among currently married women age 15–49 who said that they wanted another child. In NFHS-1 in all India, 34 percent of currently married women age 15–49 said that they wanted another child, another 35 percent were sterilized or infecund, 5 percent were undecided about whether to have another child or said it was up to God, and 26 percent said they did not want another child. In NFHS-2, 30 percent said they wanted another child, another 40 percent were steril-

Table 5.8 Among women who want another child, the sex ratio of wanted next births by birth order and mother's number of living sons: India, NFHS-1 and NFHS-2

Birth order of wanted next birth by number of living sons	NFHS-1	NFHS-2
Birth order 1	1.94	1.85
Birth order 2		
0 son	5.57	5.10
1 son	0.69	0.64
Birth order 3		
0 son	14.36	13.63
1 son	2.58	2.52
2 sons	0.21	0.23
Birth order 4+		
0 son	23.17	28.76
1 son	6.84	7.65
2 sons	1.18	1.18
3+ sons	0.40	0.50

Note: In the calculation of the sex ratio of wanted next births, values of 0.5 son and 0.5 daughter were assigned to wanted next births for which the mother said that the sex of the next child did not matter or was up to God.

ized or infecund, 2 percent were undecided or said it was up to God, and 28 percent said they did not want another child. Women who said that they wanted another child were additionally asked, "Would you prefer your next child to be a boy or a girl or doesn't it matter?" Response categories were boy, girl, "doesn't matter," and "up to God."

Table 5.8 shows the sex ratio of wanted next births. Results are based on the above survey question on preferred sex of next child, which was asked of women who said that they wanted another child. In cases where the woman said that the sex of the next child did not matter or was up to God, we assigned values of 0.5 son and 0.5 daughter for the wanted next birth.

Calculated in this way, the overall sex ratio of wanted next births fell from 2.20 in NFHS-1 to 2.12 in NFHS-2. These values (which are not shown in Table 5.8) are much higher than the sex ratio of ideal number of sons to ideal number of daughters. The reason for the discrepancy is that women with either all sons or all daughters are overrepresented among women who want another child, resulting in an upward selection bias since there is more son preference than daughter preference. This upward bias also affects the estimates specified by birth order. Because sex ratios specified by both birth order and number of living sons largely control for this bias, the table only shows estimates that are specified by both birth order and number of living sons. Birth order 1 is also shown, because there are no previous sons or daughters that would result in this bias. Bias is not completely eliminated, however, because women who

want large numbers of children or who want more than the usual number of sons are still overrepresented within categories specified by birth order of wanted next birth and number of living sons.

Table 5.8 shows that at birth order 2 among women with no son, the sex ratio of wanted next births is extremely high in NFHS-1, at 5.57, declining to 5.10 in NFHS-2. At birth order 2 among women with one son, a substantial preference for daughters already existed in NFHS-1, and it increased marginally between NFHS-1 and NFHS-2, as indicated by the drop in the sex ratio of wanted next births from 0.69 to 0.64. This finding suggests that women who want to stop at two children are not only becoming proportionately more numerous but also increasingly want to have one child of each sex, consistent with the earlier analysis of the sex composition of ideal family size in Table 5.6. At birth order 3 among women with no living son, the sex ratio of wanted next births is even higher than at birth order 2. At birth order 3 among women with no son, the sex ratio of wanted next births was 14.36 in NFHS-1, declining to 13.63 in NFHS-2. At this birth order among women with two sons, a very strong preference for daughters is evident in both surveys, as indicated by very low sex ratios of wanted next births, at 0.21 in NFHS-1 and 0.23 in NFHS-2, again consistent with the earlier analysis of the sex composition of ideal family size. In most of the categories classified by birth order and number of living sons, the trend in the sex ratio of wanted next births is downward. At birth order 4 and higher, however, the trend is upward, perhaps reflecting a rising proportion of mothers in this group who are going on to have another child only in order to get a son, as a consequence of fertility decline.

The finding that sex ratios of wanted next births specified by birth order and number of living sons are mostly falling again suggests that the actual sex ratio at birth may soon start to fall if it is not falling already. But again, if parents are increasingly resorting to sex-selective abortion to realize their preferences, it is possible that the actual sex ratio at birth is still increasing.

6 Findings for States and Groups of States

In India, there is a great deal of demand for state-level information on population and health, partly because health and family welfare are primarily state government functions rather than national government functions, and partly because there is a great deal of demographic and health variability from one state to the next. Because of this demand for state-level information, we provide information for 17 major states as well as for all India.

As mentioned earlier, however, large samples are usually needed to get statistically significant results when analyzing variation in the sex ratio at birth. Sample sizes for individual states are sometimes not sufficiently large. We therefore provide estimates not only for individual states but also for four groups of states, which we label West, North, East, and South. These groups are constructed as follows:

West: Haryana, Punjab, Gujarat, Delhi, Maharashtra, Himachal Pradesh
North: Uttar Pradesh, Rajasthan, Bihar, Madhya Pradesh
East: Assam, Orissa, West Bengal
South: Kerala, Karnataka, Tamil Nadu, Andhra Pradesh

The West category is designed to include all states thought to have a high incidence of sex-selective abortion. Haryana, Delhi, Himachal Pradesh, and Punjab are included in this group for this reason, even though they are not usually considered to be Western states. The North category is designed to include high-fertility states with a high degree of son preference but a low incidence of sex-selective abortion. Madhya Pradesh is included in this group for this reason, even though it is not normally considered to be in the North region. The states in the East group have a moderate degree of son preference and not much sex-selective abortion. The states in the South group have a relatively low degree of son preference and very little sex-selective abortion. In general, the groupings reflect an effort to construct groups that are similar in terms of son preference and use of sex-selective abortion and also have some geographical coherence.

Table 6.1 Trend in the sex ratio at birth, as estimated from India's Sample Registration System (SRS) and first and second National Family Health Surveys (NFHS-1 and NFHS-2): West states

State	Sample Registration System (SRS) 1981–90	Sample Registration System (SRS) 1996–98	National Family Health Surveys 1978–92 (NFHS-1)	National Family Health Surveys 1984–98 (NFHS-2)
Haryana	1.15	1.23	1.10	1.14
Punjab[a]	1.13	1.23	1.14	1.20
Gujarat	1.11	1.14	1.06	1.07
Delhi	–	–	1.11	1.12
Maharashtra	1.09	1.09	1.05	1.09
Himachal Pradesh	–	–	1.07	1.08
Total West states[b]	–	–	1.07	1.10

[a]In Punjab, the 15-year period before NFHS-1 is closer to 1979–93.

[b]In NFHS-1 and NFHS-2, states are combined using the all-India sample weights in order to take into account oversampling of smaller states and undersampling of larger states. In the case of the SRS, totals are not given because the SRS does not provide the numbers of male and female births for individual states that need to be added to calculate sex ratios at birth for this group of states.

Within each group of states, states are ordered from highest to lowest value of the SRB according to estimates of the SRB for 1996–98 from India's Sample Registration System.

WEST GROUP OF STATES

Table 6.1 compares estimates of the SRB from the Sample Registration System and the two surveys, NFHS-1 and NFHS-2, for the West group of states.[8] Again the comparisons are rough because the time periods available for the SRS do not coincide with the 15-year periods before the two NFHS surveys, especially in the case of NFHS-2. The SRS and NFHS estimates of the SRB in Table 6.1 are more consistent for some states than for others. In Haryana and Gujarat, the SRS estimates are substantially higher than the NFHS estimates, suggesting underregistration of female births relative to male births in the SRS in these states. In Punjab, however, the SRS and NFHS estimates are close. In Maharashtra, the SRS estimate of the SRB is substantially higher than the NFHS estimate for the earlier period, but the same as the NFHS estimate for the later period. SRS estimates of the SRB are not available for Delhi and Himachal Pradesh. (For further analysis of possible underregistration of births in the SRS, based on an analysis of SRBs, see Retherford and Mishra 2001.)

[8]In the case of Punjab, the 15-year period before NFHS-1 is closer to 1979–93 than to 1978–92, as indicated in Table 6.1. In the cases of Madhya Pradesh, West Bengal, Andhra Pradesh, and Tamil Nadu, the 15-year period before NFHS-1 is closer to 1977–91 than to 1978–92, as indicated in later tables.

Table 6.2 Estimates of the sex ratio at birth for births occurring during the 15 years before the survey, by birth order: West states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2	Birth order 3	Birth order 4+	N
Haryana					
1978–92 (NFHS-1)	1.09	1.00	1.14	1.16	6,387
1984–98 (NFHS-2)	1.10	1.14	1.29	1.08	5,802
Punjab					
1979–93 (NFHS-1)	1.09	1.11	1.17	1.22	5,978
1984–98 (NFHS-2)	1.01	1.23	1.36	1.34	4,935
Gujarat					
1978–92 (NFHS-1)	1.04	1.07	1.08	1.06	7,270
1984–98 (NFHS-2)	1.04	1.10	1.08	1.07	6,686
Delhi					
1978–92 (NFHS-1)	1.17	1.06	0.96	1.21	6,633
1984–98 (NFHS-2)	1.12	1.12	1.13	1.11	4,497
Maharashtra					
1978–92 (NFHS-1)	0.96	1.13	1.05	1.07	7,678
1984–98 (NFHS-2)	1.08	1.05	1.09	1.16	9,268
Himachal Pradesh					
1978–92 (NFHS-1)	1.15	1.00	1.08	1.06	5,650
1984–98 (NFHS-2)	1.05	1.07	1.17	1.07	4,989
Total West states[a]					
1978–92 (NFHS-1)	1.03	1.09	1.07	1.10	35,497
1984–98 (NFHS-2)	1.07	1.10	1.14	1.14	32,078

[a]Sample numbers (N) for individual states correspond to numbers of cases obtained after applying state-level sample weights. The sample numbers for states do not add to the sample number for the West group because states are combined using the all-India sample weights in order to take into account oversampling of smaller states and undersampling of larger states.

Table 6.1 also shows that there is considerable diversity by state within the West group. In 1984–98 (NFHS-2 estimates in the last column), the SRB ranged from 1.07 in Gujarat to 1.20 in Punjab, which has the highest SRB of any state in India. There is also considerable diversity by state in the amount of increase in the SRB over time. Based on the NFHS estimates, the increase in the SRB was smallest in Gujarat, Delhi, and Himachal Pradesh, where the SRB increased by only 0.01 (i.e., by 1 male birth per 100 female births) between 1978–92 and 1984–98, and largest in Punjab, where it increased by 0.06, from 1.14 to 1.20. For the West group as a whole, the SRB increased from 1.07 to 1.10.

As noted earlier, if sex-selective abortion is being practiced, SRBs should increase with birth order. Table 6.2 provides evidence that this tends to be true in the West group of states, but the increase is often irregular and sometimes lacking altogether. In NFHS-1, the increase with birth order is fairly consistent in Haryana and Punjab, but not very consistent in the other states in this group. In NFHS-2, the increase with birth order is fairly consistent in Haryana, Punjab, Maharashtra, and Himachal Pradesh, but not very consistent in the other states. In the West group as a

Table 6.3 Predicted values of the sex ratio at birth by child's birth order and mother's number of living sons for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: West states, NFHS-1 and NFHS-2

State	Birth order 2		Birth order 3			Birth order 4 and higher			
	0 son	1 son†	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Haryana									
1978–92 (NFHS-1)	1.05	1.00	1.24	1.14	1.03	1.23	1.24	0.96	1.02
1984–98 (NFHS-2)	1.17	1.15	1.57*	1.19	1.16	1.10	1.17	0.93	0.97
Punjab									
1979–93 (NFHS-1)	1.13	1.05	1.26	1.18	0.99	1.14	1.54*	0.97	1.15
1984–98 (NFHS-2)	1.39*	1.01	1.72*	1.38*	0.90	1.44*	1.44*	1.31	1.28
Gujarat									
1978–92 (NFHS-1)	1.08	1.00	1.18	1.05	0.88	1.24	1.17	1.04	0.85
1984–98 (NFHS-2)	1.14	0.97	1.15	0.95	1.37*	1.35*	1.09	1.05	1.05
Delhi									
1978–92 (NFHS-1)	1.06	1.08	1.08	1.00	0.73*	1.30	1.21	1.23	1.11
1984–98 (NFHS-2)	1.21	1.08	1.56*	1.03	0.87	1.08	1.06	1.02	1.13
Maharashtra									
1978–92 (NFHS-1)	1.10	1.12	1.06	1.08	0.93	1.05	1.08	1.20	1.12
1984–98 (NFHS-2)	1.10	0.97	1.28*	1.07	0.87	1.44*	1.16	1.16	0.89
Himachal Pradesh									
1978–92 (NFHS-1)	1.00	1.00	1.05	1.08	1.15	1.42	1.00	0.94	0.92
1984–98 (NFHS-2)	1.01	1.11	1.36	1.07	1.12	1.08	1.05	1.13	1.29
Total West states									
1978–92 (NFHS-1)	1.09	1.07	1.13	1.09	0.93	1.13	1.17	1.09	1.04
1984–98 (NFHS-2)	1.15*	1.00	1.32*	1.08	1.00	1.34*	1.15*	1.10	1.01

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

whole, the SRB increases between birth orders 1 and 4+ from 1.03 to 1.10 in NFHS-1 and from 1.07 to 1.14 in NFHS-2.

In Table 6.2 one can also look at how the SRB changed at each birth order between the two surveys. At birth order 1, the change is upward in two states, downward in three states, and unchanged in one state, probably reflecting sampling variability for the most part, inasmuch as sex-selective abortion is probably not practiced much for first births. At birth order 2 the change is upward in all states except Maharashtra, where it is downward. At birth order 3 it is upward in all states except Gujarat, where there is no change. And at birth order 4+ it is upward in four states and downward in two states. In the West group of states as a whole, the SRB increased at every birth order.

Table 6.3 shows estimates of the sex ratio at birth by birth order and number of living sons for births of order 2 and higher occurring in the 15 years before NFHS-1 and NFHS-2 in the West group of states. The estimates are predicted values of the SRB, derived by logistic regression in the same way and controlling for the same set of predictor variables as was done earlier in the last two columns of Table 5.4 for all India.

The highest values of the SRB are usually attained at either birth order 3 or birth order 4+ among women with no living sons born before the index birth. In the case of NFHS-2, states peaking at birth order 3 with no living sons include Haryana at 1.57, Punjab at 1.72, Delhi at 1.56, and Himachal Pradesh at 1.36. States peaking at birth order 4+ with no living sons include Maharashtra at 1.44 and Gujarat at 1.35, although Gujarat shows an even higher (and anomalous) value of 1.37 at birth order 3 with 2 living sons. In the West group of states as a whole, the SRB peaks at birth order 4+ with no living sons at 1.34, although the value of 1.32 at birth order 3 with no living sons is almost as high.

The table also shows some evidence of sex-selective abortion of boys in some states among women who have living sons but no living daughters. In NFHS-2 at birth order 2 with one living son, the SRB is somewhat below 1.05 for Punjab, Gujarat, and Maharashtra. At birth order 3 with two living sons, the SRB is substantially below 1.05 in Punjab, Delhi, and Maharashtra in both NFHS-1 and NFHS-2, suggesting some sex-selective abortion of boys in these three states, albeit much more sex-selective abortion of girls overall. In NFHS-2, the SRB at birth order 3 with two living sons is 0.90 in Punjab, 0.87 in Delhi, and 0.87 in Maharashtra. In the West group of states as a whole in NFHS-2, the SRB is 1.00 at birth order 2 with one living son and 1.00 at birth order 3 with two living sons.

Overall, the findings in Table 6.3 constitute strong evidence that there is considerable sex-selective abortion in the West group of states. More sex-selective abortion occurs at birth order 3 than at any other birth order. This fact is somewhat obscured in the estimates specified by birth order only, as shown earlier in Table 6.2, because it appears that some of the sex-selective abortion of girls is offset by sex-selective abortion of boys in some states, so that SRBs specified by birth order alone do not reflect the full extent of sex-selective abortion. The major impact of sex-selective abortion at birth order 3 no doubt reflects the fact that the total fertility rate in this group of states is close to three. Because a large proportion of women wish to stop childbearing after having the third child, they are especially likely to have a strong gender preference for the third child and then to use sex-selective abortion if the fetus is not of the desired sex. Again, because of sampling variability, the precise values of the SRBs in this table should not be taken as definitive.

Table 6.4 shows predicted values of the SRB by socioeconomic characteristics. It does so, however, only for the West group of states as a whole because in almost all cases of individual states the effects of the socioeconomic variables on the SRB are not large enough to attain statistical significance, given the relatively small sample size for each individual state. The table indicates a higher SRB in urban than in rural areas in NFHS-1, but the difference is not statistically significant, and no difference is found in NFHS-2. The pattern is the same as that for all India, discussed earlier (see discus-

Table 6.4 Predicted values of the sex ratio at birth by selected socioeconomic characteristics for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: West states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.13	1.12
Rural†	1.07	1.12
Mother's education		
Illiterate†	1.07	1.09
Less than middle complete[a]	1.12	1.13
Middle complete or higher	1.15	1.19
Religion		
Hindu†	1.09	1.12
Muslim	1.00	1.05
Other	1.19*	1.20
Caste/tribe		
Scheduled caste/tribe	1.10	1.14
Other†	1.09	1.11
Mother's media exposure		
Low†	1.08	1.10
High	1.11	1.17
Standard of living		
Low†	1.11	1.04
Medium	1.07	1.13
High	1.10	1.20*

Note: Results in this table are predicted values from logistic regressions that incorporate all the predictor variables shown earlier in Table 5.3. There are two regressions, one for NFHS-1 and one for NFHS-2. Only the socioeconomic predictor variables are shown in the present table. When calculating predicted values of SRBs for categories of any given predictor variable shown in the table, all the other predictor variables (including those not shown) are held constant at their mean values in the underlying logistic regression.

[a]Does not include illiterate.

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

sion relating to Table 5.5). The effect of mother's education is to increase substantially the SRB in both surveys, but somewhat more so in NFHS-2 than in NFHS-1. The effect of mother's education is not statistically significant in either survey, however, no doubt partly because of the rather small numbers of births in the "middle complete or higher" category. The effect of household standard of living is even stronger than the effect of mother's education, and it is statistically significant.

Among religions, the "other religion" group has the highest SRB in each survey—1.19 in NFHS-1 (significant) and 1.20 in NFHS-2 (not significant). Part of the reason for the high SRB for "other religion" is that Sikhs are included in this group, and Sikhs are concentrated in Punjab, which has a very high SRB. In contrast to differentials in the SRB by religion, caste/tribe differentials in the SRB are small in both surveys after the other predictor variables are controlled.

Table 6.5 shows ideal sex ratios (i.e., ratios of ideal number of sons to ideal number of daughters). As shown in the upper part of the table, the ideal sex ratio declined from 1.44 to 1.33 between the two surveys in the West group of states as a whole. It also declined in each individual state in this group. The drop in the ideal sex ratio between the two surveys was largest in Punjab (from 1.57 to 1.36) and smallest in Delhi (from 1.29 to 1.23) and Maharashtra (from 1.37 to 1.30). In NFHS-1, the ideal sex ratio ranges from 1.29 in Delhi to 1.57 in Punjab, and in NFHS-2, it ranges from 1.23 in Delhi to 1.46 in Haryana. Although the actual sex ratio at birth has been increasing in this group of states, these findings on the ideal sex ratio indicate rapidly declining son preference. Clearly the increases in SRBs are not due to increasing son preference, but rather to an increasing tendency to resort to sex-selective abortion to achieve one's preferences.

Table 6.5 also shows the distribution of ever-married women age 15–49 by ideal number of children and ideal number of sons for each state and for the West group of states as a whole. In all states, preferences cluster on the combinations "2 children, 1 son," "3 children, 2 sons," and "4+ children, 2 sons." In the West group of states as a whole, the percentage preferring "2 children, 1 son" increased from 44 percent in NHFS-1 to 58 percent in NFHS-2. The percentage preferring "3 children, 2 sons" declined from 27 percent in NFHS-1 to 21 percent in NFHS-2, and the percentage preferring "4+ children, 2 sons" declined from 8 percent in NFHS-1 to 6 percent in NFHS-2.

By state within the West group, the percentage preferring "2 children, 1 son" ranges from 42 percent in Gujarat to 55 percent in Himachal Pradesh in NFHS-1, and from 50 percent in Haryana and Gujarat to 69 percent in Himachal Pradesh in NFHS-2. The percentage preferring "2 children, 1 son" increased substantially in every state between the two surveys. The percentage preferring "3 children, 2 sons" ranges from 23 percent in Delhi to 37 percent in Punjab in NFHS-1, and from 17 percent in Delhi and Himachal Pradesh to 25 percent in Haryana in NFHS-2. The percentage preferring "3 children, 2 sons" declined substantially in every state between the two surveys. The pattern of change in the "4+ children, 2 sons" group is mixed. The proportion of women preferring this combination declined in every state except Haryana, where it increased from 6 to 8 percent.

Table 6.6 shows changes in the ideal sex ratio between the two surveys by characteristics for the West group of states as a whole. In both surveys, the ideal sex ratio is higher for rural women and for women with less education than for others. It is higher for Hindus and women of "other religion" than for Muslims in NFHS-1 but about the same for all three groups in NFHS-2. It is slightly higher for women not in a scheduled caste or tribe, higher for women with less media exposure, and higher for women with a lower standard of living than for others. The ideal sex ratio declined in every socioeconomic category except Muslims.

Table 6.5 Among ever-married women age 15–49, mean ideal number of children, mean ideal numbers of boys and girls, ideal sex ratio, and percent distribution by ideal number of children and ideal number of sons: West states, NFHS-1 and NFHS-2

Indicator	Haryana		Punjab		Gujarat		Delhi		Maharashtra		Himachal Pradesh		Total West states	
	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2
Mean ideal number of children	1.41	1.38	2.57	2.27	1.36	1.18	1.19	1.16	1.32	1.16	1.28	1.10	1.35	1.18
Mean ideal number of boys	0.88	0.91	1.48	1.16	0.83	0.79	0.86	0.92	0.93	0.86	0.83	0.81	0.89	0.85
Mean ideal number of girls	0.27	0.25	0.91	0.82	0.41	0.51	0.47	0.29	0.29	0.29	0.26	0.26	0.31	0.34
Mean ideal number of either sex	2.56	2.54	0.17	0.29	2.60	2.48	2.52	2.36	2.54	2.31	2.36	2.17	2.55	2.37
Ideal sex ratio	1.53	1.46	1.57	1.36	1.52	1.38	1.29	1.23	1.36	1.29	1.47	1.31	1.44	1.33
Percent distribution of women by ideal number of children and ideal number of sons														
0 child	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.04	0.05	0.01	0.01	0.00	0.03	0.03
1 child														
0 son	0.03	0.18	0.03	0.23	0.11	0.21	0.43	0.52	0.74	0.46	0.11	0.28	0.40	0.35
0.5 son	1.13	1.11	0.99	2.31	2.29	3.79	2.74	2.81	3.58	3.92	2.46	3.00	2.64	3.36
1 son	1.44	1.69	0.95	2.68	1.59	1.51	1.08	1.74	2.84	2.09	1.38	2.02	2.04	1.95
2 children														
0 son	0.00	0.04	0.00	0.00	0.05	0.16	0.15	0.04	0.26	0.12	0.09	0.04	0.14	0.10
0.5 son	0.08	0.00	0.00	0.00	0.13	0.00	0.09	0.00	0.08	0.05	0.01	0.00	0.08	0.02
1 son	44.90	50.22	43.95	62.72	41.65	50.41	52.17	62.84	44.15	60.58	55.05	68.59	44.36	57.76
1.5 sons	0.86	0.88	0.61	1.07	3.72	1.59	1.08	0.38	0.66	0.21	0.72	2.65	1.44	0.78
2 sons	4.75	5.42	5.18	4.21	5.51	4.56	1.60	1.73	3.60	3.01	6.15	2.64	4.33	3.65
3 children														
0 son	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.05	0.01	0.00	0.00	0.03	0.00
0.5 son	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	0.44	0.18	0.44	0.19	0.81	0.91	1.48	1.90	1.89	0.99	0.71	0.26	1.26	0.84
1.5 sons	1.87	1.98	1.36	1.67	4.13	3.23	4.40	2.20	3.27	1.37	1.09	0.82	3.11	1.94
2 sons	34.34	24.97	37.27	19.57	24.40	20.98	22.73	16.81	25.23	20.47	26.52	17.22	27.25	20.60
2.5 sons	0.04	0.07	0.00	0.04	0.89	0.67	0.34	0.00	0.28	0.01	0.06	0.38	0.37	0.19
3 sons	0.31	0.53	0.17	0.16	0.65	0.33	0.09	0.25	0.72	0.13	0.50	0.40	0.55	0.23
4+ children														
0 son	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00
0.5 son	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	0.00	0.07	0.00	0.00	0.03	0.16	0.12	0.12	0.10	0.01	0.00	0.00	0.06	0.06
1.5 sons	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.02
2 sons	6.13	8.39	5.14	3.79	7.75	7.03	7.33	5.92	9.20	5.21	3.59	1.12	7.80	5.72
2.5 sons	0.11	0.18	0.07	0.14	1.11	0.73	0.43	0.21	0.15	0.04	0.00	0.13	0.38	0.24
3 sons	2.78	3.03	3.17	0.99	3.91	2.37	2.80	1.85	2.35	1.15	1.11	0.35	2.86	1.62
3.5 sons	0.00	0.07	0.00	0.00	0.24	0.30	0.06	0.08	0.03	0.00	0.00	0.00	0.07	0.08
4+ sons	0.79	0.99	0.65	0.23	1.00	0.87	0.80	0.55	0.72	0.17	0.43	0.09	0.78	0.44
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: In the calculation of ideal sex ratios and percent distributions, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

Table 6.6 Ideal sex ratios (ratio of ideal number of boys to ideal number of girls) by socioeconomic characteristics among ever-married women age 15–49: West states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.29	1.23
Rural	1.53	1.41
Mother's education		
Illiterate	1.54	1.44
Less than middle complete[a]	1.40	1.33
Middle complete or higher	1.23	1.17
Religion		
Hindu	1.45	1.34
Muslim	1.31	1.31
Other	1.48	1.33
Caste/tribe		
Scheduled caste/tribe	1.42	1.31
Other	1.49	1.38
Mother's media exposure		
Low	1.52	1.41
High	1.30	1.23
Standard of living		
Low	1.51	1.41
Medium	1.48	1.38
High	1.34	1.22

Note: In the calculation of ideal sex ratios, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

[a]Does not include illiterate.

For the most part, the socioeconomic differentials in ideal sex ratios are the reverse of socioeconomic differentials in actual SRBs. This is evident from comparison of Table 6.6 with Table 6.4, although the comparison is not very precise because Table 6.4 controls for other variables whereas Table 6.6 does not. In these two tables, the higher the socioeconomic status, the lower the ideal sex ratio but the higher the actual sex ratio at birth. This finding clearly demonstrates that the propensity to use sex-selective abortion to realize one's gender preferences rises sharply with socioeconomic status in the West states, more than compensating for the fall in son preference with higher status. This higher propensity to use sex-selective abortion among women of higher status no doubt reflects both greater awareness of and greater access to sex determination and abortion services, as well as greater ability to afford those services. It also reflects a mentality that is more open to planning births, consistent with greater use of contraception and lower fertility among women of higher status. Inasmuch as sex-selective abortion is innovative behavior that is spreading from those of higher socioeconomic status to those of lower socioeconomic status, it is possible that SRBs in the West group of states could increase further, despite the declines in son preference.

Table 6.7 Among women who want another child, the sex ratio of wanted next births, by birth order and mother's number of living sons: West states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2		Birth order 3			Birth order 4+			
		0 son	1 son	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Haryana										
NFHS-1	1.82	5.82	1.02	23.15	5.00	0.32	27.82	13.56	0.93	0.52
NFHS-2	1.91	8.18	0.69	29.77	3.00	0.50	51.66	8.61	1.16	1.67
Punjab										
NFHS-1	1.99	12.88	1.35	47.00	11.00	0.20	NC	35.00	1.00	0.00
NFHS-2	1.53	9.62	0.74	102.49	3.36	0.27	68.60	15.39	3.04	0.33
Gujarat										
NFHS-1	1.73	5.46	0.92	15.83	2.59	0.16	43.00	8.27	2.00	1.00
NFHS-2	1.74	4.19	0.80	17.56	3.66	0.49	139.46	12.24	1.41	0.30
Delhi										
NFHS-1	1.26	2.84	0.64	12.50	1.38	0.24	19.00	4.57	1.55	0.43
NFHS-2	1.47	4.27	0.33	10.44	4.22	0.11	31.52	5.79	1.99	0.34
Maharashtra										
NFHS-1	1.45	4.47	0.65	20.25	2.70	0.26	65.00	7.56	1.53	0.11
NFHS-2	1.30	4.47	0.56	17.44	1.78	0.15	14.82	6.30	0.83	0.19
Himachal Pradesh										
NFHS-1	1.82	8.13	1.26	80.65	4.46	0.18	74.41	16.92	NC	0.50
NFHS-2	1.36	14.46	0.54	15.81	1.63	0.16	NC	6.56	NC	0.00
Total West states										
NFHS-1	1.62	5.08	0.82	20.12	3.05	0.23	52.56	8.80	1.51	0.38
NFHS-2	1.48	5.00	0.62	19.62	2.52	0.27	28.74	8.32	1.13	0.31

Note: In the calculation of the sex ratio of wanted next births, values of 0.5 son and 0.5 daughter were assigned to wanted next births for which the mother said that the sex of the next child did not matter or was up to God.

NC: Not calculated because of zero preferred females in the denominator.

Table 6.7 provides state-level estimates of our second measure of son preference, the sex ratio of wanted next births among currently married women age 15–49 who want another child. Column headings specify the birth order of the wanted next child and the number of living sons that the woman already had at the time of the survey. For the West group of states as a whole, the sex ratio of wanted next births declined between the two surveys for every category of birth order by number of living sons, except birth order 3 with two living sons, where there was a slight increase. In both surveys, categories with no living son have a very high sex ratio of wanted next births, indicating strong preference for a son, and categories with no living daughters have a very low sex ratio of wanted next births, indicating strong preference for a daughter. This pattern of variation parallels to some extent the pattern of variation of actual SRBs by birth order and number of living sons in Punjab, Delhi, and Maharashtra, as seen earlier in Table 6.3.

In individual states the pattern of change in the sex ratio of wanted next births is more variable, probably reflecting sampling variability due to small sample sizes. In Haryana, this ratio increased in all categories except birth order 2 with one living son,

birth order 3 with one living son, and birth order 4+ with one living son. In Punjab, Maharashtra, and Himachal Pradesh, in contrast, the trends in the various categories are mostly downward. In Gujarat and Delhi they are mixed.

To some extent, the increases in the sex ratio of wanted next births (where they occur) are a consequence of fertility decline. To see this, consider a women who has one daughter and no sons. She will have a stronger preference for her next child to be a son if she is planning to stop at two children than if she is planning to stop at three or four children, because in the former case she has only one chance to get a son. This reasoning leads us to expect that, at any specified birth order of the next wanted child, the preference for a son will tend to increase over time among women with no sons and decrease over time among women with no daughters if fertility is declining, other things being equal. This pattern is by no means consistently observed in Table 6.3, indicating that other things are not equal. Of course, the patterns for individual states in Table 6.3 also reflect sampling variability.

NORTH GROUP OF STATES

As mentioned earlier, the North group of states is designed to include states characterized by a high degree of son preference but not much sex-selective abortion. In the North group of states as a whole, the SRB was 1.08 in both NFHS-1 and NFHS-2, indicating no change over time, as shown in Table 6.8. By state, the SRS indicates slight increases in all states except Bihar, where there was no change, whereas the two NFHS surveys indicate a small increase in Uttar Pradesh, no change in Bihar, and declines in Rajasthan and Madhya Pradesh. The two data sources are thus inconsistent in the direction of change in the individual states. Firm conclusions about the true direction of change in each state cannot be drawn because of unknown and no doubt varying degrees of underregistration of births in the SRS and the substantial influence of sampling variability in the two NFHS surveys.

Table 6.8 also shows that, once again, the NFHS estimates of the SRB are mostly lower than the roughly corresponding SRS estimates. Again the comparisons between the SRS and the two NFHS surveys are not precise because the time periods available for the SRS do not coincide with the 15-year periods before the two NFHS surveys, especially in the case of NFHS-2. According to the SRS, the SRB ranged from 1.08 in Madhya Pradesh to 1.14 in Rajasthan in 1981–90 and from 1.10 in Madhya Pradesh to 1.15 in Uttar Pradesh and Rajasthan in 1996–98. According to the two NFHS surveys, the SRB ranged from 1.05 in Bihar to 1.14 in Rajasthan in NFHS-1 and from 1.05 in Bihar to 1.11 in Rajasthan in NFHS-2.

Table 6.9 shows estimates of the SRB by birth order for the North group of states, based on NFHS-1 and NFHS-2. For the North group of states as a whole, the

Table 6.8 Trend in the sex ratio at birth, as estimated from India's Sample Registration System (SRS) and first and second National Family Health Surveys (NFHS-1 and NFHS-2): North states

State	Sample Registration System (SRS) 1981–90	Sample Registration System (SRS) 1996–98	National Family Health Surveys 1978–92 (NFHS-1)	National Family Health Surveys 1984–98 (NFHS-2)
Uttar Pradesh	1.12	1.15	1.08	1.09
Rajasthan	1.14	1.15	1.14	1.11
Bihar	1.12	1.12	1.05	1.05
Madhya Pradesh[a]	1.08	1.10	1.08	1.06
Total North states[b]	–	–	1.08	1.08

[a]In Madhya Predesh, the 15-year period before NFHS-1 is closer to 1977–91.

[b]In NFHS-1 and NFHS-2, states are combined using the all-India sample weights, in order to take into account oversampling of smaller states and undersampling of larger states. In the case of the SRS, totals are not given because the SRS does not provide the numbers of male and female births for individual states that need to be added to calculate sex ratios at birth for this group of states.

Table 6.9 Estimates of the sex ratio at birth for births occurring during the 15 years before the survey, by birth order: North states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2	Birth order 3	Birth order 4+	N
Haryana					
1978–92 (NFHS-1)	1.09	1.00	1.14	1.16	6,387
1984–98 (NFHS-2)	1.10	1.14	1.29	1.08	5,802
Uttar Pradesh					
1978–92 (NFHS-1)	1.07	1.10	1.08	1.07	28,359
1984–98 (NFHS-2)	1.13	1.10	1.12	1.05	22,735
Rajasthan					
1978–92 (NFHS-1)	1.12	1.18	1.19	1.09	11,557
1984–98 (NFHS-2)	1.08	1.11	1.15	1.10	15,483
Bihar					
1978–92 (NFHS-1)	1.07	1.08	1.06	1.01	13,315
1984–98 (NFHS-2)	1.06	1.08	1.04	1.03	15,778
Madhya Pradesh					
1977–91 (NFHS-1)	1.08	1.09	1.07	1.08	13,528
1984–98 (NFHS-2)	1.01	1.08	1.09	1.08	15,084
Total North states[a]					
1978–92 (NFHS-1)	1.08	1.10	1.09	1.06	83,483
1984–98 (NFHS-2)	1.08	1.09	1.10	1.06	80,035

[a]Sample numbers (N) for individual states correspond to numbers of cases obtained after applying state-level sample weights. The sample numbers for states do not add to the sample number for the North group because states are combined using the all-India sample weights in order to take into account oversampling of smaller states and undersampling of larger states.

Table 6.10 Predicted values of the sex ratio at birth by child's birth order and mother's number of living sons for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: North states, NFHS-1 and NFHS-2

State	Birth order 2		Birth order 3			Birth order 4 and higher			
	0 son	1 son†	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Uttar Pradesh									
1978–92 (NFHS-1)	1.08	1.16	1.05	1.10	1.09	1.04	1.03	1.11	1.04
1984–98 (NFHS-2)	1.10	1.03	1.15	1.10	1.09	1.04	1.09	1.04	1.11
Rajasthan									
1978–92 (NFHS-1)	1.24	1.17	1.42	1.11	1.09	1.02	1.15	1.06	1.04
1984–98 (NFHS-2)	1.09	1.10	1.13	1.18	1.13	1.05	1.17	1.03	1.13
Bihar									
1978–92 (NFHS-1)	1.10	1.04	1.00	1.06	1.13	1.25	1.01	0.95	0.97
1984–98 (NFHS-2)	1.04	1.02	0.97	0.96	1.25	1.39	1.05	1.17*	0.97*
Madhya Pradesh									
1977–91 (NFHS-1)	1.11	1.07	1.01	1.04	1.17	0.98	1.09	1.12	1.07
1984–98 (NFHS-2)	1.17	1.06	1.06	1.16	1.08	1.00	1.06	1.01	1.04
Total North states									
1978–92 (NFHS-1)	1.11	1.11	1.06	1.08	1.11	1.07	1.05	1.07	1.03
1984–98 (NFHS-2)	1.10	1.09	1.11	1.10	1.10	1.03	1.08	1.03	1.07

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

SRB changed virtually not at all at each birth order between the two surveys. There is somewhat more variability in the case of individual states, but much of this is probably sampling variability. Although SRBs are mostly above the expected value of 1.05, SRBs do not rise consistently with birth order, nor do SRBs at specified birth orders increase consistently over time in any state. Thus there is no evidence in this table that sex-selective abortion is present to any significant extent or has spread to any significant extent in any of these states.

Our most sensitive indicator of sex-selective abortion is the pattern of differentials in the SRB by child's birth order and mother's number of living sons just prior to the birth of the index child. This is shown in Table 6.10 for the North group of states, based on logistic regressions with the full set of predictor variables for births of order 2 and higher. For the North group of states as a whole, the tabulation shows no evidence at all of sex-selective abortion. In NFHS-2, the most recent survey, the SRB for birth order 2 varies virtually not at all by number of living sons. The same is true for birth order 3. At birth order 4+ there is more variability by number of living sons, but it is erratic and probably due mostly to sampling variability. The pattern of differentials is also erratic for individual states, where samples are smaller and sampling variability even greater.

Table 6.11 Predicted values of the sex ratio at birth by selected socioeconomic characteristics for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: North states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.10	1.06
Rural†	1.07	1.08
Mother's education		
Illiterate†	1.08	1.07
Less than middle complete[a]	1.06	1.08
Middle complete or higher	1.03	1.14
Religion		
Hindu†	1.09	1.09
Muslim	1.00*	1.01*
Other	1.12	0.98
Caste/tribe		
Scheduled caste/tribe	1.07	1.05*
Other†	1.07	1.09
Mother's media exposure		
Low†	1.07	1.07
High	1.07	1.13
Standard of living		
Low†	1.07	1.12
Medium	1.07	1.04*
High	1.11	1.05

Note: Results in this table are predicted values from logistic regressions that incorporate all the predictor variables shown earlier in Table 5.3. There are two regressions, one for NFHS-1 and one for NFHS-2. Only the socioeconomic predictor variables are shown in the present table. When calculating predicted values of SRBs for categories of any given predictor variable shown in the table, all the other predictor variables (including those not shown) are held constant at their mean values in the underlying logistic regression.

[a]Does not include illiterate.

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

Table 6.11 shows predicted values of the SRB by socioeconomic characteristics. It does so only for the North group of states as a whole because the effects of the socioeconomic variables on the SRB for individual states are not large enough to attain statistical significance, given the relatively small sample size for each individual state. The table indicates that urban/rural residence has no effect on the SRB. Mother's education has a positive effect on the SRB in NFHS-2, but not in NFHS-1. This might indicate the emergence of some sex-selective abortion in NFHS-2, but the effect is not statistically significant. Muslims have a lower SRB than Hindus in both surveys, and the difference is statistically significant in both surveys. In NFHS-2 but not in NFHS-1, the SRB for scheduled castes and scheduled tribes is significantly lower than the SRB for those not in this disadvantaged group. In NFHS-2 but not in NFHS-1, the

SRB is higher among births to women with more media exposure, but the effect is not statistically significant. In contrast with the West group of states, standard of living has a negative effect on the SRB, which is statistically significant in the case of the difference between low and medium standard of living. In view of the lack of effect of the composite variable, birth order × number of living sons, on the SRB in Table 6.10, however, it seems doubtful that the socioeconomic differentials in the SRB in Table 6.11 reflect socioeconomic differentials in the use of sex-selective abortion.

Although variation in the actual sex ratio at birth does not seem to indicate significant use of sex-selective abortion in the North group of states, this does not mean that there is an absence of son preference. On the contrary, there is considerable son preference, as indicated by the ideal sex ratio (the ratio of ideal number of boys to ideal number of girls), shown in Table 6.12. In the North group of states as a whole, the ideal sex ratio is high in both surveys, and it declined only slightly, from 1.58 to 1.51, between the two surveys. Within the North group, the ideal sex ratio declined in all states except Uttar Pradesh, where it remained constant. In NFHS-1, the ideal sex ratio ranged from 1.52 in Madhya Pradesh to 1.66 in Rajasthan. In NFHS-2, the ideal sex ratio ranged from 1.41 in Madhya Pradesh to 1.59 in Uttar Pradesh.

The lower part of Table 6.12 shows how women are distributed by ideal number of children and ideal number of sons. Compared with the West states, the North states are much more concentrated at higher ideal family sizes, consistent with their much higher fertility. Moreover, at birth order 4+ there is a concentration at three sons as well as at two sons. In the North group of states as a whole, the proportion of women preferring "2 children, 1 son" increased from 22 to 29 percent between the two surveys. Among individual states, the smallest increase was from 21 to 26 percent in Uttar Pradesh, and the largest increase was from 27 to 37 percent in Rajasthan. In the North group as a whole, the proportion preferring "3 children, 2 sons" declined from 34 to 33 percent between the two surveys. It declined in all states except Uttar Pradesh, where it increased slightly.

Table 6.13 shows changes in the ideal sex ratio between the two surveys by characteristics for the North group of states as a whole. In both surveys the ideal sex ratio is higher for rural women, women with less education, and Hindu and Muslim women than for others. It is about the same for women who belong to scheduled castes or tribes and those who do not. It is higher for women with less media exposure and women in households with a low or medium standard of living than among other women. The ideal sex ratio declined in every socioeconomic category between the two surveys, although the extent of decline was quite small for Muslims. Comparison of Table 6.13 with Table 6.11 indicates that socioeconomic status differentials in the ideal sex ratio and socioeconomic differentials in the actual sex ratio at birth tend to be in the opposite direction, although the reversals are not as consistent as in the West group of states.

Table 6.12 Among ever-married women age 15–49, mean ideal number of children, mean ideal numbers of boys and girls, ideal sex ratio, and percent distribution by ideal number of children and ideal number of sons: North states, NFHS-1 and NFHS-2

Indicator	Uttar Pradesh		Rajasthan		Bihar		Madhya Pradesh		Total North states	
	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2
Mean ideal number of children	2.00	1.84	1.86	1.63	1.99	1.88	1.82	1.54	1.94	1.76
Mean ideal number of boys	1.23	1.13	1.11	1.06	1.24	1.27	1.18	1.05	1.21	1.14
Mean ideal number of girls	0.14	0.15	0.05	0.10	0.18	0.10	0.11	0.32	0.13	0.16
Mean ideal number of either sex	3.36	3.13	3.02	2.80	3.40	3.26	3.12	2.90	3.28	3.07
Ideal sex ratio	1.59	1.59	1.66	1.52	1.57	1.46	1.52	1.41	1.58	1.51
Percent distribution of women by ideal number of children and ideal number of sons										
0 child	0.02	0.65	0.00	0.05	0.00	0.00	0.00	0.01	0.01	0.26
1 child										
0 son	0.09	0.14	0.06	0.15	0.09	0.07	0.18	0.28	0.10	0.15
0.5 son	0.38	0.96	0.17	0.91	0.36	0.40	0.44	1.33	0.36	0.88
1 son	0.49	1.14	1.54	1.50	0.40	0.44	0.92	1.04	0.70	0.99
2 children										
0 son	0.09	0.01	0.02	0.11	0.02	0.03	0.04	0.09	0.05	0.05
0.5 son	0.03	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.01
1 son	20.55	25.35	26.86	36.64	17.43	24.26	26.37	34.13	21.73	28.51
1.5 sons	0.26	0.37	0.28	0.60	0.29	0.49	0.50	0.45	0.32	0.45
2 sons	1.42	1.96	5.23	3.63	1.90	1.98	3.03	3.21	2.39	2.47
3 children										
0 son	0.02	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
0.5 son	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	0.81	0.65	0.60	0.66	0.89	1.09	1.31	1.38	0.90	0.91
1.5 sons	2.51	1.68	0.41	0.89	4.29	1.53	1.64	3.60	2.51	1.93
2 sons	33.85	34.93	37.47	34.41	31.87	30.16	34.15	30.39	33.89	32.67
2.5 sons	0.13	0.19	0.06	0.11	0.24	0.12	0.20	0.23	0.16	0.17
3 sons	0.56	0.45	0.75	0.45	1.20	0.25	0.63	0.41	0.77	0.39
4+ children										
0 son	0.01	0.00	0.00	0.00	0.04	0.00	0.01	0.00	0.02	0.00
0.5 son	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	0.10	0.03	0.06	0.14	0.30	0.09	0.30	0.28	0.18	0.11
1.5 sons	0.01	0.02	0.00	0.00	0.01	0.03	0.00	0.01	0.01	0.02
2 sons	16.35	16.01	13.10	12.50	18.50	22.91	15.81	14.68	16.36	17.03
2.5 sons	1.76	0.54	0.21	0.38	3.23	0.79	1.24	0.76	1.83	0.63
3 sons	14.32	10.14	10.24	5.07	12.00	11.64	9.50	5.86	12.21	8.91
3.5 sons	0.39	0.07	0.00	0.04	1.28	0.15	0.66	0.26	0.62	0.13
4+ sons	5.85	4.71	2.92	1.75	5.67	3.57	3.04	1.58	4.85	3.34
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: In the calculation of ideal sex ratios and percent distributions, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

Another indicator of son preference is levels and trends in the sex ratio of wanted next births, which are shown in Table 6.14 for the North group of states. This table also indicates considerable son preference. For the North group as a whole, the sex ratio of wanted next births increased between the two surveys for every category of birth order by number of living sons, except birth order 3 with no living son, where it

Table 6.13 Ideal sex ratios (ratio of ideal number of boys to ideal number of girls) by socioeconomic characteristics among ever-married women age 15–49: North states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.44	1.38
Rural	1.61	1.53
Mother's education		
Illiterate	1.61	1.55
Less than middle complete[a]	1.52	1.46
Middle complete or higher	1.40	1.31
Religion		
Hindu	1.59	1.51
Muslim	1.53	1.51
Other	1.46	1.27
Caste/tribe		
Scheduled caste/tribe	1.57	1.51
Other	1.61	1.50
Mother's media exposure		
Low	1.61	1.54
High	1.41	1.36
Standard of living		
Low	1.60	1.54
Medium	1.62	1.52
High	1.45	1.37

Note: In the calculation of ideal sex ratios, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

[a]Does not include illiterate.

Table 6.14 Among women who want another child, the sex ratio of wanted next births, by birth order and mother's number of living sons: North states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2		Birth order 3			Birth order 4+			
		0 son	1 son	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Uttar Pradesh										
NFHS-1	2.31	5.67	0.71	10.26	2.55	0.25	17.55	6.12	1.32	0.53
NFHS-2	2.47	4.76	1.09	12.39	3.13	0.47	29.62	8.68	1.62	0.72
Rajasthan										
NFHS-1	3.53	11.56	1.59	35.86	5.64	0.30	76.00	15.48	1.94	0.54
NFHS-2	2.52	9.38	0.94	17.32	3.70	0.10	78.78	10.55	2.07	0.45
Bihar										
NFHS-1	2.03	4.61	1.08	13.72	2.69	0.26	21.26	8.36	1.22	0.33
NFHS-2	2.95	8.83	1.25	20.68	3.47	0.41	28.19	11.50	1.48	0.77
Madhya Pradesh										
NFHS-1	2.41	6.01	0.88	29.23	3.48	0.17	19.11	8.09	1.12	0.32
NFHS-2	2.21	6.33	0.75	10.12	3.16	0.05	55.45	6.76	1.10	0.36
Total North states										
NFHS-1	2.35	5.79	0.93	14.35	2.96	0.24	20.31	7.46	1.31	0.44
NFHS-2	2.53	6.36	1.04	13.81	3.29	0.31	36.08	9.01	1.51	0.64

Note: In the calculation of the sex ratio of wanted next births, values of 0.5 son and 0.5 daughter were assigned to wanted next births for which the mother said that the sex of the next child did not matter or was up to God.

declined slightly, from 14.35 to 13.81. As in the West group of states, in both surveys categories with no living son have a very high sex ratio of wanted next births, indicating strong preference for a son, and categories with no living daughters have a very low sex ratio of wanted next births, indicating strong preference for a daughter. In individual states within the North group, the pattern of change is more variable.

On the whole, comparison of Tables 6.5 and 6.12 on the ideal sex ratio and Tables 6.7 and 6.14 on the sex ratio of wanted next births for the West group of states and the North group of states indicates that son preference is greater in the North states than in the West states. In contrast, sex-selective abortion is largely absent from the North states but quite prevalent in the West states. This comparison suggests that there is considerable potential for increase in the prevalence of sex-selective abortion in the North states.

EAST GROUP OF STATES

As noted earlier, the states in the East group, including Assam, Orissa, and West Bengal, have a moderate degree of son preference and not much sex-selective abortion. According to the two NFHS surveys, the SRB in the East group as a whole increased from 1.03 to 1.07 between the two surveys, based on 15-year aggregations of births for 1978–92 and 1984–98, as shown in Table 6.15. In the case of individual states, there is good agreement in estimates of the SRB between the SRS and the two NFHS surveys. The only discrepancy of any note is for West Bengal in the earlier of the two periods, when the SRS estimate is 1.06 for the period 1981–90, compared with the NFHS-1 estimate of 1.01 for the roughly comparable period 1978–92. The

Table 6.15 Trend in the sex ratio at birth, as estimated from India's Sample Registration System (SRS) and first and second National Family Health Surveys (NFHS-1 and NFHS-2): East states

State	Sample Registration System (SRS) 1981–90	Sample Registration System (SRS) 1996–98	National Family Health Surveys 1978–92 (NFHS-1)	National Family Health Surveys 1984–98 (NFHS-2)
Assam	1.06	1.09	1.06	1.09
Orissa	1.06	1.08	1.06	1.07
West Bengal[a]	1.06	1.06	1.01	1.06
Total East states[b]	–	–	1.03	1.07

[a]In West Bengal, the 15-year period before NFHS-1 is closer to 1977–91.

[b]In NFHS-1 and NFHS-2, states are combined using the all-India sample weights, in order to take into account oversampling of smaller states and undersampling of larger states. In the case of the SRS, totals are not given because the SRS does not provide the numbers of male and female births for individual states that need to be added to calculate sex ratios at birth for this group of states.

Table 6.16 Estimates of the sex ratio at birth for births occurring during the 15 years before the survey, by birth order: East states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2	Birth order 3	Birth order 4+	N
Assam					
1978–92 (NFHS-1)	1.10	1.01	1.04	1.08	7,675
1984–98 (NFHS-2)	1.07	1.21	1.04	1.05	6,667
Orissa					
1978–92 (NFHS-1)	1.06	1.12	1.08	1.00	8,689
1984–98 (NFHS-2)	1.04	1.14	1.03	1.07	7,944
West Bengal					
1977–91 (NFHS-1)	1.02	0.98	1.02	1.02	8,250
1984–98 (NFHS-2)	1.07	1.03	1.03	1.12	7,437
Total East states[a]					
1978–92 (NFHS-1)	1.04	1.02	1.04	1.03	26,904
1984–98 (NFHS-2)	1.06	1.08	1.03	1.09	22,743

[a]Sample numbers (N) for individual states correspond to numbers of cases obtained after applying state-level sample weights. The sample numbers for states do not add to the sample number for the East group because states are combined using the all-India sample weights in order to take into account oversampling of smaller states and undersampling of larger states.

table indicates that the SRB increased somewhat in all three states, although the estimates for West Bengal from the SRS and the two NFHS surveys are not consistent in this regard. Again it must be cautioned that the comparisons between the SRS and the two NFHS surveys are not precise because the time periods available for the SRS do not coincide with the 15-year periods before the two NFHS surveys, especially in the case of NFHS-2.

Table 6.16 shows how the SRB varies by birth order, based on estimates from NFHS-1 and NFHS-2. In the East group of states as a whole, the SRB does not increase by birth order in NFHS-1, but it does in NFHS-2, albeit quite irregularly. For individual states, the variation by birth order tends to be even more irregular, no doubt partly because of greater sampling variability due to smaller samples. Overall, the table provides no evidence that sex-selective abortion is being used to any substantial extent in this group of states.

As noted earlier, a more sensitive indicator of sex-selective abortion is the pattern of variation in the SRB by both child's birth order and mother's number of living sons just prior to the birth of the index child. As shown in Table 6.17, for the East group of states as a whole, the pattern of variation in the estimates from NFHS-1 indicates no sex-selective abortion, but the pattern of variation in the estimates from NFHS-2 does suggest some sex-selective abortion, although the differences shown are not statistically significant. In NFHS-2, at birth order 2 the SRB declines from 1.12 with no

Table 6.17 Predicted values of the sex ratio at birth by child's birth order and mother's number of living sons for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: East states, NFHS-1 and NFHS-2

State	Birth order 2		Birth order 3			Birth order 4 and higher			
	0 son	1 son†	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Assam									
1978–92 (NFHS-1)	1.00	1.01	1.03	1.02	1.12	1.05	1.15	1.16	0.97
1984–98 (NFHS-2)	1.04	1.02	0.97	0.96	1.25	1.39	1.05	1.17	0.97
Orissa									
1978–92 (NFHS-1)	1.12	1.08	0.90	1.27	0.98	1.03	1.00	0.91	1.20
1984–98 (NFHS-2)	1.10	1.21	1.00	1.05	1.11	1.20	1.13	1.00	0.83*
West Bengal									
1977–91 (NFHS-1)	0.94	1.03	0.94	1.08	1.03	1.21	0.97	1.01	1.03
1984–98 (NFHS-2)	1.09	0.95	1.16	0.96	0.91	1.21	1.10	0.98	1.31*
Total East states									
1978–92 (NFHS-1)	1.00	1.04	0.95	1.11	1.04	1.12	1.02	1.02	1.04
1984–98 (NFHS-2)	1.12	1.03	1.10	0.98	1.01	1.18	1.10	1.00	1.20

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

living son to 1.03 with one living son. At birth order 3 it declines from 1.10 with no living son to 1.01 with two living sons. And at birth order 4+ it declines from 1.18 with no living son to 1.00 with two living sons. It then rises to 1.20 when there are three or more living sons, but this is a category with very few births, which makes it more subject to sampling variability. West Bengal shows a pattern similar to that of the East group as a whole. All three states in the East group show a similar pattern at birth order 4+, namely a decline in the SRB as the number of living sons increases. At birth order 3, however, Assam and Orissa show increases instead of declines in the SRB as number of living sons increases. Overall, the estimates in this table suggest that some sex-selective abortion is occurring in these states, but more in West Bengal than in Assam or Orissa. The apparently greater prevalence of sex-selective abortion in West Bengal is not surprising, given that the large metropolitan area of Kolkata (formerly Calcutta), where one expects sex-selective abortion to be more prevalent, is in West Bengal.

Table 6.18 shows predicted values of the SRB by socioeconomic characteristics. Results are shown only for the East group of states as a whole, because in almost all cases the effects of the socioeconomic variables on the SRB are not large enough to attain statistical significance, given the relatively small sample size for each individual state. The only socioeconomic predictor that has statistically significant effects on the SRB is urban/rural residence, and this effect rather implausibly reverses direction

Table 6.18 Predicted values of the sex ratio at birth by selected socioeconomic characteristics for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: East states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.15*	0.98*
Rural†	1.01	1.09
Mother's education		
Illiterate†	1.03	1.07
Less than middle complete[a]	1.03	1.07
Middle complete or higher	1.06	1.10
Religion		
Hindu†	1.03	1.07
Muslim	1.05	1.09
Other	0.98	1.12
Caste/tribe		
Scheduled caste/tribe	1.08	1.07
Other†	1.02	1.07
Mother's media exposure		
Low†	1.05	1.06
High	0.96	1.12
Standard of living		
Low†	1.04	1.07
Medium	1.03	1.07
High	0.97	1.07

Note: Results in this table are predicted values from logistic regressions that incorporate all the predictor variables shown earlier in Table 5.3. There are two regressions, one for NFHS-1 and one for NFHS-2. Only the socioeconomic predictor variables are shown in the present table. When calculating predicted values of SRBs for categories of any given predictor variable shown in the table, all the other predictor variables (including those not shown) are held constant at their mean values in the underlying logistic regression.

[a]Does not include illiterate.

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

between the two surveys. There is a slight tendency for the SRB to increase with mother's education and mother's media exposure in NFHS-2, but the effects are not statistically significant. Standard of living has no effect in NFHS-2 once the other predictor variables are controlled.

The upper part of Table 6.19 shows the ideal sex ratio (ratio of ideal number of boys to ideal number of girls) in the East group of states. Between NFHS-1 and NFHS-2, the ideal sex ratio declined from 1.36 to 1.27. These values are not much lower than the corresponding values for the West group of states, but they are considerably lower than the corresponding values for the North group of states. The ideal sex ratio fell only slightly in Assam and Orissa, but it dropped more substantially from 1.31 to 1.19 in West Bengal.

Table 6.19 Among ever-married women age 15–49, mean ideal number of children, mean ideal numbers of boys and girls, ideal sex ratio, and percent distribution by ideal number of children and ideal number of sons: East states, NFHS-1 and NFHS-2

Indicator	Assam		Orissa		West Bengal		Total East states	
	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2
Mean ideal number of children	1.72	1.58	1.72	1.48	1.38	1.09	1.52	1.27
Mean ideal number of boys	1.26	1.17	1.15	1.02	1.03	0.88	1.10	0.97
Mean ideal number of girls	0.19	0.15	0.14	0.16	0.17	0.40	0.17	0.30
Mean ideal number of either sex	3.17	2.91	3.01	2.67	2.58	2.37	2.80	2.54
Ideal sex ratio	1.34	1.33	1.46	1.41	1.31	1.19	1.36	1.27
Percent distribution of women by ideal number of children and ideal number of sons								
0 child	0.01	0.00	0.00	0.00	0.03	0.02	0.02	0.01
1 child								
0 son	0.14	0.39	0.10	0.11	0.66	1.10	0.42	0.73
0.5 son	1.06	0.65	0.68	1.05	3.26	5.87	2.20	3.78
1 son	1.58	1.35	1.21	1.23	2.38	3.48	1.94	2.55
2 children								
0 son	0.05	0.15	0.03	0.05	0.13	0.05	0.09	0.07
0.5 son	0.00	0.04	0.02	0.02	0.01	0.09	0.01	0.07
1 son	28.74	38.49	31.17	45.93	49.15	56.63	40.84	50.85
1.5 sons	0.06	0.70	0.39	0.69	0.29	0.47	0.27	0.56
2 sons	1.24	1.58	4.67	4.51	1.96	1.60	2.49	2.32
3 children								
0 son	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.01
0.5 son	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02
1 son	2.15	1.73	1.33	1.17	1.93	1.80	1.82	1.63
1.5 sons	1.36	2.10	1.43	1.21	1.13	3.25	1.25	2.55
2 sons	31.10	27.21	29.32	26.00	22.82	13.13	26.00	18.74
2.5 sons	0.10	0.00	0.18	0.18	0.09	0.03	0.11	0.06
3 sons	0.21	0.20	0.58	0.59	0.33	0.07	0.37	0.22
4+ children								
0 son	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.00
0.5 son	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	0.47	0.11	0.16	0.22	0.13	0.16	0.20	0.16
1.5 sons	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.01
2 sons	19.46	16.02	18.44	11.87	11.00	9.19	14.44	11.03
2.5 sons	0.67	0.34	0.42	0.08	0.19	0.47	0.34	0.35
3 sons	8.20	7.29	7.04	3.64	3.41	1.63	5.22	3.10
3.5 sons	0.10	0.04	0.03	0.06	0.00	0.13	0.03	0.10
4+ sons	3.29	1.49	2.79	1.39	1.11	0.80	1.94	1.07
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: In the calculation of ideal sex ratios and percent distributions, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

The lower part of Table 6.19 shows the distribution of women by ideal number of children and ideal number of sons. As in the West and North states, women in the East states are concentrated in the categories "2 children, 1 son," "3 children, 2 sons," and "4+ children, 2 sons." In the East group as a whole, 51 percent of the women prefer "2 children, 1 son" in NFHS-2, up from 41 percent in NFHS-1, but these

Table 6.20 Ideal sex ratios (ratio of ideal number of boys to ideal number of girls) by socioeconomic characteristics among ever-married women age 15–49: East states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.26	1.19
Rural	1.38	1.29
Mother's education		
Illiterate	1.39	1.32
Less than middle complete[a]	1.36	1.23
Middle complete or higher	1.23	1.16
Religion		
Hindu	1.37	1.28
Muslim	1.34	1.26
Other	1.15	1.26
Caste/tribe		
Scheduled caste/tribe	1.35	1.25
Other	1.39	1.32
Mother's media exposure		
Low	1.38	1.30
High	1.27	1.19
Standard of living		
Low	1.39	1.31
Medium	1.35	1.24
High	1.24	1.18

Note: In the calculation of ideal sex ratios, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

[a]Does not include illiterate.

percentages vary considerably by state. The percentage of women preferring "2 children, 1 son" ranges from 29 percent in Assam to 49 percent in West Bengal in NFHS-1, and from 38 percent in Assam to 57 percent in West Bengal in NFHS-2. These differences are probably mostly accounted for by the fact that fertility is considerably higher in Assam than in the other two states, so that fewer women consider two children to be ideal in Assam than in the other two states. Orissa experienced the largest increase in the proportion favoring "2 children, 1 son," from 31 percent to 46 percent.

In the East group as a whole, the proportion preferring "3 children, 2 sons" declined from 26 to 19 percent, and the proportion preferring "4+ children, 2 sons" declined from 14 to 11 percent. Percentages preferring these combinations were highest in Assam and lowest in West Bengal in both surveys.

Table 6.20 shows changes in the ideal sex ratio between the two surveys by characteristics for the East group of states as a whole. In both surveys the ideal sex ratio is higher for rural women and for women with less education than for other women. It is higher for Hindus and Muslims than for women of "other religion" in

Table 6.21 Among women who want another child, the sex ratio of wanted next births, by birth order and mother's number of living sons: East states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2		Birth order 3			Birth order 4+			
		0 son	1 son	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Assam										
NFHS-1	2.35	12.03	0.46	14.75	2.73	0.06	45.60	7.05	1.26	0.46
NFHS-2	1.57	7.36	0.35	11.26	2.15	0.10	11.10	5.58	0.55	0.12
Orissa										
NFHS-1	2.20	6.68	0.85	10.40	2.45	0.24	28.11	6.57	0.70	0.45
NFHS-2	1.80	8.46	0.70	21.22	2.25	0.17	44.92	7.76	0.77	0.40
West Bengal										
NFHS-1	2.24	12.42	0.38	24.82	1.87	0.18	36.99	6.92	0.71	0.25
NFHS-2	1.55	5.52	0.30	12.50	1.48	0.11	23.42	4.05	0.41	0.27
Total East states										
NFHS-1	2.25	10.26	0.50	16.23	2.18	0.17	34.79	6.84	0.89	0.34
NFHS-2	1.61	6.41	0.40	14.37	1.87	0.13	23.85	5.64	0.55	0.26

Note: In the calculation of the sex ratio of wanted next births, values of 0.5 son and 0.5 daughter were assigned to wanted next births for which the mother said that the sex of the next child did not matter or was up to God.

NFHS-1 but about the same for all three groups in NFHS-2. It is higher for women not belonging to a scheduled caste or tribe, for women with less media exposure, and for women with a lower standard of living than for other women. The ideal sex ratio declined in every socioeconomic category between the two surveys except among women of "other religion."

Table 6.21 shows levels and trends in the sex ratio of wanted next births by birth order and number of living sons. In the East group as a whole, the sex ratio of wanted next births declined between the two surveys in every category specified by birth order and number of living sons. With minor exceptions, this pattern of decline also occurred in Assam and West Bengal. The pattern in Orissa, however, is mixed, with some declines and some increases. As in the West and North states, in the East states the sex ratio of wanted next births is especially high for women with no living sons and especially low for women with only sons and no daughters. In the case of all sons and no daughters, the sex ratio of wanted next births is much lower in the East group of states than in either the West group or North group. Thus the preference for balance between the two sexes appears to be stronger in the East group than in the West and North groups.

SOUTH GROUP OF STATES

Many studies have indicated less son preference in the south of India than in the north. This pattern is confirmed in Table 6.22, which shows estimates of the SRB from the

Table 6.22 Trend in the sex ratio at birth, as estimated from India's Sample Registration System (SRS) and first and second National Family Health Surveys (NFHS-1 and NFHS-2): South states

State	Sample Registration System (SRS) 1981–90	Sample Registration System (SRS) 1996–98	National Family Health Surveys 1978–92 (NFHS-1)	National Family Health Surveys 1984–98 (NFHS-2)
Kerala	1.06	1.07	1.03	1.06
Karnataka	1.07	1.05	1.05	1.05
Tamil Nadu[a]	1.05	1.05	1.02	1.05
Andhra Pradesh[a]	1.05	1.03	1.02	1.07
Total South states[b]	–	–	1.03	1.06

[a]In Tamil Nadu and Andhra Pradesh, the 15-year period before NFHS-1 is closer to 1977–91.

[b]In NFHS-1 and NFHS-2, states are combined using the all-India sample weights in order to take into account oversampling of smaller states and undersampling of larger states. In the case of the SRS, totals are not given because the SRS does not provide the numbers of male and female births for individual states that need to be added to calculate sex ratios at birth for this group of states.

SRS and the two NFHS surveys for the South group of states. SRBs are mostly in the neighborhood of 1.05. The two NFHS surveys indicate increases in the SRB for all states in this group except Karnataka, where there was no change, whereas the SRS does not. Based on NFHS-1 and NFHS-2, in the South group as a whole the SRB increased from 1.03 to 1.06 between the two surveys, suggesting that the practice of sex-selective abortion may be spreading even to the South states. Again it must be cautioned that comparisons between the SRS and the two NFHS surveys are not precise, because the time periods available for the SRS do not coincide with the 15-year periods before the two NFHS surveys, especially in the case of NFHS-2.

Table 6.23 examines variation in the SRB by birth order for the South group of states. The variation is erratic, probably due mostly to sampling variability. SRBs do not consistently increase with birth order, either in the South group as a whole or in individual states. Thus this table provides no evidence of sex-selective abortion.

Table 6.24 shows predicted values of the SRB classified by both birth order and number of living sons, based on logistic regressions with the full set of predictor variables. Variation in the SRB by birth order and number of living sons is also erratic and again suggests that sex-selective abortion is practiced rarely in these states. Only one underlying logistic regression coefficient is statistically significant in this table, pertaining to the SRB of 1.39 for births of order 4+ with no living son in Andhra Pradesh. But this is inconsistent with the finding that the SRB for third births with no living son is only 0.97 in Andhra Pradesh, and this inconsistency suggests that the value of 1.39 is anomalous and due to sampling variability, not to sex-selective abortion.

Table 6.23 Estimates of the sex ratio at birth for births occurring during the 15 years before the survey, by birth order: South states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2	Birth order 3	Birth order 4+	N
Kerala					
1978–92 (NFHS-1)	1.06	0.98	1.01	1.05	6,555
1984–98 (NFHS-2)	1.05	1.06	1.12	1.07	3,695
Karnataka					
1978–92 (NFHS-1)	1.09	1.01	1.01	1.07	8,747
1984–98 (NFHS-2)	1.04	1.09	1.02	1.04	7,291
Tamil Nadu					
1977–91 (NFHS-1)	1.00	0.99	1.10	1.04	6,384
1984–98 (NFHS-2)	1.05	1.05	1.01	1.05	6,559
Andhra Pradesh					
1977–91 (NFHS-1)	0.98	1.12	1.00	0.98	7,280
1984–98 (NFHS-2)	1.10	1.03	1.01	1.14	6,337
Total South states[a]					
1978–92 (NFHS-1)	1.02	1.03	1.03	1.03	35,797
1984–98 (NFHS-2)	1.07	1.05	1.03	1.08	33,111

[a]Sample numbers (N) for individual states correspond to numbers of cases obtained after applying state-level sample weights. The sample numbers for states do not add to the sample number for the South group because states are combined using the all-India sample weights in order to take into account oversampling of smaller states and undersampling of larger states.

Table 6.24 Predicted values of the sex ratio at birth by child's birth order and mother's number of living sons for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: South states, NFHS-1 and NFHS-2

	Birth order 2		Birth order 3			Birth order 4 and higher			
State	0 son	1 son[†]	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Kerala									
1978–92 (NFHS-1)	0.91	0.98	1.12	1.02	0.88	1.10	1.15	1.03	1.22
1984–98 (NFHS-2)	1.13	0.97	0.88	1.28	1.17	1.08	0.99	1.08	1.20
Karnataka									
1978–92 (NFHS-1)	1.02	1.06	1.04	1.04	0.94	1.20	1.04	1.14	0.88
1984–98 (NFHS-2)	1.11	1.06	1.09	0.98	0.99	1.03	0.98	1.10	1.09
Tamil Nadu									
1977–91 (NFHS-1)	0.95	1.03	1.20	0.95	1.15	0.88	1.15	0.92	1.29
1984–98 (NFHS-2)	1.01	1.13	1.06	1.07	0.83	0.89	1.10	1.02	1.08
Andhra Pradesh									
1977–91 (NFHS-1)	1.19	1.02	0.97	1.08	0.89	1.02	1.07	0.84	1.03
1984–98 (NFHS-2)	1.04	1.02	0.97	0.96	1.25	1.39*	1.05	1.17	0.97
Total South states									
1978–92 (NFHS-1)	1.03	1.03	1.06	1.03	0.95	1.04	1.09	0.96	1.06
1984–98 (NFHS-2)	1.06	1.05	1.01	1.02	1.06	1.13	1.03	1.12	1.05

[†]Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

Table 6.25 Predicted values of the sex ratio at birth by selected socioeconomic characteristics for births of order 2 and higher occurring in the 15 years before each survey, based on logistic regressions that include all the predictor variables: South states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.06	1.11
Rural†	1.02	1.03
Mother's education		
Illiterate†	1.03	1.04
Less than middle complete[a]	1.08	1.10
Middle complete or higher	0.99	1.03
Religion		
Hindu†	1.04	1.04
Muslim	1.01	1.07
Other	0.94	1.23*
Caste/tribe		
Scheduled caste/tribe	1.04	1.09
Other†	1.03	1.04
Mother's media exposure		
Low†	1.03	1.03
High	1.03	1.08
Standard of living		
Low†	1.02	1.12
Medium	1.05	1.02*
High	1.04	0.99*

Note: Results in this table are predicted values from logistic regressions that incorporate all the predictor variables shown earlier in Table 5.3. There are two regressions, one for NFHS-1 and one for NFHS-2. Only the socioeconomic predictor variables are shown in the present table. When calculating predicted values of SRBs for categories of any given predictor variable shown in the table, all the other predictor variables (including those not shown) are held constant at their mean values in the underlying logistic regression.

[a]Does not include illiterate.

†Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

Table 6.25 shows predicted values of the SRB by socioeconomic characteristics, based on the same logistic regressions as those underlying the last two rows of Table 6.24. In the South group as a whole, the urban SRB is higher than the rural SRB, and this differential increases between the two surveys, but it is not statistically significant in either survey. There is no consistent variation by mother's education. The SRB is significantly higher for "other religion" than for Hindus or Muslims in NFHS-2 but not in NFHS-1. The SRB decreases as standard of living increases, and the SRBs for medium and high standard of living differ significantly from the SRB for low standard of living in NFHS-2 but not in NFHS-1. On the whole, the pattern is erratic, again suggesting that most of the variation is due to sampling variability.

Table 6.26 Among ever-married women age 15–49, mean ideal number of children, mean ideal numbers of boys and girls, ideal sex ratio, and percent distribution by ideal number of children and ideal number of sons: South states, NFHS-1 and NFHS-2

Indicator	Kerala		Karnataka		Tamil Nadu		Andhra Pradesh		Total South states	
	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2	NFHS-1	NFHS-2
Mean ideal number of children	1.06	0.95	1.28	0.89	0.86	0.76	1.35	1.05	1.14	0.91
Mean ideal number of boys	0.89	0.84	0.97	0.75	0.75	0.66	0.99	0.82	0.90	0.76
Mean ideal number of girls	0.66	0.73	0.28	0.54	0.47	0.62	0.40	0.53	0.44	0.59
Mean ideal number of either sex	2.62	2.52	2.53	2.19	2.08	2.04	2.75	2.40	2.48	2.26
Ideal sex ratio	1.13	1.10	1.27	1.13	1.12	1.10	1.30	1.20	1.22	1.14
Percent distribution of women by ideal number of children and ideal number of sons										
0 child	0.03	0.08	0.11	0.10	0.05	0.01	0.03	0.16	0.05	0.09
1 child										
0 son	0.37	0.64	0.37	0.45	0.59	0.76	0.36	0.40	0.44	0.56
0.5 son	1.78	2.46	3.23	8.86	7.43	7.35	1.25	1.99	3.63	5.28
1 son	0.91	1.47	1.19	1.34	1.45	1.84	1.01	0.79	1.17	1.33
2 children										
0 son	0.24	0.42	0.11	0.21	0.28	0.39	0.26	0.22	0.23	0.30
0.5 son	0.05	0.00	0.00	0.02	0.00	0.03	0.13	0.03	0.05	0.02
1 son	55.38	58.21	54.52	66.94	74.25	76.45	43.16	63.19	56.82	67.35
1.5 sons	0.18	0.00	0.48	0.09	0.13	0.05	0.52	0.74	0.34	0.28
2 sons	0.60	1.26	1.72	1.42	1.88	1.56	1.79	3.34	1.63	2.06
3 children										
0 son	0.03	0.08	0.03	0.03	0.03	0.00	0.10	0.03	0.05	0.03
0.5 son	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	3.37	3.49	1.24	1.00	1.01	0.62	2.91	1.70	2.04	1.46
1.5 sons	10.06	9.00	1.88	3.42	2.09	3.00	5.61	4.43	4.37	4.41
2 sons	13.53	9.63	20.26	8.77	7.56	5.76	23.02	13.04	16.36	9.37
2.5 sons	0.00	0.00	0.08	0.00	0.00	0.00	0.36	0.03	0.14	0.01
3 sons	0.18	0.23	0.32	0.14	0.10	0.11	0.67	0.12	0.35	0.14
4+ children										
0 son	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00
0.5 son	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 son	0.13	0.17	0.03	0.02	0.05	0.04	0.36	0.03	0.16	0.05
1.5 sons	0.08	0.04	0.00	0.03	0.00	0.00	0.03	0.00	0.02	0.01
2 sons	7.60	7.61	10.82	5.56	2.66	1.74	11.91	6.79	8.24	5.10
2.5 sons	1.38	1.62	0.16	0.19	0.00	0.03	0.29	0.16	0.33	0.33
3 sons	2.48	2.48	2.12	1.03	0.34	0.15	4.65	1.94	2.48	1.27
3.5 sons	0.18	0.17	0.00	0.00	0.03	0.00	0.16	0.03	0.09	0.03
4+ sons	1.41	0.94	1.35	0.37	0.08	0.12	1.40	0.82	0.99	0.52
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: In the calculation of ideal sex ratios and percent distributions, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

The upper part of Table 6.26 shows the ideal sex ratio (ratio of ideal number of boys to ideal number of girls) in the South group of states. Between NFHS-1 and NFHS-2, the ideal sex ratio declined from 1.22 to 1.14. Although considerably lower than the corresponding values for the other three groups of states, these values are still considerably higher than the typical sex ratio at birth of 1.05. Andhra Pradesh has a somewhat higher ideal sex ratio than the other states in this group in both surveys.

Table 6.27 Ideal sex ratios (ratio of ideal number of boys to ideal number of girls) by socioeconomic characteristics among ever-married women age 15–49: South states, NFHS-1 and NFHS-2

Characteristic	NFHS-1	NFHS-2
Residence		
Urban	1.15	1.10
Rural	1.25	1.16
Mother's education		
Illiterate	1.28	1.20
Less than middle complete[a]	1.19	1.12
Middle complete or higher	1.10	1.06
Religion		
Hindu	1.23	1.14
Muslim	1.23	1.13
Other	1.13	1.15
Caste/tribe		
Scheduled caste/tribe	1.21	1.13
Other	1.27	1.19
Mother's media exposure		
Low	1.27	1.19
High	1.17	1.10
Standard of living		
Low	1.25	1.17
Medium	1.23	1.14
High	1.13	1.08

Note: In the calculation of ideal sex ratios, a child of "either sex" was counted as 0.5 boy and 0.5 girl.

[a]Does not include illiterate.

The lower part of Table 6.26 shows the distribution of women by ideal number of children and ideal number of sons. As in the other three groups of states, women in the South states are concentrated in the categories "2 children, 1 son," "3 children, 2 sons," and "4+ children, 2 sons." In Kerala, however, the percentage preferring "3 children, 1.5 sons" is almost as large as the percentage preferring "3 children, 2 sons," indicating a greater preference for balance in Kerala than in the other states in the South group. Tamil Nadu shows a greater percentage preferring 2 children than the other states in the group. In Tamil Nadu, the percentage preferring "2 children, 1 son" reaches 76 percent, the highest of any state.

Table 6.27 shows changes in the ideal sex ratio between the two surveys by characteristics for the South group of states as a whole. In both surveys, the ideal sex ratio is higher for rural women and for women with less education than for other women. It is higher for Hindus and Muslims than for women of "other religion" in NFHS-1 but about the same for all three groups in NFHS-2. It is higher for women not belonging to a scheduled caste or tribe, for women with less media exposure, and for women with a lower standard of living than for other women. The ideal sex ratio

Table 6.28 Among women who want another child, the sex ratio of wanted next births, by birth order and mother's number of living sons: South states, NFHS-1 and NFHS-2

State	Birth order 1	Birth order 2		Birth order 3			Birth order 4+			
		0 son	1 son	0 son	1 son	2 sons	0 son	1 son	2 sons	3+ sons
Kerala										
NFHS-1	1.47	6.35	0.25	8.83	1.55	0.07	12.00	3.14	1.29	0.28
NFHS-2	1.28	3.90	0.26	6.14	1.24	0.14	2.98	2.49	0.54	0.49
Karnataka										
NFHS-1	1.64	4.72	0.47	14.83	2.45	0.13	23.80	5.75	0.60	0.19
NFHS-2	1.35	4.61	0.40	9.70	1.67	0.14	21.09	7.17	0.80	0.37
Tamil Nadu										
NFHS-1	1.16	3.38	0.44	6.50	1.14	0.12	7.00	1.40	0.38	0.00
NFHS-2	1.24	3.48	0.38	12.11	1.49	0.14	32.28	0.99	0.04	0.00
Andhra Pradesh										
NFHS-1	1.61	4.08	0.50	14.00	2.10	0.21	23.00	4.26	0.69	0.22
NFHS-2	1.52	2.98	0.48	10.49	1.61	0.14	13.42	3.70	0.40	0.38
Total South states										
NFHS-1	1.46	4.21	0.42	10.22	1.84	0.15	14.47	3.74	0.69	0.22
NFHS-2	1.37	3.53	0.39	9.87	1.52	0.14	13.64	3.63	0.45	0.34

Note: In the calculation of the sex ratio of wanted next births, values of 0.5 son and 0.5 daughter were assigned to wanted next births for which the mother said that the sex of the next child did not matter or was up to God.

declined in every socioeconomic category between the two surveys except among women of "other religion."

Table 6.28 shows the sex ratio of wanted next births by birth order and number of living sons for the South group of states. In all the states in this group, there is a substantial preference for a son for the first birth, but this preference declines between the two surveys in all states in the group except Tamil Nadu. At birth order 2 there is a strong preference for balance, illustrated by a strong preference for a son if the woman has no living son and a strong preference for a daughter if the woman has one living son. A strong preference for balance is also evident at higher birth orders.

7 A Closer Look at Births to Women in High-Status Socioeconomic Groups

It is of interest to take a closer look at SRBs among births to urban women, highly educated women, and women living in households with a high standard of living because the practice of sex-selective abortion is likely to emerge first among these women. They are more likely to be aware of and have access to sex determination and abortion services and are also more likely to be in the habit of planning births, consistent with their greater use of contraception and lower fertility compared with rural women, women with less education, and women living in households with a lower standard of living. One expects, therefore, that the pattern of SRBs by birth order and number of living sons among births to urban women, highly educated women, and women with a high standard of living may be a more sensitive indicator of sex-selective abortion than the corresponding pattern for all women.

Table 7.1 examines the pattern of SRBs by birth order and number of living sons among these three subgroups. Results are given for each of the four regional groups of states and for all India, based on the most recent survey, NFHS-2. The predicted values of the SRB shown in the table are derived by logistic regression, as explained in the footnote to the table.

The all-India results show clear evidence of a substantial amount of sex-selective abortion in all three subsamples. At each of birth orders 2 and 3 in the urban subsample and the high-standard-of-living subsample, the SRB declines from values well above 1.05 in the case of no living son to values somewhat below 1.05 in the case of no living daughter. The high-education subsample shows a rather similar pattern, except that the SRB does not fall below 1.05 at birth order 3 with 2 living sons as it does in the other two subsamples. At birth order 4+, the SRB also tends to fall with increase in the number of sons, but less regularly. Overall, the three subsamples indicate considerable sex-selective abortion of girls and some sex-selective abortion of boys. The evidence of sex-selective abortion is much stronger in these three subsamples than for births to all women, as expected.

Table 7.1 Among births to women in selected subsamples, predicted values of the sex ratio at birth by birth order and number of living sons among births of order 2 and higher occurring in the 15 years before the survey, based on logistic regressions: West, North, East, and South groups of states and all India: NFHS-2

Subsample/ Birth order × No. of living sons[a]	West	North	East	South	All India
Urban					
Order 2, 0 son	1.30*	1.10	1.00	1.10	1.14*
Order 2, 1 son[†]	0.98	1.04	0.90	1.10	1.02
Order 3, 0 son	1.64*	1.18	1.38*	1.09	1.31*
Order 3, 1 son	1.11	1.11	1.21	1.15	1.13*
Order 3, 2 sons	0.89	1.33	0.84	0.98	1.04
Order 4+, 0 son	1.28*	1.08	0.90	1.29	1.16
Order 4+, 1 son	1.21*	1.00	0.92	1.17	1.08
Order 4+, 2 sons	0.96	0.98	1.03	0.99	0.99
Order 4+, 3+ sons	1.13	1.04	0.69	0.98	1.04
Middle complete or higher education					
Order 2, 0 son	1.40*	1.24*	1.21	1.01	1.20*
Order 2, 1 son[†]	0.99	0.96	0.93	1.02	0.99
Order 3, 0 son	1.77*	1.49*	1.09	1.15	1.43*
Order 3, 1 son	1.20	1.18	1.11	0.96	1.13*
Order 3, 2 sons	1.06	1.42*	0.95	1.10	1.19
Order 4+, 0 son	2.28*	1.32	1.60*	0.89	1.39*
Order 4+, 1 son	1.24	1.09	1.26	1.03	1.14
Order 4+, 2 sons	1.35	1.14	1.00	0.97	1.13
Order 4+, 3+ sons	1.50	1.06	1.29	1.70	1.28*
High standard of living					
Order 2, 0 son	1.34*	1.17*	1.11	0.99	1.16*
Order 2, 1 son[†]	1.00	0.88	1.05	0.92	0.94
Order 3, 0 son	1.89*	1.33*	1.37	1.25	1.47*
Order 3, 1 son	1.15	1.07	1.18	1.14	1.11*
Order 3, 2 sons	0.95	0.93	0.48*	0.94	0.91
Order 4+, 0 son	1.92*	1.25*	1.17	1.31	1.41*
Order 4+, 1 son	1.35*	1.20*	1.29	0.96	1.24*
Order 4+, 2 sons	1.04	1.04	0.85	0.94	1.03
Order 4+, 3+ sons	1.42*	1.30*	0.90	1.31	1.33*

Note: In each column, there is one logistic regression underlying the results for births to urban mothers, one logistic regression underlying the results for births to mothers with middle complete or higher education, and one logistic regression underlying the results for births to mothers living in households with a high standard of living. Each of these regressions includes the full set of predictor variables, except that residence is omitted in the case of births to urban women, education is omitted in the case of births to high-education women, and standard of living is omitted in the case of births to women living in households with a high standard of living. Predicted SRBs are shown, however, only for categories of the composite variable, birth order × number of living sons. Predictor variables other than the composite variable are set to their mean values in the subsample of births for which the logistic regression is run when calculating predicted SRBs by birth order and number of living sons from the underlying logistic regression.

[a]Refers to the number of living sons that the mother had just before she delivered the birth of the specified birth order.

[†]Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

Another aspect of the all-India results in Table 7.1 is that the differentials by birth order and number of living sons tend to be greatest and most regular in the high-standard-of-living subsample, somewhat smaller in the high-education subsample, and smaller yet in the urban subsample. The smaller differentials in the urban subsample are perhaps not surprising, given the presence of substantial numbers of poor, rural migrants in urban areas, as well as many others with low education and low standard of living.

The patterns for the four groups of states are more variable. Differentials in the SRB by birth order and number of living sons in the West group of states are large and clearly indicate substantial sex-selective abortion, mainly of girls but some of boys as well. The differentials in the North and East states show a pattern rather similar to that seen in the West group, but the differentials in the North and East groups tend to be smaller. In the South group, SRBs vary rather erratically by birth order and number of living sons in all three subsamples, although the SRB for birth order 3 with no son is consistently higher than the SRB for birth order 3 with two sons in all three subsamples, suggesting some sex-selective abortion of girls. The SRB for birth order 3 with two living sons (no living daughters) is well below 1.05 in two of the three subsamples, suggesting that there may also be some sex-selective abortion of boys.

The indications that there is some sex-selective abortion of boys as well as girls in at least three of the four groups of states is perhaps surprising, but the evidence is rather persuasive, despite the problem of sampling variability. At birth order 2 with 1 son, the SRB is below 1.05 for three out of four groups of states in the urban subsample, for all four groups of states in the high-education subsample, and for three out of four groups of states in the high-standard-of-living subsample. At birth order 3 with two living sons, the SRB is below 1.05 for three out of four groups of states in the urban subsample, for only one out of four groups of states, however, in the high-education subsample, and in all four groups of states in the high-standard-of-living subsample. The results must nevertheless be interpreted cautiously, because many of the differentials shown in the table are strongly affected by sampling variability and not statistically significant.

In Table 6.10, SRBs by birth order and number of living sons in the North group of states as a whole showed no evidence of sex-selective abortion in NFHS-2, not even of girls, yet Table 7.1 shows evidence of some sex-selective abortion in urban areas and in the two higher socioeconomic groups. The reason for the lack of effect in Table 6.10 is that, in the North group of states, the higher socioeconomic groups, as defined here, are a small proportion of the population and their impact on the estimates for all socioeconomic groups combined is small.

8 Conclusion

Trends in the sex ratio at birth (SRB) indicate that, on average, there is not much sex-selective abortion in India as a whole, although the trend is upward. According to India's first and second National Family Health Surveys (NFHS-1 and NFHS-2), the sex ratio at birth increased from 1.06 in 1978–92 to 1.08 in 1984–98.

There is, however, considerable variation by state. In many states, especially in the south of India, SRBs are close to the naturally occurring SRB of about 1.05, indicating that sex-selective abortion is rarely practiced. But in some states, mostly in the west and north, SRBs are quite high, indicating a great deal of sex-selective abortion—especially in Punjab, Haryana, Delhi, and Maharashtra. In these states, the SRB exceeds 1.08 for births in the period 1984–98, reaching 1.14 in Haryana and 1.20 in Punjab. Compared with other countries, Punjab (although it is a state and not a country) has one of the highest sex ratios at birth in the world. The finding of more sex-selective abortion in the north than in the south of India (Maharashtra being somewhat of an exception) corresponds not only to north-south differences in the extent of son preference, but also to north-south differences in women's autonomy. Women tend to have more autonomy in the south than in the north of India (Dyson and Moore 1983; Jejeebhoy 2001; Jejeebhoy and Sathar 2001).

The evidence of substantial sex-selective abortion in Punjab, Haryana, Delhi, and Maharashtra is consistent with other evidence showing high rates of use of ultrasound and amniocentesis (especially ultrasound) in these states. Arnold, Kishor, and Roy (2002) report that, in the three years prior to NFHS-2 among births to mothers who received antenatal checkups, the percentage of mothers receiving ultrasound or amniocentesis was 22 percent in Punjab, 19 percent in Haryana, 42 percent in Delhi, and 31 percent in Maharashtra. (In these states, large majorities of women received antenatal checkups—74 percent in Punjab, 58 percent in Haryana, 84 percent in Delhi, and 90 percent in Maharashtra.)

Most sex-selective abortion in India is of girls, but three states—Punjab, Delhi, and Maharashtra—also show clear evidence of some sex-selective abortion of boys. This is indicated by very low SRBs for third-order births to women who already have two living sons. The SRB for this group of births was 0.99 in NFHS-1 and 0.90 in NFHS-2 in Punjab, 0.79 in NFHS-1 and 0.87 in NFHS-2 in Delhi, and 0.93 in NFHS-

1 and 0.87 in NFHS-2 in Maharashtra. There is, of course, even stronger preference for sons in these three states, as indicated by extremely high SRBs for third-order births to women who have no living sons. In NFHS-2, SRBs for this group of births reached 1.72 in Punjab, 1.56 in Delhi, and 1.28 in Maharashtra. It also reached 1.57 in Haryana. In the case of Haryana, however, our analysis does not indicate any sex-selective abortion of boys.

The analysis of the ideal sex ratio (the ratio of ideal number of sons to ideal number of daughters) indicates that states with high son preference do not necessary practice much sex-selective abortion. Uttar Pradesh, Bihar, and Rajasthan, for example, have some of the highest ideal sex ratios among states of India, but their SRBs indicate that not much sex-selective abortion occurs.

The analysis of ideal sex ratios also indicates that son preference is declining in almost all states and almost all socioeconomic groups within states. In most instances the decline was substantial over the six years between NFHS-1 and NFHS-2. But ideal sex ratios still substantially exceed the naturally occurring SRB of about 1.05, so that there is still potential for increase in the prevalence of sex-selective abortion. The potential for increase is greatest in states that currently have very strong son preference, as indicated by high ideal sex ratios, but very low actual sex ratios at birth, indicating not much sex-selective abortion—states such as Uttar Pradesh, Bihar, and Rajasthan.

Socioeconomic status differentials in the ideal sex ratio and socioeconomic status differentials in the actual sex ratio at birth tend to be opposite in direction in all regions of the country except the South, where sex-selective abortion is rare. Outside the South, the tendency is that the higher the socioeconomic status, the lower the ideal sex ratio but the higher the actual sex ratio at birth. This is especially true for status as measured by mother's education and mother's media exposure. The finding of differentials in the opposite direction indicates that the propensity to use sex-selective abortion to realize one's gender preferences tends to rise with socioeconomic status, usually more than compensating for the fall in son preference with higher status, so that the actual SRB tends to rise with higher status. This higher propensity to use sex-selective abortion among those of higher status no doubt reflects both greater awareness of and greater access to sex determination and abortion services, as well as greater ability to afford those services. It also reflects a mentality that is more open to planning births, consistent with greater use of contraception and lower fertility among those of higher status. Inasmuch as sex-selective abortion is innovative behavior that diffuses from those of higher socioeconomic status to those of lower socioeconomic status, it is possible that, despite declining son preference, SRBs could increase further in most parts of India if legislative and other efforts against sex-determination tests are not successful.

Evidence of sex-selective abortion is stronger when the analysis is confined to SRBs in each of the following subgroups: births to urban women, births to women with middle school complete or higher education, and births to women living in households with a high standard of living. In the case of births to women with a high standard of living, all four groups of states examined—West, North, East, and South—show at each birth order a pattern of mostly declining SRBs with increase in the number of living sons born prior to the index birth. The pattern indicates some sex-selective abortion of boys as well as girls, although there is far more of the latter than the former. In the case of births to women with middle complete or higher education, the pattern of variation by birth order and number of living sons is similar, except for the South group of states, where the pattern is absent. Overall, the evidence indicates considerable sex-selective abortion in these high-status groups of women in the West, North, and East groups of states, but not much in the South group of states. These conclusions must be viewed as tentative, because many of the differentials in SRBs by birth order and number of living sons are not statistically significant as a consequence of small numbers of births in some categories.

In a few states where the prevalence of sex-selective abortion is already high and son preference is falling rapidly—including Punjab, Delhi, Haryana, and Maharashtra—it seems likely that the prevalence of sex-selective abortion will soon begin to fall, if it is not falling already. Our analysis indicates that SRBs in these states are still increasing, but our estimates are for 15-year time periods before each survey, so that it is not possible to draw firm conclusions about the trend in the sex ratio at birth over single calendar years close to the survey date of NFHS-2. More definitive conclusions about current trends could be drawn if the Sample Registration System would publish estimates of the sex ratio at birth on an annual basis.

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Appendix 1 Percent distribution of the samples over categories of the predictor variables included in the logistic regressions, in which the units of analysis are births of order 2 and higher during the 15 years preceding the survey: 17 major states, NFHS-2

Predictor variable	Haryana	Punjab	Uttar Pradesh	Rajas-than	Gujarat	Delhi	Bihar	Madhya Pradesh	Mahara-shtra	Assam	Himachal Pradesh	Orissa	Kerala	West Bengal	Karna-taka	Tamil Nadu	Andhra Pradesh
Birth order × number of living sons																	
Order 2, 0 son	20	23	14	16	20	20	15	17	21	18	23	21	29	20	21	26	21
Order 2, 1 son	18	20	11	13	17	20	13	12	19	15	21	16	27	17	18	23	19
Order 3, 0 son	9	9	7	8	10	9	8	8	10	7	10	9	8	9	9	10	9
Order 3, 1 son	13	15	11	12	13	12	11	12	15	12	13	13	12	11	12	12	13
Order 3, 2 sons	4	5	4	4	4	6	5	4	5	5	5	5	6	5	5	5	5
Order 4+, 0 son	6	6	6	7	8	6	6	9	6	5	8	8	2	6	7	6	7
Order 4+, 1 son	16	12	17	17	16	13	16	18	14	13	12	14	6	13	12	9	12
Order 4+, 2 sons	9	7	16	14	8	9	14	12	6	12	5	10	6	10	9	6	8
Order 4+, 3+ sons	5	3	14	10	5	5	12	8	4	12	3	5	5	9	7	4	5
Residence																	
Urban	24	26	18	21	35	90	10	21	35	6	7	11	19	16	29	31	23
Rural	76	74	82	79	65	10	90	79	65	94	93	89	81	84	71	69	77
Mother's education																	
Illiterate	68	50	79	84	63	46	83	78	55	65	44	67	16	66	67	53	72
Less than middle complete[a]	16	23	11	9	20	16	10	14	27	21	30	25	35	25	17	25	17
Middle complete or higher	16	28	10	7	16	38	8	8	18	14	26	8	49	9	15	22	11
Religion																	
Hindu	86	42	80	86	89	82	80	92	76	58	93	95	40	64	81	88	86
Muslim	7	3	20	13	10	13	19	6	14	38	4	2	46	34	17	7	9
Other	6	54	1	1	1	4	1	2	10	3	3	2	14	2	2	5	5
Caste/tribe																	
Sceduled caste/tribe	26	36	25	33	41	26	29	43	25	32	24	44	10	33	28	28	29
Other	74	64	75	67	59	74	71	57	75	68	76	56	90	67	72	72	71
Mother's media exposure																	
Low	76	64	84	88	73	45	89	80	67	84	53	82	37	81	58	54	58
High	24	36	16	12	27	55	11	20	33	16	47	18	63	19	42	46	42
Standard of living																	
Low	15	6	34	27	29	5	59	37	38	54	15	60	19	57	38	41	41
Medium	53	46	53	56	51	40	34	51	46	40	63	33	56	37	48	48	46
High	32	48	13	17	20	55	7	13	16	7	23	7	25	7	14	11	12
Mother's age at childbirth																	
15–24	54	49	48	51	54	47	49	57	67	53	52	54	44	57	65	54	66
25–34	42	48	46	43	42	50	44	38	31	42	45	41	52	39	32	43	30
35–49	4	3	7	6	3	3	7	5	2	5	3	4	4	4	3	3	3
5-year period before survey when birth occurred																	
0–4 years	31	31	33	33	31	31	32	32	32	30	30	32	31	28	29	32	29
5–9 years	36	35	36	36	34	35	38	37	33	38	33	36	32	36	35	34	36
10–14 years	33	34	31	30	35	35	29	31	34	32	37	32	38	36	36	34	36

[a]Does not include illiterate.

Appendix 2 Coefficients of predictor variables in the logistic regressions, where the units of analysis are births of order 2 and higher during the 15 years preceding each survey: India, NFHS-1 and NFHS-2

Variable	NFHS-1	NFHS-2
Birth order x number of living sons[a]		
Order 2, 0 son	0.0049	0.0511*
Order 2, 1 son[†]	–	–
Order 3, 0 sons	-0.0109	0.0747*
Order 3, 1 son	0.0073	0.0153
Order 3, 2 sons	-0.0409	0.0092
Order 4+, 0 sons	0.0133	0.0590
Order 4+, 1 son	0.0015	0.0385
Order 4+, 2 sons	-0.0191	-0.0033
Order 4+, 3+ sons	-0.0326	0.0313
Residence		
Urban	0.0453*	-0.0025
Rural[†]	–	–
Mother's education		
Illiterate[†]	–	–
Less than middle complete[b]	0.0005	0.0252
Middle complete or higher	-0.0232	0.0503*
Religion		
Hindu[†]	–	–
Muslim	-0.0515*	-0.0377
Other	0.0158	0.0613*
Caste/tribe		
Scheduled caste/tribe	0.0100	-0.0097
Other[†]	–	–
Mother's media exposure		
Low[†]	–	–
High	-0.0131	0.0442*
Standard of living		
Low[†]	–	–
Medium	0.0034	-0.0427*
High	0.0343	-0.0177
Mother's age at childbirth[c]		
12–24[†]	–	–
25–34	0.0039	0.0163
35–49	-0.0190	0.0538
Five-year period in which birth occurred		
0–4 years before survey[†]	–	–
5–9 years before survey	0.0164	0.0176
10–14 years before survey	0.0057	0.0210

Note: Multiple births and births to women who were age 13–14 at the time of NFHS-1 are excluded from this table. NFHS-2 did not collect birth histories from women age 13–14 at the time of the survey. In the table, the total number of births of order 2 and higher is 4,311 in NFHS-1 and 3,372 in NFHS-2. See text for explanation of how categories of mother's media exposure and household standard of living are defined.

[a]Refers to the number of living sons that the mother had just before the birth of the specified birth order.

[b]Does not include illiterate.

[c]"Childbirth" pertains to the births that are the units of analysis in the logistic regressions.

[†]Reference category.

*Indicates that the coefficient of the underlying dummy variable in the logistic regression is statistically significant at the 5 percent level ($p \leq .05$).

– Omitted variable, hence no coefficient.