

Measuring Sex Selective Abortions in India: Evidences from Haryana

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Abstract

The declining child sex ratio (F/M) has been one of the important concerns in India's demography in recent times. Haryana is one of the developed states situated in north India, having one of the lowest sex ratio as well as declining trend in child sex ratio in the last two decades. The present study aims to understand the magnitude of sex selective abortions and their reasons in Haryana. The data come from a community based research project in Jind district of Haryana. As a first step, in order to identify the areas of high incidence of induced abortion, secondary data from censuses on child population (0-4 and 5-9) were analysed by districts. The district maps were prepared using child sex ratios. The district that exhibited very high sex ratio namely Jind was selected.

There were many villages with child sex ratio of 125(M/F) and above in Jind district. One of the concentrations of such cluster was selected. From the selected cluster of villages, five villages were selected randomly and a complete census of all the households in the selected villages was done. A total of 2590 households were covered and 2646 ever-married women in the reproductive ages were interviewed. Detailed information was collected on household characteristics, pregnancy histories, antenatal care, deliveries, abortion history, reasons for abortion and place of abortion for each pregnancy starting from marriage. The study provides estimates of sex-selective abortions based on evidences on pregnancy history of women, spontaneous and induced abortions and ultrasound status.

Introduction:

The declining child sex ratio (F/M) has been one of the important concerns in India's demography in recent times (Kundu and Sahu 1991; Srinivasan, 1994; Bhat, 2002). The 2001 census of India shows an unusually high sex ratio (females per thousand males) for children less than seven years of age in the country as a whole. Though there has been an increase in the overall sex ratio from 927 in 1991 to 933 in 2001, which is a good news, the worrying news is that the sex ratio figures (number of females per thousand males) of children below seven years has fallen markedly from 945 in 1991 to 927 in 2001. Worse still, the child sex ratios are the lowest ever in some of the affluent states of the country situated in northern parts of India. In India as a whole son preference is stronger in the North than it is in other parts of India. The sharp decrease in the under seven sex ratio in the northern states of India is 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 (Arnold et al., 2002). Haryana is one of the developed states situated in north India, having one of the lowest sex ratio as well as declining trend in child sex ratio in the last two decades.

Sex selective abortion is indeed a matter of great concern. The social and demographic implications of sex selective abortions are grave. In much of South Asia, sons are preferred over daughters for a number of economic, social and religious reasons, including financial support, old age security, property inheritance, dowry, family lineage, prestige and power, birth and death rituals and beliefs about religious duties and salvation. (Arnold et al. 2002; Basu 1993; Kishor 1993; Bardhan 1988; Karki 1988; Das Gupta 1987; Das 1987; Miller 1981).

Sex selective abortion occurs in two steps. The first step is to assess the sex of the foetus. The second step is to obtain an abortion if the foetus is not of desired sex. Three methods are commonly used for determining the sex of the foetus. They are amniocentesis (normally performed after 15-17 weeks of pregnancy) chorionic villus sampling (expensive and normally performed around 10th week of pregnancy) and ultrasound, the least expensive and normally performed around the 12th week of pregnancy. Ultrasound is a primary investigative modality for foetal diagnosis and therapy. Through the availability of high-resolution equipment, it is possible to see the

details of fetal anatomy. Ultrasound typically costs between 500/- to 1000/- rupees and is considered by many couples to be a good investment in order to save, many times that sum known as dowry payments, if the foetus is female (Fernandes, 1998).

The technology, introduced to detect genetic abnormalities, in the 1970s became commonly available in India in the 1990s (Arnold et al., 2002). These techniques also came to be widely used to determine the sex of the foetus and subsequent abortions if the foetus was female (Henshaw et.al. 1999). Not only did it spread in urban areas, its use has spread in rural areas too. For example, in one large community based study in rural Maharashtra in India, one out of every six married women who had an abortion in the previous 18 months said the abortion had been subsequent to a sex determination test showing a female foetus. (Ganatra, 2002).

MTP and PNDT Act: The legal aspect Concerning Abortion

Abortion has been legal in India since 1972, when the Medical Termination of Pregnancy (MTP) Act was passed. The act was implemented in major states of India except Sikkim (Karkal, 1991). Under the *Act* abortion is legal if the pregnancy that it terminates endangers the life of the woman, causes grave injury to her physical or mental health or is likely to result in the birth of a baby with physical or mental abnormalities or is a result of rape or contraceptive failure. The *Act* further stated that abortions could only take place in Government approved health facilities specifically approved for conducting abortions and by a registered medical practitioner. However because of a shortage of these facilities this requirement is not well enforced in India.

With the enactment of the MTP Act sex determination technologies arrived in India in 1975 for determination of genetic abnormalities. However these techniques came to be widely used for determining the sex of the foetus and subsequent abortions if the foetus was female. In view of the widespread misuse of this technique, the Maharashtra Government in India enacted the Maharashtra regulation of PNDT act in 1988 under the pressure from Forum against 'Sex Determination and Sex Pre-Selection' (FASDSP) a social action group based in Mumbai. This *Act* was repealed by the enactment of a central legislation based on the very Act known as the 'Prenatal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994' by the

Government of India in 1994. The purpose of the *Act* was to prevent sex selective abortions of female foetuses. Under this law availability of facilities for sex determination was banned and a doctor in an unregistered clinic conducting such a test was liable to be imprisoned for three years with a fine of Rs. 10000/-. However the law has not been implemented forcefully and the act has virtually remained ineffective and inadequate. According to Kishwar (1993), laws are not likely to be affective in society where son preference is strong and deeply embedded in patriarchal structures and hence, unless the patriarchal norms of the society are challenged the desire to do away with girl children will remain.

Abortion Statistics in India

Despite legalization of abortion, research suggests that more and more illegal abortions are taking place than legal ones. It has been estimated that 5-6 million abortions occur annually in India and that roughly 90 percent of them occur in unapproved facilities (Ganatar, 2000 and Arnold et.al, 2002). 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, Jessani and Iyer 1995, Chhabra and Nuna 1994). Government of India statistics show that 16 percent of abortions takes place at gestations greater than 12 weeks (Ministry of Health and Family Welfare, 1996). Data sources providing consistent estimates of induced abortion in India are scarce, whatever is available is through Government reports and surveys. Indian Council of Medical Research's (ICMR) study in 1983 conducted in five states 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. Higher abortion ratios in the range of 3 to 9 per 100 live births are estimated by several micro level studies. A study of abortions in Maharashtra estimated abortion ratios of 11 to 14 induced abortions per 100 live births (Gantara et al. 2000). According to the government records most of the abortions are among women below 30 and the most common reasons for abortions are related to family planning including birth spacing and family limitation or for economic reasons. Most of these abortions are also often preceded by sex determination tests (Roy et al 2002).

There is a dearth of evidence on sex selective abortions in India because most of the abortions are illegal and not reported and there is hardly any documentation on the magnitude of sex selective abortions in India. The study provides estimates and magnitude of sex selective abortions in the rural area of Haryana based on evidences on pregnancy history of women, spontaneous and induced abortions and ultrasound status.

Methodology:

The data for the present paper is a part of a large scale community based research study conducted in Jind district of Haryana in the year 2001 (Unisa, 2001). As a first step in order to identify the clusters of high incident areas of induced abortion, a secondary data analysis of child population in 0-4 years was carried out for 1981 and 1991 censuses by states and districts and shown for three points of time from 1981 to 2001(at the time of survey only 1981 and 1991 censuses were available). While the child sex ratio for Haryana was 921 females for every thousand males in 1981 it came down to 886 in 1991 and further down to 817 in 2001(see Appendix A and B). Thus there has been a massive decline in the sex ratio of this age group, which is most likely because of sex selective abortions. Jind district in Haryana exhibited a very high sex ratio in 1981 and 1991 and was thus selected for the study. The district map was prepared using child sex ratios (0-6 years) at the village level. There were many villages with a sex ratio of 125 and above in Jind district. One such cluster was selected. From the selected cluster of villages, five villages were selected randomly and a complete census of all the households in the selected villages was done during January-March 2001. A total of 2590 households in Jind were covered and a total of 2646 ever-married women in the reproductive ages were interviewed for the study. Detailed information was collected on household characteristics, pregnancy history, antenatal care, deliveries, abortion history, and reasons for abortion, place of abortion and obstetric morbidity for each pregnancy starting from marriage.

The analysis of the present paper is based on questions asked to the ever-married women about their pregnancy history; antenatal care deliveries and abortion history based on gestation period and sonography status. In the section on pregnancy history detail information was sought on outcome of each pregnancy starting from first pregnancy till their tenth pregnancy. Details about live birth, stillbirth, spontaneous

abortion and induced abortion were recorded from women by order of pregnancy to see the changing patterns in the outcome of each pregnancy. In the section on antenatal care deliveries detailed information was collected with regard to the week/month of pregnancy at which the woman went for her first Antenatal Checkup. Information on urine pregnancy test, blood test and ultrasound/ sonography test and in which month of pregnancy did they undergo these tests was also collected. As regards ultrasound, information was collected on the reasons for undergoing ultrasound and who motivated them for the ultrasound test. Further details were asked on whether the sex of the baby was disclosed during sonography and if revealed what was the sex of the foetus. These questions were asked to see if the sonography test was closely followed by an abortion or not. Detailed information for each pregnancy was elicited. In the section on abortion history details were collected about the gestation period of pregnancy when the abortion occurred by order of pregnancy, and whether abortion was spontaneous or induced. Sex ratio of children has been estimated separately in all pregnancies, for women who underwent ultrasound and for women who had not by duration of pregnancy.

Profile of the Respondents

Women's health seeking and demographic behavior is said to be closely linked with several background characteristics such as age, marital status, religion and caste. All these factors influence her fertility seeking behavior. Table 1 gives a brief description of the respondents who were interviewed by their background characteristics. A large number of respondents fall in high fertility age group of 20-29. More than half are in the early reproductive age group of 15-29 years (52 percent). Very few (5 percent) are in the 45 – 49 age group. More than 90 percent of women are currently married and were living with their husbands. More than 60 percent women (64.7 %) are illiterate. Among those women who are literate, large proportions have completed primary but not the middle school. With regard to employment status it is seen that close to fifty percent (49 percent) respondents had not been working in the past 12 months prior to the survey. Thirteen percent women were employed with someone else. Most of the women in Haryana are engaged in their own family farm or business.

The investment in children's education indicates to what degree son preference is prevalent in a particular society. To capture this, along with the

background profile, women were also asked about the perceived educational aspirations for their children. A large proportion of the women (about 57 percent) (table not shown) believed that a son should be given as much education as he desires compared to 48 percent women who believed that a girl should be given as much education as she desires. Even for educating children beyond higher secondary school, graduation and above, women were more desirous of educating their sons than their daughters. Thus the inclination for educating a male child is stronger than the female child, quite possible in view of the social cultural norms prevalent in India where girls are considered a liability/burden and sons are regarded as a source of old age security. Therefore investing in girls' education beyond a certain level is not encouraged.

Evidences of Sex Selective Abortions from the Study

1: Abortions based on pregnancy history of the women

To determine the prevalence of sex selective abortions in the study area an attempt is made to see what percentage of live birth and abortions have occurred to women starting from their first pregnancy till their sixth pregnancy and above. Table 2 shows percent distribution of the outcome of pregnancies by order of pregnancy, and sex ratio at birth. Out of the total of 2,362 first pregnancies, ninety one percent have resulted in a live birth and six percent pregnancies ended in spontaneous abortion whereas less than one percent pregnancies were turned out as induced abortions. This percentage has more or less remained steady till the third parity after which there is a decline in the percentage of live births and there is a subsequent rise in the percentage of spontaneous and induced abortion. From the table it may be observed that with increasing parity the chances of having a live birth is decreasing and there is an increase in the reporting of spontaneous abortions. Two things can be deduced out of this. One is due to the preference for a bigger family size; the percentage of women reporting induced abortions is perhaps low till the first three pregnancies and the increase in the reporting of induced abortions after the third parity could be most likely because of sex selective abortions. Sex ratio at birth is another important indicator of sex selective abortions. From Table 2 it is seen that the number of males per 100 female births has declined after the third parity but has gone up for sixth and above pregnancies. Thus as has been said earlier, abortions in the higher

order pregnancies is more compared to earlier pregnancies, and are most likely to have been induced. The sex ratio at birth for rural areas given by SRS (Sample Registration System, 2001) is also same as observed for the sample population i.e., 122 males per 100 females.

2: Level, trend and frequency of abortions

Abortion ratios are calculated for five-year period starting from 1976 to 2001 to see the trend in the pattern of abortion in the study area in the past few years. The figures of induced abortion ratios for all the time periods are relatively less in comparison to spontaneous abortion ratios that have been quite high in the recent period (see Table 3). There is a high possibility that most of the abortions that have been induced are reported as spontaneous. The total abortion ratios have increased markedly from 2.3 in 1975 and before to 10.6 in 2001 per 100 live births. However the increase in the abortion ratio in the recent period is very high compared to earlier years. 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 period.

Table 4 shows the frequency of abortions and its rate. A noticeable percentage of women have had two abortions, and a small percentage of women have undergone three and more abortions. There is a possibility that quite a significant number of these women may be undergoing repeated abortions showing indirect evidences of the practice of sex selective abortions in the study area. Overall a total of 18 percent women have had abortions.

Table 5 shows that twelve percent women reported to have at least one abortion. Most of these women belong to high standard of living, were educated beyond higher secondary level, and with husbands in jobs (other than daily wage laborers or cultivators). This shows that abortion seekers are women who are well off economically and socially.

3: Antenatal Check-up and Ultrasound before live births and abortion

It would be interesting to see in how many pregnancies out of the total live births that occurred or pregnancies that resulted in abortion did women go for

antenatal checkups, the urine pregnancy test, the blood test and the ultrasound test. Ultrasound test, which is a part of ANC and is used for monitoring the pregnancy and also to determine the sex of the foetus, throws light on the association between these tests and its link to abortion. Ultrasound test was conducted for 10 percent of the pregnancies during 1996- 2001 (see Table 6) and this figure is quite high from what it was in the previous time periods. Also in more than one fourth of the pregnancies the urine test, blood test and antenatal check up was done and these figures have shown an improvement from what it was in the earlier years. However a different picture emerges when these tests are linked with abortion. Although there is an increase in the percentages of urine, blood tests along with ANC checkups over the years, the increase has not been as rapid as it is observed for ultrasound. There is a marked increase in the proportion of pregnancies with ultrasound test from 1986-1990 (less than 5 %) to nearly 16 percent in 1996-2001, which were resulted in abortion. Thus the percentage of women undergoing an ultrasound for the pregnancies that are resulting in an abortion in the recent period is much higher than for pregnancies that resulted in live births for the same time period.

Over all, 12 percent women in the study area underwent ultrasound. Nearly eight percent women had undergone at least one ultrasound. A small percentage of women have undergone ultrasound three or more times (See Table 7). Detailed information has been sought about their ultrasound status, i.e. who motivated them for ultrasound, the reasons for undergoing ultrasound and whether sex of the baby was revealed during ultrasound by order of pregnancy and attempts have been made to see whether these in turn are associated with sex selective abortions. Table 8 gives detailed information about these issues.

By parity of women it is seen that four percent women went for ultrasound in their first order and this has remained constant till the fourth parity after which there is an increase in women who underwent ultrasound. Close to half of the women (47 percent) reported that it was on doctor's suggestion that they underwent ultrasound during their first pregnancy. It is also observed that for the subsequent pregnancies the doctor's influence has gradually declined. More than one-fourth women and their husbands have turned out to be the primary decision makers for undergoing ultrasound from the third pregnancy onwards. This shows that ultrasound on doctor's suggestion could be primarily because of medical reasons whereas in other cases the test was done most likely to determine the sex of the unborn child.

Over the years the incidence of abortion is increasing and one of the reasons for undergoing ultrasound could be to know the sex of the baby and subsequently to resort induced abortion if the foetus is unwanted. To throw more light on this issue questions on reasons for undergoing ultrasound were asked to those women who underwent an ultrasound so as to know their intention behind it. Interestingly as the order of pregnancy increases, the desire to know the sex of the baby has come out as the major reason for undergoing ultrasound. Though a major chunk of the women reported that health of the baby was the main reason for undergoing ultrasound, this looks quite dubious. This could be true for women who are going under the doctor's initiation during their first pregnancy but not for later pregnancies (see Table 8). Except abnormalities and position of the baby (to know the position of the baby test is conducted after seven months of gestation) all other reasons look defensive. Further more than 50 percent women underwent ultrasound after three months of pregnancy. This shows that the sex of the baby (which can be determined reasonably accurate after the first trimester) was the main reason for undergoing ultrasound after the initial three months.

Fourteen percent women reported that the sex of the baby was revealed to them during the ultrasound test during their first pregnancy. And this figure increased significantly from a mere 14 percent women in the first order of pregnancy who reported that the sex of the foetus was revealed to them, it rose to as high as 36 percent in the fourth parity. Thus the inquisitiveness to know the sex of the baby probably is more among women in the third or fourth pregnancies and this could be largely due to son preference. Only nine women reported that they had abortion after knowing the sex of the baby. Out of which seven reported sex of the foetus as female and other two reported male foetus. However, the possible reason why many women did not report the sex selective abortions could be that women are aware of the fact that abortion due to sex selection is illegal and might not have stated the actual reasons for the ultrasound.

To arrive at more definite conclusions, pregnancy outcome by parity was observed for all pregnancies for that women underwent an ultrasound test and those pregnancies for which women did not resort to ultrasound (see Table 9). Among the pregnancies for which women underwent an ultrasound, the percentage of live births is less compared to those pregnancies without an ultrasound test. The likelihood of some pregnancies being terminated after the ultrasound test (on knowing that it is a

female foetus) cannot be ruled out. Also after the fourth parity the induced abortion has increased for all pregnancies for that women underwent an ultrasound test. Similarly, the rate of spontaneous abortion is also found among pregnancies with an ultrasound than without an ultrasound test.

It is expected that the antenatal care is independent of sex of live birth and mostly it depends on the parity, unless sex selective abortions may be used to avoid births of children of an undesired sex after the sex of the foetus has been determined. To ascertain this antenatal care by the sex of live birth is examined and presented in Table 10. For first two pregnancies antenatal care is almost same for male or female births. From third pregnancy onwards a rise in the antenatal care was found for male births. A slightly different pattern emerges when ultrasound is linked with the sex of the live births and among those women who had at least one ANC, blood and urine test and the sex of the live birth. In case of ultrasound it is seen that the use of it was less for male birth till the second order of pregnancy, but there is a rise in the use from the third pregnancy onwards. Thus it can be said that after the third pregnancy the chances of female foetus being aborted is more after the use of ultrasound.

Methodology and Discussion on Estimation of Induced and Sex Selective Abortions

1. Estimation of induced abortion

From the previous section of paper we have learned that total abortions are increasing over the period 1971 to 2001. Although there is an increase in induced abortion but it is insignificant whereas the spontaneous abortion increased from 2.3 to 9.3 per 100 live births (Table 3). As with the advancement of medical technology and use of antenatal care it is expected that spontaneous abortions will decrease or remain more or less constant over a short period of time. Before 1975, medical technology to determine the sex of baby was not available and in the subsequent years spontaneous abortion increased three times. Therefore, we assume the level of spontaneous abortion in 2001 is same as that of the 1975. Consequently increase in the level of spontaneous abortions is due to some induced abortion being reported by women as spontaneous.

A worldwide view of induced abortions show that India has one of the highest proportions of second trimester abortions amongst countries, which have legalized

abortions (Teitze, 1986). The analysis of data on abortion by duration of pregnancy (in months) indicates that around 40 per cent of the spontaneous and induced abortions have taken place in the second trimester. The figures are quite high in the recent period (Table not shown). According to Merck Manual, about 85 percent spontaneous abortions occur in the 1st trimester and tend to have fetal causes; those occurring in the 2nd trimester are more likely to have maternal causes like incompetent cervix, congenital or acquired anomalies of uterine cavity, acute infection, immunologic problems and severe emotional shock. Looking at the trend of total abortions and magnitude of abortions after the gestation period of three months we can decisively draw the conclusion that all reported spontaneous abortions are not really spontaneous but include induced abortion as well. Hence using the survey results above, we can drive the approximate number of induced abortions in Haryana (India) by applying the formula shown below:

$$\text{IAR}(e, t) = \text{SAR}(t) - \text{SAR}(0) + \text{IAR}(t)$$

where $\text{IAR}(e,t)$: estimated induced abortion ratio at time t , $\text{SAR}(t)$: reported spontaneous abortion ratio at time t , $\text{SAR}(0)$: spontaneous abortion ratio in the absence of sex selective technologies, and $\text{IAR}(t)$: reported induced abortion ratio at time t . In case of current survey, reported spontaneous and induced abortion ratios during 1996-2001 are 9.3 and 1.3 per 100 live births respectively and spontaneous abortion ratio before 1976 is considered as the spontaneous ratio in the absence of sex determination technologies i.e., 2.3 per 100 live births. This calculation yields an estimated induced abortion ratio of 8.6 abortions per 100 live births during 1996-2001. Using these ratios we estimate around seventy five percent reported spontaneous abortions are in fact induced abortions (calculations are based on Table 3).

After getting an estimate of induced abortions we can discuss about estimation of sex selective abortion. As a first step in this direction, sex ratio of children ever born and children surviving are examined. The normal sex ratio at birth lies between 105 to 106 males per 100 live female births implying that the number of boys born is somewhat higher than number of girls born. On the other hand sex ratio at birth above 106 indicates that pre-birth interventions have reduced the likelihood of female births. Hence for the present study the sex ratio of children ever born and of number of living

children was estimated for those who underwent at least one ultrasound test and had at least one abortion in any pregnancy.

Table 11 shows that in the study area when the number of children in the family is in between one to three, the sex ratio of children ever born and of living children is very high than the normal expected sex ratio of 105 or 106 males per 100 females. However when the number of children is four and above, the sex ratio in case of children ever born is 90 males per 100 females and that of living children is 86 males per 100 females. Similar pattern of sex ratios with birth order of children is also found from the NFHS data of Haryana (Zuanna and Leone, 2001; IIPS and Macro, 2000). This could be most likely because of the fact that many couples may not be resorting to sex selective abortions for getting a male child, but on the other hand may be waiting till they get a male child in the family and hence the family size increases and the sex ratio decreases. Also the sex ratio of children ever born is 126 and for living children is 132 in case of women who never had an abortion in their lifetime. Similarly those women who never had ultrasound during any pregnancy, sex ratio of children ever born is 120 and living children is 130. This shows that women who are not having the sons are only going for ultrasound followed by abortion to achieve the desired sex composition of their children.

2. Extent of use of ultrasound and sex selective abortions

To estimate the extent and magnitude evidence of sex selective abortions a new measure similar to Arnold (1985) is proposed here. Basically this measure will show the extent of use of ultrasound, sex selective abortion, and pregnancy wastage among women assuming its use in the absence of sex preference. It is assumed that all women at each parity will act in the same manner as those women at same parity who are currently most contented with the sex composition of their children. A summary measure of the use of ultrasound for knowing the sex of the foetus and sex selective abortion for each number of living children and the total are given below:

At each number of children, the percentage of women having undergone ultrasound in the absence of sex preference is

$$ASPUR_I = \text{Min } UR_{IJ} \text{ where } I = 1, 2, \dots, n, J = 0, 1, 2, \dots, I$$

At each number of children and sex composition, the percentage of women having undergone an ultrasound to know the sex of foetus is

$$SFUR_{IJ} = UR_{IJ} - ASPUR_I$$

$$TSFUR_I = TUR_I - ASPUR_I$$

Total percentage of women who have undergone an ultrasound to know the sex of foetus is

$$TSFUR = \frac{\sum_{I=1}^n TSFUR_I * W_I}{\sum_{I=1}^n W_I}$$

Where I : is number of living children, J: number of living sons among I living children, W_I : Number of women with I living children, UR_{IJ} : percentage of women undergone ultrasound with I living children and J number of sons, TUR_I : total percentage of women undergone an ultrasound with I living children, $ASPUR_I$: percentage of women undergone ultrasound in the absence of sex preference with I living children, $SFUR_{IJ}$: percentage of women undergone an ultrasound to know the sex of foetus with I living children and J number of sons, $TSFUR_I$: total percentage of women undergone ultrasound to know the sex of the foetus with I living children, and $TSFUR$: total percentage of women with living children having undergone an ultrasound to know the sex of foetus.

Similarly a summary measure of the sex selective abortion for each number of living children and the total are given below. At each number of children, the percentage of women who had abortions in the absence of sex preference is

$$ASPAR_I = \text{Min } AR_{IJ} \text{ where } I = 1, 2, \dots, n, J = 0, 1, 2, \dots, I$$

At each number of children and sex composition, the percentage of women who had sex selective abortions is

$$SSAR_{IJ} = AR_{IJ} - ASPAR_I$$

$$TSSAR_I = TAR_I - ASPAR_I$$

Total percentage of women who had sex selective abortions is

$$TSSAR = \frac{\sum_{I=1}^n TSSAR_I * W_I}{\sum_{I=1}^n W_I}$$

Where I : is number of living children, J : number of living sons among I living children, W_I : Number of women with I living children, AR_{IJ} : percentage of women who had abortions with I living children and J number of sons, TAR_I : total percentage of women who had an abortion with I living children, $ASPAR_I$: percentage of women who had abortions in the absence of sex preference with I living children, $SFAR_{IJ}$: percentage of women who had sex selective abortions with I living children and J number of sons, $TSSAR_I$: total percentage of women who had sex selective abortions with I living children, and $TSSUR$: total percentage of women with living children who had sex selective abortions.

Application of this measure is shown for the state of Haryana as it is an ideal place for the demonstration of sex selective abortions. In Table 12, this measure is used to show the excess use of ultrasound test to know the sex of the foetus; similarly in Table 13 taking all abortions into consideration, an estimate of percentage of women who had sex selective abortions by their number of living children and sons are given. The second column of Table 12 and 13 show the percentage of women actually undergone ultrasound, and abortion respectively in the sample population. The third column of the respective tables shows the percentage of women who had undergone ultrasound, and sex selective abortion in the absence of sex preference. The fourth column of these tables shows the percentage of women who had undergone ultrasound to know the sex of the foetus and sex selective abortions respectively.

There is significant difference in the percentage of women who underwent ultrasound by different sex composition of children. If we assume the lowest percentages of ultrasound in the absence of son preference, then the percentages above this level are most likely due to son preference. For example, among women with two living children 13.8 per cent of women with two sons undergone ultrasound compared to 16.7 of those with two daughters. Hence, the use of ultrasound for women with two daughters is more, as they are dissatisfied with the sex of their children and wanted to know the sex of the foetus. It is assumed that if the sex of the child no longer makes any difference, then women with any sex composition of children at each number of living children would have the same rate of use of ultrasound.

Table 13 shows the percentage of women who ever had an abortion (induced as well as spontaneous) by number of living children and number of sons in the

family. The percentage of reported abortions is invariably higher in all the cases marked by absence of sons irrespective of the number of living children in the family. Lower is the number of sons in the family higher is the abortion. This implies that son preference is inherently dominant in the study area thereby resulting in abortions of female foetuses. Using above procedure the use of abortion in the presence of sex preference is examined. For example, among women with two living children 16.35 per cent of women with two sons had abortions compared to 20.69 percent of those with one son and one daughter. Hence, the percentage of women who had abortion with two sons is less, as they are satisfied with the sex of their children.

Fourth column of Table 12 and 13 shows percentage of women undergone ultrasound to know the sex of foetus and sex selective abortions respectively. This measure has specifically given the magnitude of the use of ultrasound to know the sex of foetus and sex selective abortions. The total use of ultrasound in the sample population is 12.5 percent out of which one-third had undergone this to know the sex of foetus. Similarly, 18.22 percent women had abortions and out of which more than one-third had sex selective abortions. It is evident from Table 12 and 13 that sex preference has significant effect on use of ultrasound and abortions. The figures for ultrasound test seem to be lower because many women may not be reporting due to enforcement of PNDT law in the recent years.

3. Magnitude of sex selective abortions

Above two methods have given the estimate of the use of ultrasound to know the sex of foetus and sex selective abortions with respect to women. To estimate the magnitude of sex selective abortions in comparison to live births, following methodology is adopted where total pregnancies for women with different children ever born is considered. At each number of children ever born, mean number of pregnancies a woman had is estimated. Further using this information, pregnancy wastage is estimated. Percentage of pregnancies wasted in comparison to live births is given below:

$$PWR_{IJ} = 100 * (MP_{IJ} - I) / I \text{ where } I = 1, 2, \dots, n, J = 0, 1, 2, \dots, I$$

Pregnancy wastage ratio in comparison to live births in the absence of sex preference is

$$ASPPWR_I = \text{Min } PWR_{IJ} \text{ where } I = 1, 2, \dots, n, J = 0, 1, 2, \dots, I$$

At each number of children ever born and sex composition, percentage of pregnancies wasted as sex selective abortions in comparison to live births is

$$SSPWR_{IJ} = PWR_{IJ} - ASPPWR_I$$

$$TSSPWR_I = TPWR_I - ASPPWR_I$$

Total percentage of pregnancies wastage for sex selective abortions in comparison to live births is

$$TSSPWR = \frac{\sum_{I=1}^n TSSPWR_I (I \cdot W_I)}{\sum_{I=1}^n I \cdot W_I}$$

Where I : is number of live births to women, J: number of live birth of sons among I live births to women, W_I : Number of women with I live births, MP_{IJ} : mean umber of pregnancy wastage for I live births, PWR_{IJ} : percentage of pregnancy wastage in comparison to live births with I live births and J number of sons, $TPWR_I$: total percentage of pregnancy wastage in comparison to live births with I live births, $ASPPWR_I$: percentage of pregnancy wastage in comparison to live births in the absence of sex preference with I live births, $SSPWR_{IJ}$: percentage of pregnancy wasted in comparison to live births for sex selective abortions with I live births and J number of sons, $TSSPWR_I$: total percentage of pregnancy wastage f in comparison to live births or sex selective abortions with I live births, and $TSSPWR$: total percentage of pregnancies wasted as sex selective abortions in comparison to live births.

Table 14 gives after considering mean number of pregnancies and mean pregnancy wastage, an estimate of sex selective abortions Mean number of pregnancies women had with one, two and more live births with specific sex composition are also presented in Table 14. Total pregnancies include live births, stillbirths, and spontaneous and induced abortions. Pregnancy wastage includes stillbirths and reported spontaneous and induced abortions. If there is a misreporting of women about induced abortion as spontaneous or stillbirth then taking them all together will overcome this problem. In case of one live birth as son, women had more pregnancies than those who had one daughter. Similarly those women who had two live births and out of which one is son, then mean number of pregnancies they had is much higher than those who had two sons. Also number of pregnancies is more

for those women who had two daughters. In case of three live births, highest mean number of pregnancies is found for women with three daughters followed by two sons and one daughter. Similar to the above two procedures, here also we have used same terminology. Maximum pregnancy wastage is noticed for no son or one son category, which is due to sex selective abortions. Overall it is found that 2.67 per cent sex selective abortions have occurred per 100 live births. This is one-third of the reported pregnancy wastage in the study area. If we adjust for these sex selective abortions, the sex ratio at birth will be around become 115 males per 100 females which is reasonably closer to SRS reported sex ratio at birth for northern states.

Conclusion:

This paper proposes a new method of estimation of induced and sex selective abortion that avoids many of the problems inherent in the reporting of induced and sex selective abortions. In the present situation when there is a law against prenatal selection and abortion of female foetus in India, woman may not report directly induced as well as sex selective abortions, and most of the times they may report it as spontaneous abortions. Therefore, a method that is not requiring information on induced and sex selective abortions directly will be more useful. The proposed method is based on widely available survey data on pregnancies and the sex composition of children. This method has also been extended to examine the use of ultrasound to know the sex of foetus.

In any large scale survey, pregnancy history of women may be collected in detail with repeated questions on number of pregnancies in different sections of the questionnaire such as antenatal care, delivery care (in the current study pregnancy history is asked three times, once directly, second time with antenatal care and third time with abortion history). It is no doubt that complete pregnancy history will be helpful to estimate sex selective abortions and over come all the problems of underreporting of induced and sex selective abortions as well as misreporting of the events.

In the rural area of Haryana ample evidences of sex selective abortions are found. The total use of ultrasound in the sample population is one out of eight women, and out of which one-third had undergone this to know the sex of foetus. Similarly, around one-fifth women had abortions and out of which more than one-third had sex

selective abortions. The figures for ultrasound test seem to be lower because many women may not be reporting due to enforcement of PNDT law in the recent years.

Maximum pregnancy wastage is noticed for no son or one son category, which is due to sex selective abortions. Overall it is found that 2.67 per cent sex selective abortions have occurred per 100 live births. This is one-third of the reported pregnancy wastage in the study area. If we adjust for these sex selective abortions, the sex ratio at birth will be around become 115 males per 100 females. As we have entered into the 21st century there was a hope that our fight against patriarchy and violence against women come to end. However the modern technologies have brought with new hurdles before the women.

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Table 1
Percent distribution of the respondents by their background characteristics

Background Characteristics	Percentages
Age Groups	
15-19	7.5
20-24	21.0
25-29	23.1
30-34	18.0
35-39	15.5
40-44	9.6
45-49	5.3
Marital Status	
Currently Married	97.1
Widowed	2.9
Education	
Illiterate	64.7
Literate<primary school complete	2.2
Primary school complete	14.2
Middle school complete	8.1
High school complete	7.2
High secondary complete and above	3.6
Husband's Education	
Illiterate	31.2
Literate<primary school complete	2.8
Primary school complete	16.3
Middle school complete	16.0
High school complete	20.9
High secondary complete and above	12.8
Working Status	
Working in family farm/business	35.1
Employed with someone else	13.2
Self employed	2.7
Not worked in the past 12 months	49.0

Table 2
Percentage distribution of all pregnancies in women's birth histories by outcome, according to order of pregnancy

Order of pregnancy	Live Birth	Still Birth	Spontaneous Abortion	Induced Abortion	Total pregnancies	Sex Ratio of Live Births(M/F)
	%	%	%	%		
1	91.4	2.8	5.7	0.04	2362	123
2	92.9	1.5	5.1	0.34	2078	122
3	93.2	1.4	5.0	0.26	1541	127
4	90.4	1.8	6.7	1.01	890	118
5	87.9	2.3	8.0	1.6	473	118
6&above	89.0	1.9	8.0	0.98	410	125
Total	91.8	2.0	5.8	0.40	7754	122

Table 3
Percentage of abortions in comparison to live births by years

Years	Induced abortion		Spontaneous abortion ratio		Total abortion ratio	Live births
	Ratio	Number	Ratio	Number		
2001 – 1996**	1.3	23	9.3	165	10.6	1766
1995 – 1991	0.4	7	6.1	116	6.5	1913
1990 – 1986	0.2	2	4.5	77	4.7	1707
1985 – 1981	-	-	5.4	58	5.4	1060
1980 - 1976	0.2	1	5.8	29	6.0	494
<= 1975	-		2.3	4	2.3	174
Total	0.4	33	6.3	449	6.7	7114

* Abortion Ratio: (No. of abortions/live births)*100

** Survey was carried out during January to March 2001.

Table 4
Percentage of women who had abortions by its frequency

No. of times Abortion	No. of Women who had abortions*	Abortion rate**
1.	199	7.52
2	83	3.14
3	19	0.72
4+	14	0.53
At least one abortion	315	11.9
Total	482	18.22***

*Total abortion: Induced + spontaneous

** Abortion Rate: (No. of Women who had abortion/Total no. of women in 15 – 49 age group)*100

*** (Total no. of abortions / total no. of women in 15-49 age group)*100

Table 5
Percentage of women who had abortions by socioeconomic background characteristics

Background	% of women with at least one abortion	Number of women
SLI		
Low	12.5	512
Medium	11.2	1123
High	13.7	1011
Women's Education		
Illiterate		
Literate<primary	10.6	1712
Primary school complete	17.6	34
Middle school complete	15.8	400
High school complete	13.6	214
Higher secondary complete and above	16.8	190
	17.7	96
Husband's occupation		
Cultivator	11.5	1246
Labour or wages	12.6	720
Other	14.0	680

Table 6
Percentage of women who underwent at least one ANC checkup, urine test, blood test and ultrasound before live birth or abortion by years

Years	ANC %		Urine test %		Blood test		Ultrasound test	
	LB	A	LB	A	LB	A	LB	A
2001 – 1996	30.8	26.8	27.4	26.8	24.9	22.7	10.0	15.8
1995 – 1991	19.0	22.8	16.4	17.1	14.6	13.3	3.8	9.5
1990 – 1986	11.2	21.5	9.3	13.8	8.4	12.3	0.9	4.6
1985 – 1981	7.6	4.2	6.1	4.2	5.4	4.2	0.3	-
1980 – 1976	2.9	4.0	2.3	4.0	2.5	4.0	-	-
<= 1975	0.6	-	-	-	-	-	-	-
>1985	20.3	24.3	17.7	21.1	16.0	17.9	4.8	11.7
Total	16.7	20.4	14.4	17.8	13.0	15.2	3.7	9.3

LB : Live births, A: Abortion

Table 7
Percentage of women who underwent an ultrasound as a part of antenatal checkups

<i>No. of pregnancies</i>	<i>No. of Women</i>	<i>Ultrasound rate*</i>
1	155	5.9
2	42	1.6
3	15	0.6
4+	10	0.4
At least one Ultrasound in any pregnancy	222	8.4
Total number of Ultrasounds for all women	330	12.5**
Total number of ultrasounds for all pregnancies	330	6.1***

* (No of women who underwent ultrasound / total no. of women in 15 – 49 age group)*100

** (Total no. of ultrasounds/ total no of women in 15 – 49 age group)*100.

*** (Total no. of ultrasounds / All pregnancies after 1985)*100.

Table 8
Percentage of women who went for ultrasound test, reasons for undergoing ultrasound, who motivated them to go and whether the sex of the baby was revealed to them after ultrasound by order of pregnancy

<i>Reasons and suggestion/ Parity</i>	1	2	3	4	5+
% of women who went for Ultrasound	4.6(112)	3.7(78)	3.8(59)	4.3(39)	5.4(42)
Reasons for undergoing ultrasound					
Sex of the child	5.8	10.0	11.1	22.9	33.3
Position of the baby	2.9	1.4	-	2.9	2.3
Child's health	52.4	55.7	55.6	54.3	33.3
Abnormality	14.6	10.0	9.3	11.4	-
Mother's health	24.3	22.9	24.1	8.6	7.1
Percentage of women who underwent ultrasound after three months gestation	57.1	58.3	64.8	59.5	61.9
Persons who suggested them to undergo ultrasound					
Self	28.5	29.4	32.2	23.0	30.9
Husband	23.2	19.2	27.1	25.6	28.5
Family & relatives	7.1	5.1	5.0	7.6	16.6
Nurses	11.6	10.2	13.5	12.8	7.1
Doctors	47.3	37.1	32.2	30.7	19.0
Others	-	-	-	-	-
Sex of the baby revealed after ultrasound	14.2	15.3	28.8	35.9	42.8

Table 9
Percentage distribution of all pregnancies by outcome, according to ultrasound status during pregnancies, 2001

<i>Parity</i>	<i>Ultrasound</i>	<i>Live birth</i>	<i>Still birth</i>	<i>Spontaneous abortion</i>	<i>Induced abortion</i>	<i>Twins</i>	<i>Total</i>
1	Yes	82.2	2.8	12.1	0.9	1.9	100
	No	91.8	2.9	5.3	-	-	100
2	Yes	86.1	2.8	8.3	1.4	0.4	100
	No	93.2	1.5	4.8	0.3	0.2	100
3	Yes	86.2	1.7	12.1	-	-	100
	No	93.8	1.5	4.5	0.2	-	100
4+	Yes	73.7	5.3	9.2	11.8	-	100
	No	90.4	1.9	7.0	0.5	0.2	100
Total	Yes	81.8	3.2	10.5	3.5	1.0	100
	No	92.3	2.0	5.4	0.2	0.1	100

Table 10
Percentage of women who underwent at least one ANC checkup, urine test, blood test, and ultrasound during pregnancy and sex of live births

<i>Parity</i>	<i>ANC</i>			<i>Urine</i>			<i>Blood</i>			<i>Ultrasound</i>		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	21.0	20.4	20.8	17.2	18.4	17.8	15.9	16.0	16.0	3.5	4.9	4.2
2	19.4	15.5	17.7	16.4	13.4	15.1	14.7	12.5	13.8	3.2	3.6	3.4
3	16.9	12.8	15.1	14.3	11.5	13.1	13.0	9.7	11.6	5.0	1.6	3.5
4	10.8	12.2	11.5	9.1	10.8	10.0	8.6	10.0	9.2	4.0	3.1	3.5
5	11.4	11.8	11.8	10.5	10.2	10.5	10.0	9.1	9.8	5.0	3.7	4.7
6	13.3	9.6	11.8	15.0	9.6	12.7	13.3	7.2	10.8	7.5	4.8	6.4
Total	17.8	15.7	16.8	15.0	14.0	14.6	13.7	12.4	13.1	4.0	3.5	3.8

Table 11
Sex ratio by children ever born, children living, abortion and ultrasound

<i>Characteristics</i>	<i>Sex ratio of children ever born</i>	<i>Sex ratio of living children</i>
Number of Children		
1	128	138
2	207	219
3	158	153
4+	90	86
At least one abortion in any pregnancy		
Yes	99	103
No	126	132
At least one ultrasound in any pregnancy		
Yes	108	110
No	124	130
Total	122	128

Table 12
Effect of Sex Preference on Use of Ultrasound Test

Number and sex of living children	Percent of women who had undergone an ultrasound test			Total number of women
	Observed	In the absence of sex preference	To know the sex of foetus	
No children	4.3	4.3	0.0	326
One child				
No sons	26.6	23.9	2.7	154
One son	23.9	23.9	0.0	213
Total	25.1	23.9	1.2	367
Two children				
No sons	16.7	13.8	2.9	66
One son	16.2	13.8	2.4	290
Two sons	13.8	13.8	0.0	318
Total	15.1	13.8	1.3	674
Three children				
No son	0.0	1.8	1.8	25
One son	14.6	1.8	12.8	191
Two sons	11.2	1.8	9.4	367
Three sons	1.8	1.8	0.0	113
Total	10.2	1.8	8.4	696
Four children +				
No son	(4.3)	(3.7)	(0.6)	23
One son	14.9	3.7	11.2	124
Two sons	17.8	3.7	14.1	252
Three sons	3.7	3.7	0.0	135
Four sons	0.0	3.7	3.70	49
Total	8.7	3.7	5.00	583
Total	12.5	8.7	3.8	2646

() less than 25 cases

Table 13
Effect of Sex Preference on Use of Abortions

Number and sex of living children	Percent of women who ever had an abortion			Total number of women
	Observed	In the absence of sex preference	Sex selective	
No children	12.88	12.88	0.0	326
One child				
No sons	16.23	16.23	0.0	154
One son	33.33	16.23	17.1	213
Total	26.16	16.23	9.77	367
Two children				
No sons	18.18	16.35	1.83	66
One son	20.69	16.35	4.34	290
Two sons	16.35	16.35	0.0	318
Total	18.40	16.35	2.05	674
Three children				
No son	24.00	8.85	15.15	25
One son	14.66	8.85	5.81	191
Two sons	17.98	8.85	9.13	367
Three Sons	08.85	8.85	0.0	113
Total	15.80	8.85	6.95	696
Four children+				
No son	(56.5)	(6.1)	(50.4)	23
One son	26.6	6.1	20.5	124
Two sons	17.1	6.1	11.0	252
Three sons	13.3	6.1	7.2	135
Four sons+	6.1	6.1	0.0	49
Total	18.86	6.1	12.76	583
Total	18.22	11.68	6.54	2646

() less than 25 cases

Table 14
Effect of Sex Preference on Pregnancy Wastage*

<i>Number and sex of children ever born</i>	<i>Mean number of pregnancies</i>	<i>Pregnancy wastage ratio in comparison to live births</i>			<i>Observed number of women</i>
		<i>Observed</i>	<i>In the absence of sex preference</i>	<i>Sex selective</i>	
One child					
No sons	1.2083	20.83	20.83	-	144
One son	1.3081	30.81	20.83	9.98	185
Total	1.2644	26.44	20.83	5.61	329
Two children					
No sons	2.2296	11.48	10.45	1.03	61
One son	2.3189	15.94	10.45	5.49	254
Two sons	2.2091	10.45	10.45	-	263
Total	2.2595	12.97	10.45	2.52	578
Three children					
No son	3.2500	8.33	3.80	4.53	20
One son	3.1622	5.40	3.80	1.60	185
Two sons	3.2108	7.02	3.80	3.22	370
Three sons	3.1140	3.80	3.80	-	114
Total	3.1829	6.09	3.80	2.29	689
Four children					
No son	4.5714	14.28	3.35	10.93	14
One son	4.1343	3.35	3.35	-	67
Two sons	4.2486	6.21	3.35	2.86	185
Three sons	4.1688	4.22	3.35	0.87	77
Four sons	4.1481	3.70	3.35	0.35	27
Total	4.2162	5.40	3.35	2.05	370
Five Children					
No son	5.4286	8.57	2.66	5.91	7
One son	5.4468	8.93	2.66	6.27	47
Two sons	5.2097	4.19	2.66	1.53	62
Three sons	5.3443	6.88	2.66	4.22	61
Four sons +	5.1249	2.66	2.66	-	32
Total	5.2970	5.94	2.66	3.28	209
Six children					
No son/one son	6.2499	4.17	0.76	3.38	12
Two sons	6.2558	4.26	0.76	3.50	43
Three sons	6.2759	4.59	0.76	3.83	29
Four sons+	6.0455	0.76	0.76	-	22
Total	6.2170	3.61	0.76	2.85	106
Seven children					
No son/one son	8.2857	4.08	2.86	15.51	7
Two sons	7.2000	2.86	2.86	-	10
Three sons	7.4000	5.71	2.86	2.85	5
Four sons+	7.3846	5.49	2.86	2.63	13
Total	7.5143	7.35	2.86	4.49	35
Eight children					
No son/one son	9.000	12.5	0.00	12.50	3
Two sons/Three sons	8.250	3.12	0.00	3.12	8
Four sons+	8.312	3.90	0.00	3.90	16
Total					
Total	3.2665	7.70	5.05	2.67	2338

* Pregnancy Wastage: stillbirths, and spontaneous and induced abortions

Appendix A
Sex ratio (F/M) of children (0-4 years) for India and States for the year
1981, 1991 and 2001

India & States	1981	1991	2001
India	977	955	933
Andhra Pradesh	1000	978	964
Assam	*	978	971
Bihar	1003	978	957
Chattisgarh	*	*	975
Gujarat	961	938	888
Haryana	921	886	817
Jharkhand	*	*	975
Kerala	974	951	961
Karnataka	980	962	947
Madhya Pradesh	988	967	938
Maharashtra	960	945	912
Orissa	1003	974	959
Punjab	925	874	794
Rajasthan	978	936	913
Tamil Nadu	973	951	946
Uttar Pradesh	964	946	929
Uttaranchal	*	*	906
West Bengal	991	972	965

*Not Available

Source:

Census of India 1981, series 1, Part IV A. Social & Cultural Tables.

Census of India 1991, series 1, Part IV A. C Series, Social & Cultural Tables Vol – 2.
Report and Series on Age, Series I, Census of India 2001.

Appendix B
Sex ratio (F/M) of children (0-4 years) by districts for the year 1981, 1991
and 2001. (Haryana)

State /Districts	1981	1991	2001
Haryana	930	886	867
Panchkula	*	*	881
Ambala	940	887	826
Yamunanagar	*	882	849
Kurukshetra	880	868	857
Kaithal	*	855	849
Karnal	930	914	865
Panipat	*	899	862
Sonipat	890	883	836
Jind	880	867	876
Fathebad	*	*	890
Sirsa	940	896	883
Hisar	920	865	868
Bhiwani	940	901	881
Rohtak	940	860	869
Jhajjar	*	*	868
Mahendragarh	950	893	869
Rewari	*	907	866
Gurgaon	960	927	867
Faridabad	920	894	898

* Not Available

Source:

Census of India 1981 Series 6, Haryana Part IV A, Social & Cultural Tables.

Census of India 1991 Series 8, Haryana Part IV A – C Series, Social & Cultural Tables.

Report and Series on Age, Series I, Census of India 2001.