India's Declining Female Sex Ratio:  
Sex-selective Abortion and Other Reasons

The decline in India's population sex-ratio during the twentieth century has been the subject of much discussion in recent years. Sex-selective abortion of the female fetus following a prenatal diagnostic test is widely believed to be the major contributor to this phenomenon. This fact sheet explores factors that are known to influence the sex ratio of a population. It examines the extent to which sex-selective abortion may be contributing to the declining sex ratio, and argues that restricting access to abortion services is not the answer to stopping the decline in India's female sex ratio.

1. Understanding sex ratios

According to conventional definition,

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\text{Sex ratio} = \frac{\text{Number of males}}{\text{Number of females}} \times 100. 
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However, in India, we usually define sex ratio as \( \frac{\text{Number of females}}{\text{Number of males}} \times 1000 \) in any given population, at a specific point in time.

When we see mention of 'declining sex ratio' in an article, we need to find out which sex ratio is being referred to. Discussions on declining sex ratio usually use one of three different sex ratios.

Population sex ratio is the ratio of females per 1000 males in the entire population. India's population sex ratio according to census of India, 2001, was 933 females per 1000 males.

The Juvenile sex ratio – the ratio of females per 1000 males in the 0-6 age group- became the indicator of focus especially since 2001 census. This was because the 2001 census reported that there had been a steep decline in juvenile sex ratio between 1991 and 2001: from 945 females per 1000 males to 927 females per 1000 males.

Sex ratio at birth is the ratio of female live births per 1000 male live births. The natural sex ratio at birth usually has more males than females. The fact that more boys are born than girls has been known at least since the 17th century (1). A study covering 24 countries found a sex ratio at birth of 934-952 females per 1000 males for babies born during 1962-1980(2). A sex ratio at birth that lies between 934 and 952 females per 1000 male births is therefore considered to be within the normal range.

2. Which is the indicator to examine to understand the incidence of sex-selective abortions?

It is common to read headlines about “declining sex ratios cause for concern”. The sex ratio being discussed is usually the population sex ratio. This decline is immediately interpreted as the direct result of more sex selective abortions of the female fetuses taking place. We would be wrong in drawing such a conclusion. 

Why?

The decline in population sex ratio or juvenile sex ratio can happen due to reasons other than sex-selective abortion of the female fetus. The population sex ratio in a large city may show a large decline in females over the past decade. This may be the result of significant male migration into the city during the past decade.

What about the juvenile (0-6 yrs) sex ratio? Can we assume that a decline in the 0-6 age group means that was an increase in sex-selective abortion of the female fetus? The answer is again, “no”. 
We know that more boys are born than girls. If the sex ratio at birth is within the normal range, but proportionately more girls than boys die during childhood, then this will result in a decline in juvenile sex ratio. For example, according to the census of 2001, there were 19.2 million births in the year 2000. Let us assume that the sex ratio at birth for these babies was 934 females per 1000 males. At age 5, the sex ratio of this cohort would have declined from 934 to 925 females per 1000 males because more girls died in the 0-5 age group. During 2001-05, the under-five mortality rate for girls in India was 79.2 per 1000 live births as compared to 69.7 for boys (3).

To summarize, a decline in the population sex ratio or the juvenile sex ratio cannot be attributed completely to sex selective abortion of the female fetus, because factors such as higher male migration and higher female mortality in specific age groups also contribute to lowering the female sex ratio.

This brings us to the third indicator, the sex ratio at birth. We argue that even a declining female sex ratio at birth cannot be assumed to be the result exclusively of sex-selective abortion of the female fetus. The reason is that there are many other factors that can cause a decline in sex ratio at birth. Sex selective abortion of the female fetus is only one of the many factors.

3. A “lower than normal” female sex ratio at birth (SRB) is not always the result of sex-selective abortion of the female fetus

India's sex ratio at birth was 905.8 females per 1000 males in 2000, according to computations based on 2001 census data. There was little rural-urban difference (Rural: 905.8 and urban: 904.2 female births per 1000 male births (4). This does not mean that all the “missing” females have been aborted after a sex-determination test. There are many reasons for this.

The SRB is not a universal constant and may change without deliberate human intervention

Studies indicate that it would be incorrect to assume that the SRB is a universal constant; and to then interpret all deviations from this as the result of deliberate human intervention. For example, sex ratios fluctuate widely when the sample size is small (Box 1).

For example, many countries in the West: Canada, Denmark, England and Wales, Finland, Germany, Greece, Japan, Netherlands, Sweden, Norway, Hungary, Poland, Romania, Portugal have registered significant increases in the proportion of female to male births since the mid half of the twentieth century. On the other hand, slight decreases in the number of female births per 1000 male births since the 1960s was observed for Australia, France, Italy, Ireland, Spain and New Zealand, while in the USA...
for births during 1969-1995, the proportion of male to female births increased in the black population but declined for the white population (5). None of these changes were the result of sex-selective abortion of either the male or the female fetus. Several other hypotheses have been put forward and examined to explain the reasons for decline in the male sex ratio at birth. These include psychological stress in the mother especially in the first trimester of pregnancy (6-8); exposure to occupational and reproductive hazards by men (9), economic collapse (10); and conflicts or war (11).

In India, the female to male ratio at birth has shown a decrease much before the advent of modern technologies of sex-determination. The SRB decreased from 934.6 females per 1000 males during 1901-10 to 909 females per 1000 males in 1940-46 in all the major provinces of British India except Bombay and Assam (120). This was because of deterioration in the completeness of vital registration data in British India.

**Box 1. SRB calculated for a small sample fluctuates considerably**

Sex ratio at birth needs to be examined for a sufficiently large sample of births. Fluctuations in SRB are observed for countries with a very small population size or when a small number of births ($< 10^8$) are being examined. This implies that examining sex ratios at birth at the village or district level over a small period of time may give misleading results.

**Increase in male births is an important factor contributing to the decrease in female sex ratio at birth**

India’s demographic transition has given rise to a number of changes all of which have the effect of increasing the number of male births.

**Declining still birth and miscarriage rates**

Biologically more male fetal losses are likely through miscarriage or stillbirth. Advances in health care which bring about a decline of these rates will contribute to a slight increase in the proportion of male births. This is corroborated by data from NFHS-1 and NFHS-2. These show that the sex ratio at birth has a higher proportion of males for women who have had trained attendance at delivery (4).

**Limiting family size**

Evidence from many studies based on large data sets shows that biologically there are more males than females among first-births. The proportion of male births declines with each subsequent birth (13-14).

This means that when couples limit their family size and therefore fewer children of higher order are born, the proportion of male births will increase.

**Family formation strategies**

In societies with a high preference for sons, the adoption of a small family norm often leads to couples stopping child-bearing as soon as they beget one or two a male children. Because there are relatively more male first and second births, the proportion of male births in the population may increase to some extent as a result of this.
**Shorter birth intervals**

Biologically, shorter birth intervals are associated with a higher proportion on male births (15). When couples decide to start childbearing soon after marriage, and have children in quick succession and then adopt a permanent method of contraception, this is likely to have an influence on the proportion of male births in the population.

**Timing of conception**

Many studies report that males are more frequently conceived at the beginning and at the end of the menstrual cycle (16-17). In other words, if couples practise “natural” family planning and avoid intercourse during the most fertile period of the menstrual cycle – the middle of the menstrual cycle, the probability of a male child being conceived increases. Although this is refuted by some studies (18), further analysis using pooled data from several studies showed that conceptions on the most fertile days had an overall SRB of 1020 females to 1000 males as compared to an SRB of 934.6 for conception on other days (19).

**India’s SRB has been increasing since 2001**

Following 2001, India’s Sample Registration System (SRS) has been publishing sex ratio at birth in some of the more populous Indian states. Fig 1 below shows the SRB in five states of India between 1999-2001 and 2004-06. A steady increase in SRB is seen, including in states such as Punjab and Haryana which had low female sex ratio at birth during the previous decades (20).

![Figure 1: Sex Ratio by State](image)

**Note:** The ratios are three-year averages.

**Source:** India, Sample Registration System.

The reasons for this reversal in trend need to be studied, taking into account the numerous factors contributing to changes in SRB.

4. **Sex-selective abortion of the female fetus-magnitude of the problem**

How big is the problem of sex-selective abortion of the female fetus, after ascertaining the sex of the fetus using an ultra-sound scan?

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1. The first birth interval is defined as the interval between marriage and first birth