Sex-Selective Abortions in India

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PROVISIONAL ESTIMATES FROM the 2001 census of India show not only an unusually high sex ratio for children under seven years of age in the country as a whole (107.8 males per 100 females), but also an increase in this sex ratio since 1991, when it was 105.8. The all-India estimates mask the much higher levels and higher increases in the sex ratios for this age group in states such as Punjab (126.1, up from 114.3 in 1991), Haryana (122.0, up from 113.8 in 1991), and Gujarat (113.9, up from 107.8 in 1991). While discrimination against young girls that results in excess female mortality has been widely documented through the years (Miller 1981; Das Gupta 1987; Kishor 1995), the recent sharp increases in the under-seven sex ratios are commonly assumed to be the result of the rapid spread of the use of ultrasound and amniocentesis for sex determination, followed by sex-selective induced abortions. In the absence of reliable information on abortions by reason for abortion, the use of sex-selective abortions can be inferred by examining sex ratios at birth and information on abortions that were preceded by the use of the technologies known to be available for sex determination of the fetus.

The census findings on the abnormally high sex ratios of young children are confirmed by the results of India's 1998–99 National Family Health Survey (NFHS-2). Since the census does not collect information on pregnancies aborted, on the use of sex-determination tests, or on sex ratios at birth, however, census data cannot be used to examine the role that sex-selective abortions are playing in the current imbalance in the sex ratios of young children in India. NFHS-2, on the other hand, provides a rich source of data to

explore this issue in greater depth. NFHS-2 data were collected from a nationally representative sample of 90,303 ever-married women aged 15–49 years. The sample was designed to provide reliable estimates for India and for every state, as well as regions within some of the larger states. NFHS-2 includes information on sex ratios at birth, spontaneous and induced abortions, sex differentials in childhood mortality, the use of ultrasound and amniocentesis during antenatal checkups, and several indicators of gender preference for children. Using NFHS-2 data, we examine the evidence for the widespread use in India and in particular states of sex-selective abortions. We proceed by discussing the legal and social setting for abortion in India, examining the extent to which sex ratios at birth reveal the use of modern technologies to avert the birth of daughters, and assessing the level of abortions and links to son preference. Having an abortion, however, does not in itself imply the use of technologies for sex selection. Thus, we present evidence on the use of ultrasound and amniocentesis for sex selection of children. We provide evidence on rules for "stopping behavior" (the intentional cessation of childbearing related to the sex of previous children) being followed by couples that complement the use of sex-selective abortions in India.

Induced abortion in India: Laws, debates, and practices

Abortion first became legal in India with the passage of the Medical Termination of Pregnancy Act in 1971. The Act came into full effect in the majority of states in 1972 and currently covers all states except Sikkim (Karkal 1991). The Act specifies the reasons for which an abortion can be legally performed, who can legally perform the abortion, and the type of facility in which it can be legally performed. Under the Act, an abortion is legal if the pregnancy that it terminates endangers the woman's life, causes grave injury to her physical or mental health, is a result of rape or contraceptive failure, or is likely to result in the birth of a child suffering from serious physical or mental abnormalities. Notably, contraceptive failure is not an acceptable reason for unmarried women to obtain an abortion. Further, to be legal, the abortion must be performed by a registered medical practitioner, that is, a practitioner whose qualifications meet the training and experience requirements stipulated by the Indian Medical Council, and must be performed in medical facilities specifically approved for conducting abortions. Approval is required from one registered medical practitioner for abortions taking place before 12 weeks of gestation, whereas two registered medical practitioners must approve abortions taking place at 12 to 20 weeks of gestation, except in the case of a medical emergency. Written approval of a guardian is required for abortions if the woman is less than 18 years of age or is mentally retarded. In all other cases approval of the woman suffices,

although an explanation of why the abortion is being sought is necessary (Mathai 1997; Gangoli 1998). Abortions even for the reasons specified by the Act, when conducted by persons other than registered medical practitioners or in facilities not specifically approved for abortion services, are illegal. The stated purpose of the Act is to provide women with safe, legal, medical services for the termination of pregnancy, although research suggests that the motivations for the Act may have had more to do with population control than with concern for maternal health or women's right to choose (Phadke 1998; Jesani and Iyer 1995).

Despite legalization of abortion on what are considered to be wide-ranging health and social grounds, however, research suggests that more illegal abortions are being performed in India than legal ones. There can be several reasons why women seeking abortions may not get a legal abortion. For example, women may have reasons for terminating a pregnancy that are different from those covered by the Act, or they may find it difficult to pay the fees charged in the private sector by approved practitioners, especially fees for the approval of two practitioners if the abortion is sought after 12 weeks of pregnancy. Notably, government statistics show that 16 percent of abortions take place at gestations greater than 12 weeks (Ministry of Health and Family Welfare 1996). Moreover, to avoid the additional bureaucratic procedures required for abortions after 12 weeks of gestation, it is likely that many later abortions are reported by both medical practitioners and pregnant women to occur at less than 12 weeks of gestation.[1] In addition, a major reason for illegal abortions appears to be bottlenecks on the supply side in the form of regional and urban–rural disparities in the availability of approved facilities registered to perform abortions. For example, only 16 percent of approved facilities are located in the four largest states that account for 40 percent of the population (Barge et al. 1998; Chhabra and Nuna 1993), and in 1990–91 there was only one approved institution per 122,260 population (Jesani and Iyer 1995). Notably too, only a fraction of medical health centers are registered to perform abortions. For example, in the early 1990s only 176 of the 1,646 Primary Health Centers in Maharashtra were approved to offer abortions (Chhabra and Nuna 1993). Thus, while at least some illegal abortions are undoubtedly performed by persons who are not medical professionals, such as traditional birth attendants, illegal providers also include medical professionals, among them gynecologists who are not specifically registered to provide the service (Ganatra et al. 2000). While government statistics estimate legal abortions at about 0.6 million annually (Ministry of Health and Family Welfare 1996), illegal abortions are estimated to be 8 to 11 times as high as legal abortions (Chhabra 1996; Jesani and Iyer 1995; Chhabra and Nuna 1993). An Indian Council of Medical Research (ICMR) study found that a large number of women seek abortions that are illegal because private practitioners provide more satisfactory services and because of the need for concealment (ICMR 1989).

Other sources of data on abortion also fail to provide consistent estimates of induced abortions in India. A population-based study conducted by the Indian Council for Medical Research in five states in 1983 estimated the induced abortion ratio to be 1.9 per 100 known pregnancies (ICMR 1989), compared with a ratio of 2.7 from government statistics (Henshaw, Singh, and Haas 1999). Almost ten years later, the first National Family Health Survey estimated the corresponding induced abortion ratio to be 1.3 (International Institute for Population Sciences 1995). The ICMR and NFHS estimates are, moreover, both likely to underestimate abortions because they do not include abortions to unmarried women (Ganatra 2000). Various studies profiling abortion seekers estimate that between 2 and 30 percent of abortion clients are not currently married, with the majority of these being never-married women. Higher abortion ratios, in the range of 3 to 9 per 100 live births, are estimated by several micro-level studies. A recent study of abortions in Maharashtra, based on combining information from many different sources, estimates abortion ratios of 11 to 14 induced abortions per 100 live births (Ganatra et al. 2000).

According to government records, more than two-thirds of abortions are among women under age 30. A review of 20 years of abortion data for Kerala from 1976/77 to 1994/95, however, reveals a clear trend toward abortions at younger ages (Rajan, Mishra, and Vimala 2000). The most common reasons for abortions are related to family planning, including birth spacing and family limitation for reasons of health (the woman's own health or, more often, the health of the previous child) or economic reasons. In addition, abortions, often preceded by a sex-determination test, are used as a strategy to ensure a desired family sex composition.

Sex determination of the fetus first became possible in India with the advent of amniocentesis in the 1970s. This technology, introduced to detect genetic abnormalities, began to be used as a way of determining the sex of a fetus. As early as 1976, however, the government banned the use of these tests for purposes of sex determination of the fetus. This law and subsequent related laws did not ban tests such as ultrasound and amniocentesis that can be used to determine the sex of the fetus as a byproduct of the test, but they made it illegal to reveal the sex of the fetus to the client. The ban on sex-determination tests in government facilities did not extend to the private medical sector, where the use of sex-determination tests flourished unregulated for at least the next 20 years. Currently the most commonly used technology for this purpose is ultrasound. Ultrasound typically costs between 500 and 1,000 rupees (about $10–20 at the current rate of exchange), about half the price of amniocentesis. Ultrasound is considered by many couples to be a good investment in order to save many times that sum in future dowry payments if the fetus is a female (Sudha and Rajan 1999). Ultrasound machines have become ubiquitous, with clinics in various parts of the country openly advertising their availability for sex determination. There are many reports

of enterprising technicians carrying portable ultrasound machines on their vehicles going into rural and harder-to-reach areas. Notably, a recent study in rural Pune found that one in six abortions was preceded by a sex-determination test (Ganatra et al. 2000).

Until recently there has been little debate, even among women's groups, about the use of sex-selective abortions to eliminate female fetuses.[2] The lack of credible opposition has had at its root the widespread acceptance of sex-selective abortions in the population as an efficient means to achieve a desired family composition. Sustaining this acceptance is the fundamental belief in the necessity to have sons and the right of couples to have them. Thus, most supporters of sex-selective abortion see it as a boon for women, because sex-selection technology allows women to bear sons without having to undergo repeated pregnancies and permits the birth only of children who are wanted. Intellectuals, too, have been divided on this issue. While some feared that girls would disappear from India (Bardhan 1974), others argued that sex selection is preferable to female infanticide or ill treatment of girls after birth. For example, Goodkind (1996, 1999) suggested that sex-selective abortion may represent a substitution of prenatal discrimination for postnatal discrimination. Further, feminists have been divided by the seeming contradiction of supporting a woman's right to abortion while opposing sex-selective abortion (Kumar 1983; Gangoli 1998).

It was not until 1985, with the formation in Maharashtra of the Forum Against Sex Determination and Sex Preselection, that sex-selective abortions were linked to the larger question of female oppression (Gangoli 1998). By 1988, this group was successful in getting the Maharashtra government to pass a law banning sex selection. Four states, namely Punjab, Haryana, Gujarat, and Rajasthan, soon followed with similar laws. Increasing concerns about the use of sex-determination tests and sex-selective abortions finally led the central government in 1994 to pass legislation making it illegal throughout India to use ultrasound or amniocentesis to determine the sex of a fetus. This law—the Pre-natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act—became fully effective throughout India on 1 January 1996. Nevertheless, enforcement of this law has been practically nonexistent in the years that followed. The high sex ratios at birth in many states revealed by the 2001 census have sparked a concerted government campaign to enforce the existing law. In addition, the Indian Medical Association and the Medical Council of India have asked doctors to stop providing sex-determination services and participating in selective abortion of female fetuses.

Our analysis provides evidence of the persistence of the use of sex-selective abortions as a means of controlling family composition. A study of the use of sex-selective abortions in India cannot, however, ignore the regional variation in the extent of son preference. Thus the discussion below examines data not only for India as a whole, but also for each state. Histori-

cally, as well as in recent years, son preference has been found to be higher in the northern states than in the southern states (Miller 1981; Sopher 1980; Clark 2000; International Institute for Population Sciences and ORC Macro 2000). For this reason, as well as to ensure that estimates are based on a sufficiently large sample size, some tables also include estimates for two groups of states. The first group (Group A) has the highest sex ratios of the population aged 0–6 years among the major states according to the 2001 census and relatively high levels of son preference (Gujarat, Haryana, and Punjab). The second group (Group B) comprises states that have relatively little son preference and much lower-than-average sex ratios of the population age 0–6 (Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu). Different states could have been selected for each of these groups, but these groupings provide a good illustration of differences in parts of the country with high and low sex ratios and levels of son preference. Although the sex ratio at birth is not as high in Gujarat as in many other states (according to NFHS-2), the low sex ratio of young children reported in the census has been a matter of serious concern in that state. Gujarat has had a long history of female infanticide among some groups and there is substantial evidence of high current levels of female feticide.

Sex ratios at birth

An evaluation of sex ratios at birth provides insight into the extent of sex-selective abortions because "normal" sex ratios at birth are found to lie between 103 and 106 males per 100 females for most societies (United Nations Secretariat 1998). These normal sex ratios at birth imply that, as a matter of biology, the number of boys born is somewhat higher than the number of girls born (Chahnazarian 1986). On the other hand, sex ratios at birth above 106 suggest that prebirth interventions are further reducing the likelihood of a female birth. Table 1 presents the sex ratios at birth for births in the five years before NFHS-2 (approximately 1994–98) as well as for the five years before the 1992–93 NFHS-1 (approximately 1988–92).

Caution must be exercised when using survey data on sex ratios at birth. These ratios can fluctuate greatly owing to chance. For example, for an observed sex ratio of 106, the 95 percent confidence interval is 92.6–119.4 if the observation is made on a sample of 1,000 births, 100.0–112.0 if made on a sample of 5,000 births, and 101.8–110.2 if made on a sample of 10,000 births, even for samples that are designed without clustering. The confidence intervals are likely to be even wider for the NFHS samples, which are multistage cluster samples.

According to NFHS-2, the sex ratio at birth at the national level for children born in the five calendar years before the survey was 106.9, up from 105.1 in NFHS-1. In NFHS-2, the rates were between 107 and 121 in

TABLE 1 Sex ratios at birth for children born in the five years preceding the survey, India, NFHS-1 and NFHS-2

State	1992–93 NFHS-1	1998–99 NFHS-2
Andhra Pradesh	100.2	103.2
Arunachal Pradesh	115.5	117.5
Assam	96.8	114.5
Bihar	96.8	106.7
Delhi	108.0	120.8
Goa	105.9	115.5
Gujarat	101.9	107.1
Haryana	113.5	117.8
Himachal Pradesh	112.3	112.6
Jammu and Kashmir	112.7	108.3
Karnataka	105.4	104.6
Kerala	99.0	107.7
Madhya Pradesh	108.1	104.5
Maharashtra	106.1	110.6
Manipur	90.6	103.0
Meghalaya	109.0	113.8
Mizoram	104.6	108.1
Nagaland	105.7	106.5
Orissa	110.9	106.0
Punjab	114.1	116.2
Rajasthan	110.8	108.8
Sikkim	U	110.1
Tamil Nadu	97.9	105.7
Tripura	103.5	103.4
Uttar Pradesh	105.4	103.6
West Bengal	103.8	108.8
Group A[1]	107.7	111.6
Group B[2]	100.8	104.7
India	105.1	106.9

NOTE: Estimates for all-India exclude Tripura.
U = unavailable
[1] Gujarat, Haryana, and Punjab
[2] Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu

16 of the 26 states that existed at the time of the survey. One factor that might account for high ratios (above the normal range of 103–106) is greater underenumeration of female births than male births because of the lower value placed on girls. But concerted efforts were made in both NFHS surveys to avoid underenumeration of children, and there is no reason why differential underenumeration should have increased over time. Although both surveys may still have differentially underenumerated female births,

the unmistakable implication of the high sex ratios at birth is that couples in many parts of India are increasingly succeeding in avoiding the birth of girls while ensuring the birth of boys.

Abortion

The analysis of sex ratios at birth provides incontrovertible evidence that couples are using family-building strategies that differentially affect the likelihood of birth of female and male children. However, unbalanced sex ratios at birth cannot, of themselves, reveal the means used for their manipulation. To establish the role of sex-selective abortions in affecting sex ratios at birth, one needs to show direct evidence of sex-selective abortions. The NFHS-2 survey included questions on the number of induced abortions and spontaneous abortions before the first live birth, in each birth interval, and in the open birth interval. These data permit a more detailed analysis of the use of abortions to achieve the desired sex composition of children.

While abortion in India is legal for a wide range of medical and social reasons, as discussed earlier, a large proportion of abortions nonetheless are conducted illegally. Further, legal or not, experience with abortions may not be something women are willing to reveal. For these reasons, women may underreport abortions. Thus, NFHS-2 data are likely to provide a lower bound to the extent of abortions taking place in India. In addition, the specific question asked in the survey required respondents to specify the type of abortion they had, namely induced or spontaneous. The extent to which women actually misreport the type of abortion, whether deliberately or because of lack of knowledge, is also not known. It can be expected that at least some of the abortions reported as spontaneous are actually induced. This expectation is supported by the analysis below.

Abortion: Levels and changes over time

Table 2 shows the percent distribution of all pregnancies of ever-married women aged 15–49, according to outcome (induced abortion, spontaneous abortion, stillbirth, or live birth). Two sets of pregnancies are examined: those that took place recently (i.e., those that followed the earliest live birth in the five years preceding the survey) and those that all women interviewed have ever had. Because the survey did not collect information on the year and month of each abortion, but only on how many abortions occurred (a) before the first birth, (b) in each interbirth interval, and (c) after the last birth, it is not possible to examine all pregnancies that took place in the five years before the survey.[3] A comparison of abortion rates for the two time periods given in the table permits an evaluation of both the level of abortions and changes over time.

According to the NFHS-2 data, in India as a whole 2 percent of all pregnancies end in an induced abortion, 4 percent end in a spontaneous abortion, and 2 percent end in a stillbirth. If sex-selective abortions are increasing over time, the expectation is that the proportion of pregnancies ending in an induced abortion will be higher in the more recent period.[4] Indeed, for India as a whole, this proportion is more than twice as high (5 percent) among pregnancies following the earliest birth in the five years preceding the survey as among all pregnancies (2 percent). Some of the increase could be due to more complete reporting of recent abortions because of the difficulty of recalling abortions that occurred in earlier periods. However, there is no way to assess whether and to what extent recall lapse may have affected the estimates. Moreover, the prevalence of induced abortions is much higher in the recent period in 25 of the 26 states. While the proportion of all pregnancies ending in an induced abortion reaches a high of 5–6 percent in only three states, among more recent pregnancies this proportion exceeds 10 percent in six states and ranges from 5 to 9 percent in nine states. For India as a whole, the estimate that 4.7 percent of pregnancies in recent years have ended in an induced abortion implies that approximately 1.3 million induced abortions are performed each year. While this estimate is about twice as high as the annual number of officially reported cases of medical termination of pregnancy, it is likely that the NFHS-2 figure also substantially underestimates the prevalence of induced abortions in India.

Unlike induced abortions, whose prevalence varies according to the choices people make, the prevalence of spontaneous abortions in a less-developed country should not increase substantially in a short period of time. However, Table 2 shows that the prevalence of reported spontaneous abortions is much higher among recent pregnancies than among all pregnancies. In India as a whole, the proportion of all pregnancies ending in a spontaneous abortion is 6 percent among recent pregnancies, compared with 4 percent among all pregnancies. Further, the prevalence of reported spontaneous abortions among recent pregnancies is higher than among all pregnancies in all states except Kerala and Sikkim. Given the continuing improvement in the provision of antenatal care in India (International Institute for Population Sciences and ORC Macro 2000), there are unlikely to be biological reasons for an increase in spontaneous abortions throughout the country. Although the number of spontaneous abortions might change somewhat owing to environmental factors or changes in diet or lifestyle, it is likely that the increase in spontaneous abortions over a relatively short period of time is, at least in part, due to some induced abortions being reported by respondents as spontaneous. Overall, these data suggest that in the recent past, about 11 percent of all pregnancies ended with a reported induced or spontaneous abortion.

TABLE 2 Percent distributions of all pregnancies of ever-married women following the earliest of their live births in the five years preceding the survey and of all pregnancies in women's birth histories by outcome, according to state, India, NFHS-2, 1998–99

State	Period[1]	Induced abortion	Spontaneous abortion	Stillbirth	Live birth	Total percent
Andhra Pradesh	Last 5 years	3.0	6.5	1.9	88.7	100.0
	All years	0.8	4.0	2.3	92.9	100.0
Arunachal Pradesh	Last 5 years	0.7	4.9	7.2	87.1	100.0
	All years	0.7	2.6	3.1	93.5	100.0
Assam	Last 5 years	12.0	9.2	5.1	73.7	100.0
	All years	3.3	6.1	3.2	87.4	100.0
Bihar	Last 5 years	0.5	4.0	2.0	93.5	100.0
	All years	0.3	3.2	2.1	94.4	100.0
Delhi	Last 5 years	12.0	8.9	1.5	77.6	100.0
	All years	4.7	5.8	1.3	88.2	100.0
Goa	Last 5 years	14.2	10.0	2.6	73.2	100.0
	All years	3.9	7.1	1.1	87.9	100.0
Gujarat	Last 5 years	5.6	5.2	1.1	88.1	100.0
	All years	2.1	4.9	1.4	91.6	100.0
Haryana	Last 5 years	5.0	10.0	2.4	82.5	100.0
	All years	1.4	5.7	3.0	90.0	100.0
Himachal Pradesh	Last 5 years	5.0	8.1	1.7	85.1	100.0
	All years	1.6	4.5	2.6	91.3	100.0
Jammu and Kashmir	Last 5 years	7.3	9.6	2.1	81.0	100.0
	All years	2.6	5.1	1.8	90.5	100.0
Karnataka	Last 5 years	2.0	5.5	2.4	90.2	100.0
	All years	0.9	4.0	2.3	92.8	100.0
Kerala	Last 5 years	4.1	5.7	0.9	89.3	100.0
	All years	1.9	5.7	1.2	91.2	100.0
Madhya Pradesh	Last 5 years	2.5	5.2	1.4	90.9	100.0
	All years	1.0	3.8	1.8	93.4	100.0
Maharashtra	Last 5 years	6.5	4.9	1.3	87.4	100.0
	All years	1.9	3.8	1.5	92.8	100.0
Manipur	Last 5 years	15.9	9.5	0.8	73.7	100.0
	All years	6.3	6.6	1.2	85.8	100.0
Meghalaya	Last 5 years	1.3	9.2	3.1	86.4	100.0
	All years	0.7	5.2	3.3	90.9	100.0
Mizoram	Last 5 years	1.1	7.1	3.2	88.6	100.0
	All years	0.6	5.3	2.3	91.8	100.0
Nagaland	Last 5 years	4.3	7.6	3.2	84.9	100.0
	All years	2.3	5.8	2.3	89.5	100.0
Orissa	Last 5 years	5.7	9.4	3.0	81.9	100.0
	All years	1.6	5.4	2.1	90.9	100.0

TABLE 2 (continued)

State	Period[1]	Induced abortion	Spontaneous abortion	Stillbirth	Live birth	Total percent
Punjab	Last 5 years	8.8	6.7	1.6	82.9	100.0
	All years	3.0	4.1	2.9	90.0	100.0
Rajasthan	Last 5 years	3.1	6.0	2.4	88.5	100.0
	All years	0.9	5.0	2.1	91.9	100.0
Sikkim	Last 5 years	3.4	1.8	3.1	91.7	100.0
	All years	0.9	2.1	2.9	94.0	100.0
Tamil Nadu	Last 5 years	12.5	10.7	1.7	75.1	100.0
	All years	5.2	6.2	2.5	86.2	100.0
Tripura	Last 5 years	17.4	7.0	0.7	74.9	100.0
	All years	4.4	3.9	1.4	90.3	100.0
Uttar Pradesh	Last 5 years	5.7	5.1	2.1	87.0	100.0
	All years	1.4	4.5	1.8	92.4	100.0
West Bengal	Last 5 years	5.7	5.1	2.1	87.0	100.0
	All years	2.2	4.0	1.8	91.9	100.0
India	Last 5 years	4.7	6.3	1.9	87.1	100.0
	All years	1.7	4.4	2.0	91.9	100.0

NOTE: Estimates for all-India exclude Tripura.
[1]Pregnancies in the last five years include only pregnancies following the earliest live birth in the five years preceding the survey. Pregnancies in all years include all pregnancies in the birth history for ever-married women aged 15–49.

Abortions and links to son preference

Abortions can be linked to son preference in at least two ways. First, the prevalence of abortions may differ according to the sex of living children in the family, even if the sex of the fetus is not known and sex-selective abortions are not used. Second, sex-selective abortions may be used to avoid births of children of an undesired sex after the sex of the fetus has been determined. To ascertain whether abortion rates are related to son preference, Table 3 presents the percentages of induced and spontaneous abortions following each live birth in the five years preceding the survey, according to the number of living sons and daughters at the beginning of each birth interval. Given the small number of cases for individual states, results are shown only for India (Table 3A) and for Group A states (Table 3B). If all abortions were unrelated to son preference, there would be no difference in the percentage of pregnancies ending in abortion according to the number of living sons and daughters within each parity.

At each parity, couples in Group A states are more likely than couples in India as a whole to have reported undergoing an induced abortion. Taken together, the percentages of induced abortions and spontaneous abortions are also higher in Group A states than in India as a whole, except for women

Table 3A Percent of pregnancies ending in an induced or spontaneous abortion in open or closed birth intervals following each live birth in the five years preceding the survey, according to the number of living sons and daughters at the beginning of the birth interval, India, NFHS-2, 1998–99

Number and sex of living children	Induced abortion	Spontaneous abortion	Number of pregnancies
One child	3.3	6.6	7,663
One son	3.7	5.6	3,883
No sons	3.0	7.7	3,780
Two children	5.6	5.9	5,333
Two sons	6.8	5.4	1,165
One son	6.2	5.6	2,659
No sons	3.6	6.8	1,509
Three children	6.0	6.3	2,973
Three sons	4.8	5.6	291
Two sons	8.1	6.3	923
One son	5.6	5.5	1,272
No sons	3.6	8.5	487
Four or more children	5.2	6.5	3,726
All sons	7.7	6.3	416
Sons > daughters	4.8	6.4	768
Sons = daughters	5.7	5.2	672
Sons < daughters	4.6	6.6	1,227
All daughters	4.4	7.8	643
Total	4.7	6.3	19,695

NOTE: Estimates for all-India exclude Tripura.

with four or more children. In India as a whole, the proportion of pregnancies ending in an abortion increases from 10 percent among couples with one child to about 12 percent among couples with two or more children, whereas in Group A states, this proportion peaks at 15 percent for couples with two living children. Thus in Group A states, it appears that abortions are more likely among lower-parity couples than among higher-parity couples. In India as a whole, induced abortions tend to increase with the number of sons, whereas spontaneous abortions tend to decline with the number of sons. In Group A states, only among couples with one child are pregnancies in the next birth interval more likely to end in an abortion if the living child is a daughter rather than a son. At other parities, spontaneous abortions vary little with the number of sons, and induced abortions tend to increase with the number of sons. These data suggest that couples with sons are more likely to have abortions, especially abortions reported as induced.

TABLE 3B Percent of pregnancies ending in an induced or spontaneous abortion in open or closed birth intervals following each live birth in the five years preceding the survey, according to the number of living sons and daughters at the beginning of each birth interval, Gujarat, Haryana, and Punjab, NFHS-2, 1998–99

Number and sex of living children	Induced abortion	Spontaneous abortion	Number of pregnancies
One child	4.1	7.7	913
One son	2.7	6.0	457
No sons	5.6	9.4	457
Two children	7.8	7.1	632
Two sons	8.4	7.2	129
One son	8.3	7.0	317
No sons	6.6	7.2	186
Three children	8.6	4.7	276
Three sons	*	*	16
Two sons	12.7	5.0	69
One son	9.3	4.8	137
No sons	1.6	5.4	53
Four or more children	7.2	4.3	241
All sons	*	*	5
Sons > daughters	(4.3)	(3.0)	31
Sons = daughters	(15.9)	(2.0)	34
Sons < daughters	8.3	3.4	101
All daughters	2.0	7.7	69
Total	6.2	6.7	2,062

* Not shown; based on fewer than 25 unweighted cases.
( ) Based on 25–49 unweighted cases.

These results are not unexpected and do not necessarily belie the expected link between abortions and son preference. Sex selection is only one of many reasons why couples opt for abortion. In fact, avoiding unplanned or unwanted births (irrespective of the sex of the child) has been documented as a major reason for abortion. One possible explanation of the preceding results is that the purported use of abortion for family planning is masking its use for sex selection. Supporting this argument is the fact that the use of abortion is strongly and negatively associated with the number of sons in Group A states for the population group that is likely to have little motivation to control family size, namely couples with one child. For these couples, the use of abortion for sex selection comes to the fore. An alternative explanation of the decrease in the prevalence of induced abortions as the number of sons increases at a given parity is related to differential stopping behavior. Stopping rules suggest that abortions in general will

be less common as the proportion of girls increases (because parents will keep trying to have a boy), while sex-selective abortions will be more common as the proportion of girls increases (because parents who already have more girls are more likely to try to avoid having another girl). It is likely that both of these effects are operating, and the former effect may be masking the latter effect in Tables 3A and 3B.

Examination of the sex ratios at birth for births occurring immediately after an aborted pregnancy provides another way of determining whether abortions in India are related to son preference. If such births have higher-than-normal sex ratios then one can conclude that at least some couples have used sex-selective abortions to avoid births that are female. NFHS-2 data (not shown) indicate that the sex ratios for next births following an induced abortion for births in the five years preceding the survey are only slightly elevated for India as whole (106.5) and for Group B states (107.9). However, in Group A states, this ratio is 158.0, suggesting that many couples in these states are using sex-selective abortions to ensure that their next birth is a son.

Use of ultrasound and amniocentesis

Our previous discussion establishes the relationship between abortion and son preference, but does not explicitly identify the mechanism through which couples determine the sex of the fetus before deciding whether or not to abort the fetus. In this section, we provide direct information on the pattern of use of the two principal tests for determining the sex of the fetus (ultrasound and amniocentesis), information that helps to establish the purpose of these tests and their link to abortion. For births in the three years before NFHS-2, mothers were asked whether they had received any antenatal checkups during their pregnancy and, if so, whether they had ultrasound or amniocentesis during any of the checkups. These tests may be used for monitoring the pregnancy, as well as for determining the sex of the fetus; however, the survey did not ask mothers who had the tests about the purpose of the tests. Also, some women may have had these tests separately (not as part of an antenatal checkup), so the use of these tests during pregnancy may be more common than their use in the context of antenatal checkups. Finally, because it is illegal to have these tests for determining the sex of the fetus, there may be some underreporting, particularly if the test was followed by an abortion.

Table 4 shows the percent of births for which the mother received at least one antenatal checkup. Although India's Reproductive and Child Health Program is designed to provide at least three antenatal care visits for pregnant women, only two-thirds of women reported to have received even one antenatal checkup for births during the three years preceding the survey. The proportion receiving checkups ranged from 36 percent in Bihar and Uttar Pradesh to 99 percent in Goa, Kerala, and Tamil Nadu. In gen-

TABLE 4 For births in the last three years, percent of mothers who received any antenatal checkups, and, among those who received at least one antenatal checkup, percent who received ultrasound, amniocentesis, or either as part of any antenatal checkup, India, NFHS-2, 1998–99

State	Percent receiving any antenatal checkups	Among mothers who received any antenatal checkups		
		Percent receiving ultrasound	Percent receiving amniocentesis	Percent receiving ultrasound or amniocentesis
Andhra Pradesh	93	23	1	23
Arunachal Pradesh	62	6	1	6
Assam	61	4	2	5
Bihar	36	6	1	6
Delhi	84	41	2	42
Goa	99	62	1	62
Gujarat	86	23	2	24
Haryana	58	19	1	19
Himachal Pradesh	87	15	0	15
Jammu and Kashmir	83	13	2	14
Karnataka	86	22	3	23
Kerala	99	44	3	45
Madhya Pradesh	61	9	2	10
Maharashtra	90	29	6	31
Manipur	80	13	0	13
Meghalaya	54	6	0	6
Mizoram	92	6	1	7
Nagaland	60	3	0	3
Orissa	83	4	1	5
Punjab	74	21	2	22
Rajasthan	48	13	1	14
Sikkim	70	12	3	13
Tamil Nadu	99	31	7	36
Tripura	71	8	5	12
Uttar Pradesh	36	13	1	13
West Bengal	90	7	0	7
Group A[1]	77	22	2	22
Group B[2]	94	28	3	30
India	66	18	2	19

NOTE: Estimates for all-India exclude Tripura.
[1]Gujarat, Haryana, and Punjab
[2]Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu

eral, antenatal checkups were more common in south India than in the north, but some states outside the south have also achieved high levels of antenatal checkups.

For births to mothers who received any antenatal checkups, Table 4 also shows the percent receiving ultrasound, amniocentesis, or either procedure. The use of amniocentesis is not widespread in any part of India. Only three states (Maharashtra, Tamil Nadu, and Tripura) have levels that exceed 3 percent. Ultrasound is much more common. For 18 percent of births in India, mothers received ultrasound as a component of an antenatal checkup. Ultrasound is most prevalent in Goa (62 percent), Kerala (44 percent), and Tamil Nadu (31 percent) in south India and Delhi (41 percent) in the north. In north India, the three states where sex-selective abortions are thought to be most common (the Group A states of Gujarat, Haryana, and Punjab) have much higher levels of ultrasound use (19–23 percent) than any other state except Delhi. These results provide evidence that ultrasound is widely available and is often used by women during pregnancy in Group A states, with the attendant possibility of misuse of the test for the purpose of sex determination of the fetus and sex-selective abortion.

Although ultrasound and amniocentesis are often used for purposes other than sex determination, NFHS-2 data show that women with no sons are more likely than other women to have these tests (see Tables 5A–5C). In the absence of sex-selective abortions, the use of ultrasound and amniocentesis would not be expected to vary according to the sex combination of previous children. Therefore, a consistent pattern of differences in the use of these procedures by the sex of living children demonstrates the use of these procedures for the purpose of sex determination. For India as a whole, at every parity, women with no living sons are more likely to have ultrasound or amniocentesis than are women with at least one son (Table 5A). The differences are particularly pronounced for women with two or three living children. Moreover, at each parity the percentage with an ultrasound test decreases monotonically with the number of living sons.

In Group A states, the use of ultrasound or amniocentesis is highest for births to women with no sons, except at the first parity where the difference is small but in the opposite direction (Table 5B). The largest differential is for births to women with two children. At that parity, only 8–9 percent of women with two sons or one son and one daughter had ultrasound or amniocentesis as part of an antenatal checkup for births in the three years preceding the survey, compared with 23 percent of women with two daughters. Even in Group B states, at each parity ultrasound and amniocentesis are used most often by women with no sons, but the differences are relatively small (Table 5C).

The use of ultrasound and amniocentesis for sex determination and subsequent sex-selective abortion can be seen more directly by contrasting sex ratios at birth for mothers who undergo these procedures with those who do not. Table 6 shows sex ratios at birth for children born in the three

TABLE 5A Percent of live births in the three years preceding the survey for which ultrasound, amniocentesis, or either was done as part of an antenatal checkup, by number and sex of living children at the time the woman got pregnant, India, NFHS-2, 1998–99

Number and sex of living children	Ultrasound	Amniocentesis	Ultrasound or amniocentesis	Number of births
No children	19.9	2.4	20.7	9,448
One child	14.5	1.7	15.3	8,343
One son	13.8	1.6	14.5	4,243
No sons	15.3	1.9	16.1	4,100
Two children	8.4	1.0	9.0	5,716
Two sons	6.7	1.2	7.6	1,266
One son	7.0	0.7	7.4	2,867
No sons	12.4	1.3	13.1	1,582
Three children	5.5	1.3	6.2	3,401
Three sons	2.7	1.0	3.7	381
Two sons	4.1	0.2	4.3	1,063
One son	4.7	1.2	5.3	1,423
No sons	12.3	3.7	14.0	534
Four or more children	2.8	0.5	3.0	5,485
All sons	1.7	0.2	1.8	674
Sons > daughters	2.3	0.1	2.4	1,214
Sons = daughters	2.6	0.3	2.8	1,020
Sons < daughters	3.0	0.8	3.4	1,672
All daughters	3.9	0.8	4.1	904
Total	12.1	1.5	12.7	32,393

NOTE: Table excludes Tripura.

years preceding the survey for births to mothers who had ultrasound, amniocentesis, either procedure, or neither procedure as part of an antenatal checkup. In India as a whole, the sex ratio at birth is 107.1 (above the normal range of 103–106) for births to women who had neither ultrasound nor amniocentesis. The sex ratio at birth is much higher if the mother had ultrasound, and is even higher if the mother had amniocentesis.

In Group B states, no such pattern is observed. In fact, sex ratios at birth are slightly lower among women who had ultrasound or amniocentesis than among women who had neither. In Group A states, the sex ratio is at the high end of the normal range for births to mothers who did not undergo either procedure, but it is exceptionally high if the mother had ultrasound or amniocentesis. The most skewed results are for Haryana, where the sex ratio at birth reaches 186.3 for women who had ultrasound or amniocentesis. In Haryana, the sex ratio at birth is abnormally high (117.0) even for women who had neither of these procedures, suggesting that there

TABLE 5B Percent of live births in the three years preceding the survey for which ultrasound, amniocentesis, or either was done as part of an antenatal checkup, by number and sex of living children at the time the woman got pregnant, Group A states: Gujarat, Haryana, and Punjab, NFHS-2, 1998–99

Number and sex of living children	Ultrasound	Amniocentesis	Ultrasound or amniocentesis	Number of births
No children	24.4	2.2	24.9	1,013
One child	18.2	1.0	18.3	929
One son	18.7	0.9	19.0	471
No sons	17.6	1.1	17.6	458
Two children	12.8	0.2	13.0	641
Two sons	8.2	0.0	8.2	128
One son	8.2	0.3	8.5	314
No sons	23.1	0.4	23.1	199
Three children	10.5	0.0	10.5	313
Three sons	(0.0)	(0.0)	(0.0)	27
Two sons	10.2	0.0	10.2	81
One son	10.2	0.0	10.2	149
No sons	16.6	0.0	16.6	57
Four or more children	6.9	1.4	6.9	380
All sons	(5.8)	(0.0)	(5.8)	25
Sons > daughters	0.0	0.0	0.0	59
Sons = daughters	5.2	0.0	5.2	55
Sons < daughters	8.2	2.5	8.2	158
All daughters	11.0	1.6	11.0	83
Total	17.0	1.2	17.2	3,277

( ) Based on 25–49 unweighted cases.

may be some underreporting of ultrasound or amniocentesis performed as part of an antenatal checkup or that in some cases these tests were conducted independently, rather than as a component of an antenatal checkup. In addition, there may be some differential underreporting of female children relative to male children in Haryana.

For women who had ultrasound or amniocentesis as part of an antenatal checkup, it is possible to use the results in Table 6 to estimate the percent of female fetuses that were aborted (on the assumption that both the reported sex ratios at birth and the reported use of these procedures during an antenatal checkup are accurate). For these calculations, it is necessary for mathematical purposes to adopt the standard definition of sex ratios used in India (females per 1,000 males) rather than the standard international definition of males per 100 females to avoid sex ratios that are undefined when there are no female births. At the national level, the sex

TABLE 5C Percent of live births in the three years preceding the survey for which ultrasound, amniocentesis, or either was done as part of an antenatal checkup, by number and sex of living children at the time the woman got pregnant, Group B states: Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu, NFHS-2, 1998–99

Number and sex of living children	Ultrasound	Amniocentesis	Ultrasound or amniocentesis	Number of births
No children	34.1	3.3	35.3	2,398
One child	26.9	3.7	29.0	2,043
One son	25.8	3.2	27.8	1,058
No sons	28.1	4.2	30.4	985
Two children	16.0	1.8	17.4	927
Two sons	16.0	3.5	18.8	224
One son	14.7	1.5	15.6	436
No sons	18.1	1.0	19.1	267
Three children	14.4	3.3	16.6	433
Three sons	(8.7)	(6.5)	(15.3)	47
Two sons	18.4	0.0	18.4	122
One son	11.6	5.3	14.1	185
No sons	18.3	1.9	20.3	79
Four or more children	8.7	1.4	9.6	377
All sons	(8.1)	(0.0)	(8.1)	47
Sons > daughters	12.2	1.3	13.5	86
Sons = daughters	(5.0)	(0.0)	(5.0)	70
Sons < daughters	6.5	0.9	7.4	113
All daughters	(12.7)	(4.8)	(14.5)	62
Total	26.1	3.1	27.7	6,178

( ) Based on 25–49 unweighted cases.

ratio for births to mothers who had neither ultrasound nor amniocentesis is 934 female births per 1,000 male births. The considerably lower sex ratios for births to mothers who had either of these tests (891) can be attributed almost entirely to sex-selective abortions. If all of the female fetuses of women who had these tests were aborted, the sex ratio for live births to these women would be zero. On the other hand, if none of these fetuses were aborted, then the sex ratio for live births to these women would be either 934 (the actual reported sex ratio for women not receiving either test) or 952 (if we take a point in the middle of the normal biological range). In the calculations, it is preferable to use the latter sex ratio since it is biologically determined and since the former sex ratio may include some women who received ultrasound or amniocentesis but not as part of an antenatal checkup. Because the reported sex ratio at birth of 891 (for births to women who had ultrasound or amniocentesis) is 93.6 percent of the way between

TABLE 6 Sex ratios at birth for children born in the three years preceding the survey whose mothers received ultrasound, amniocentesis, or neither as part of an antenatal checkup, NFHS-2, 1998–99

State	Ultrasound	Amniocentesis	Ultrasound or amniocentesis	Neither
Gujarat	123.1	*	122.0	101.9
Haryana	183.8	*	186.3	117.0
Punjab	116.7	*	118.1	104.6
Group A[1]	128.7	169.7	128.4	106.0
Group B[2]	100.3	91.3	100.6	103.1
India	112.4	120.3	112.3	107.1

NOTE: Estimates for all-India exclude Tripura.
[1]Gujarat, Haryana, and Punjab
[2]Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu
*Not shown; based on fewer than 25 unweighted cases.

0 and 952, we conclude that almost 94 percent of the female fetuses of women receiving ultrasound or amniocentesis were *not* aborted. However, the 6.4 percent that can be assumed to have been aborted represents a substantial number of sex-selective abortions.

Using the survey results above, we can derive the approximate number of annual sex-selective abortions in India by applying the formula shown below. The approach is based on a determination of the proportion of conceptions that end in sex-selective abortions. Conceptions that end in stillbirths and spontaneous abortions are not included in the equation since, by definition, they cannot be considered sex-selective abortions. For the same reason, induced abortions carried out for purposes other than sex selection are excluded. Therefore, the equation is based only on live births and sex-selective abortions. The calculation of sex-selective abortions takes advantage of the fact that all sex-selective abortions, by definition, have to be preceded by a sex-determination test on the fetus. The NFHS-2 survey provides information on sex-determination tests that are related to live births, and this information is included in the equation. The equation also takes into account sex-determination tests on fetuses that are aborted for sex-selective purposes.

The actual number of sex-selective abortions is calculated as follows:

$$SSA = (LB + SSA)*U*PA*PF,$$

where SSA = annual number of sex-selective abortions of female fetuses, LB = annual number of live births in India, U = proportion of births for which women received ultrasound or amniocentesis as part of an antenatal checkup, PA = proportion of female fetuses assumed to be aborted by women

who received ultrasound or amniocentesis as part of an antenatal checkup, and *PF* = proportion of births that are female (based on the normal biological sex ratio at birth).

The product of *U* and *PA* indicates the proportion of events that end in sex-selective abortions following a sex-determination test on the fetus. Since all sex-selective abortions have to be preceded by a sex-determination test, *U* is assumed to equal one for sex-selective abortions; hence the equation can be simplified as follows:

$$SSA = LB*U*PA*PF + SSA*PA*PF$$

or

$$SSA = (LB*U*PA*PF)/(1 - PA*PF).$$

The annual number of live births in the three years before the NFHS-2 survey is estimated by multiplying the average crude birth rate for the years 1996–98 from the Sample Registration System (27.1 per 1,000) by the size of India's population in mid-1997 (956.8 million), which is estimated by projecting the 2001 census population backward on the basis of the exponential population growth rate between the 1991 and 2001 censuses (Office of the Registrar General 2000; Office of the Registrar General and Census Commissioner 2001). This calculation yields a total of 25,926,570 annual live births. According to Table 5A, mothers had ultrasound or amniocentesis in conjunction with an antenatal checkup for 12.7 percent of births during the three years preceding NFHS-2. The proportion of births that are female (*PF*) is 0.4878, based on an assumed sex ratio at birth of 105 males per 100 females. If 6.4 percent of female fetuses were aborted (as calculated earlier), then according to the above equation there would be a total of 106,107 sex-selective abortions of female fetuses each year.

For a number of reasons the actual number of sex-selective abortions in India might exceed this estimate. First, many women may have had ultrasound or amniocentesis, but not as part of an antenatal checkup. Some of these women are likely to have had a sex-selective abortion if the fetus was determined to be female. Second, some women who had ultrasound or amniocentesis as part of an antenatal checkup may not have revealed that information to the interviewer. Finally, if some male fetuses were aborted after the mother received ultrasound or amniocentesis, the number of female fetuses aborted would have to be higher than the estimate above in order to produce a sex ratio at birth of 891 females per 1,000 males.[5] However, it should be noted again that if more female births than male births were underreported in NFHS-2, the effect would be to offset to some extent the increase attributable to the above factors. Even if there were no differential underreporting of female births and all of the difference between

the reported sex ratio at birth of 106.9 and the normal sex ratio at birth of 105.0 were attributed to sex-selective abortions, the total number of such abortions would still be less than 117,000 annually. It is encouraging that the estimates based on reported sex ratios at birth alone yield similar estimates of the prevalence of sex-selective abortions, but the more detailed method of calculation using the above formula is preferable in that it makes use of a variety of parameters that are relevant to sex-selective abortions and it highlights the mechanisms leading to sex-selective abortions.

As noted earlier, sex-selective abortions are not uniformly distributed across states in India. If the same estimation method described above is used in Haryana, for example, we calculate that at least 44 percent of female fetuses in the state were aborted in the case of women who had ultrasound or amniocentesis as part of an antenatal checkup.

Sex-selective abortions and stopping rules

In a country with a strong preference for sons, there are two basic ways that parents can ensure that they have at least one or two sons. One is to use sex-selective abortions, which will help parents avoid the birth of unwanted daughters. Another strategy is to keep having children until the minimum number of desired sons has been reached, and to stop childbearing at that point.[6] Either strategy will result in a distinctive pattern of sex ratios of births according to the number of children ever born. Table 7 shows that for India as a whole, the sex ratio at birth for women with only one

TABLE 7 Sex ratios of births for ever-married women by number of children ever born, and, among currently married women who want no more children, sex ratio of last births and all earlier births, according to state, NFHS-2, 1998–99

State	Number of children ever born						Total	Among currently married women who want no more children[1]	
	1	2	3	4	5	6+		Last births	All earlier births
Gujarat	105.8	157.9	127.9	108.3	85.8	79.9	107.7	175.2	100.4
Haryana	133.6	186.7	138.9	111.3	98.0	82.6	116.5	187.7	109.5
Punjab	134.5	159.8	132.0	113.6	97.8	81.8	118.6	217.3	101.0
Group A[2]	117.4	164.1	131.2	110.3	90.8	80.9	112.1	187.9	102.6
Group B[3]	106.7	119.2	114.6	103.6	95.2	92.8	106.3	121.9	101.8
India	114.6	130.7	122.2	108.9	98.2	86.1	108.7	143.4	106.9

NOTE: Table excludes Tripura.
[1]Currently married women who say that they do not want another child, are sterilized, or say they cannot have any more children
[2]Gujarat, Haryana, and Punjab
[3]Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu

birth is somewhat elevated (114.6), indicating that women are more likely to have gone on to have another birth (or at least to have done so earlier) if their first child was a girl than if it was a boy. For women with two children ever born, the sex ratio jumps to 130.7, demonstrating that couples without the desired number of sons are particularly likely to alter their behavior at this crucial point in their childbearing career. After two births, the sex ratio of children ever born declines rapidly, falling to 86.1 for women with six or more children. This pattern implies that girls, on average, grow up in larger families than boys. Another consequence of this pattern of behavior is that even if each couple treats their own daughters and their own sons equally, daughters might still be disadvantaged overall because the household's limited resources need to be shared by more children when families are larger.

The overall sex ratio at birth for all births to women aged 15–49 provides an indication of the degree to which the pattern observed in Table 7 is due to sex-selective abortions and to stopping rules. If stopping rules alone are applied, then the overall sex ratio will necessarily fall within the normal biological range since each birth is an independent event with a fixed probability of being a daughter or a son. The influence of sex-selective abortion is evident from the fact that the total sex ratio at birth for all-India (108.7) is slightly above the normal range, the sex ratio for Group A states is considerably higher (112.1), and Haryana and Punjab have even higher sex ratios of 117–119. Differentials in the sex ratio at birth by the number of children ever born are particularly dramatic in Group A states, where the sex ratio at birth is more than twice as high for women with two births (164.1) as for women with six or more births (80.9). Group B states also show a steady decline in the sex ratio at birth for women with two or more births (although the decline is not as steep as elsewhere), but the fact that the overall sex ratio at birth in these states is normal (106.3) suggests that the pattern is produced almost entirely by stopping rules rather than by sex-selective abortions. It should be noted, however, that the sex ratios shown in Table 7 are based on all births in the birth history, no matter when they occurred. If sex-selective abortions have been increasing over time, then the sex ratios in Table 7 are likely to underestimate the relative impact of sex-selective abortions on sex ratios at birth.

Another powerful indicator of the effect of gender preference on reproductive behavior is the sex ratio at last birth for women who have completed their childbearing. We compare this measure with the sex ratio of all earlier births in the last two columns of Table 7. Following the definition of last births in Dalla Zuanna and Leone (2001), we assume that women have stopped childbearing if they have been sterilized, if they say they do not want any more children, or if they say they cannot have any more children. In India, the sex ratio of last births (143.4) is much higher than the

sex ratio of all earlier births (106.9). The same pattern is observed in every state except Meghalaya (data not shown). Even in Group B states, there is a considerable differential, but the differential is particularly pronounced in Group A states (187.9 for last births compared with 102.6 for all earlier births). The largest differential is for Punjab, where last births are more than twice as likely to be male as female.

Conclusions

Induced abortions are legal in India, but there are restrictions on acceptable reasons for having an abortion, the type of facility in which it must be performed, and the type of medical practitioner who can legally perform one. Although the abortion law is fairly liberal, most abortions still take place illegally. Ultrasound and amniocentesis tests on pregnant women are also legal, but since 1996 it has been illegal throughout India for the sex of the child to be divulged to the parents. Nevertheless, this law has not been enforced, and in recent years both ultrasound for sex determination and sex-selective abortions of female fetuses have been rampant in many parts of India, particularly in Gujarat, Haryana, and Punjab.

Release of the preliminary results of the 2001 census of India, which showed an unexpectedly high and growing sex ratio of young children, has sparked concern about the widespread use of ultrasound and amniocentesis, followed by sex-selective abortions. However, there is a critical need to go beyond the census results to establish both the magnitude and the nature of the problem. The 1998–99 National Family Health Survey, a nationally representative sample survey of more than 90,000 ever-married women aged 15–49, provides direct information on sex ratios at birth and a rich source of data on use of sex-determination techniques and sex-selective abortions in every state of India. NFHS-2 confirmed that the sex ratio of recent births in India has been abnormally high, exceeding 110 males per 100 females in ten of India's 26 states. In addition, the survey demonstrated that ultrasound and amniocentesis are often used for sex determination, even though these tests are usually performed for other purposes.

NFHS-2 provided convincing evidence that sex-selective abortions are a common practice in many parts of India. We estimate that over 100,000 sex-selective abortions, following ultrasound or amniocentesis, have been performed annually in recent years. NFHS-2 data also show that there are approximately 1.3 million total induced abortions to ever-married women in India each year (twice the level of the official estimates), but the actual number of legal and illegal abortions each year is likely to be considerably higher.

The information available from NFHS-2 on sex ratios at birth, abortions, the use of ultrasound and amniocentesis, and the degree of son preference in India presents a consistent and compelling picture of the widespread use of

sex-selective abortions based on the outcome of sex-determination tests in India in recent years. Legislation outlawing the use of such tests during pregnancy has thus far failed to deter couples from seeking to have these tests or medical practitioners from performing them. Recently, the government has strengthened enforcement of existing legislation and expanded the laws to ban chromosome separation techniques used on sperm to increase the probability of having a son. In addition, professional associations of medical practitioners are now actively discouraging the use of sex-determination tests. These efforts are not likely to be fully successful, however, unless basic changes take place in the underlying conditions that promote sex-selective abortions in India—conditions such as a strong and persistent preference for sons, the generally low status of women, widespread expectations of large dowry payments at the time of marriage, and considerable acceptance of the practice of sex-selective abortion.

Notes

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1 It is generally agreed that the sex of a fetus can be reliably determined by ultrasound at about 16 to 19 weeks of gestation in most cases, although some studies have found that ultrasound can yield reasonably accurate results even at 12 to 14 weeks (Efrat, Akinfenwa, and Nicolaides 1999; Whitlow, Lazanakis, and Economides 1999). Therefore, most sex-selective abortions are likely to take place in the second trimester. Complications of abortion tend to increase as the gestational age increases. Because determination of the sex of the fetus through ultrasound is not foolproof, a small number of sex-selective abortions of presumed female fetuses may actually be carried out on male fetuses.

2 Many of the ethical issues surrounding sex-selective abortions are highlighted in a recent article by Oomman and Ganatra (2002) and the accompanying roundtable discussion. This publication deals with such issues as whether sex selection is part of women's right to free choice and control over their reproduction, the role of the medical profession, and whether all manifestations of sex selection are equally unethical.

3 Because information on abortions was collected in a different manner in NFHS-1, it is not possible to examine time trends in abortions by comparing information in NFHS-1 and NFHS-2. In NFHS-1, information on lifetime abortions was collected only at the end of the birth history, with no information on the timing of abortions.

4 In eight of the ten states with the highest sex ratios at birth (over 110), the difference between the percentage of induced abortions in the last five years and in all years is greater (often considerably greater) than the difference at the national level. However, sex-selective abortions make up only a small fraction of overall abortions in India, so it is likely that changes in the percentage of abortions over time are primarily due to other factors.

5 In fact, there is evidence from NFHS-2 of some sex-selective abortions of boys in the states of Punjab, Delhi, and Maharashtra for births to women who already have living sons but no living daughters (Retherford and Roy, forthcoming).

6 For a discussion of the effects of stopping rules on fertility and contraceptive use, see McClelland (1979), Chowdhury, Bairagi, and Koenig (1993), Mutharayappa et al. (1997), and Clark (2000).

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