Trends in Sex Ratio at Birth and Estimates of Girls Missing at Birth in India

United Nations Population Fund - India

The child sex ratio data from Census 2001 brought the issue of imbalance in sex ratio to centre stage in development debates. Child sex ratio is the number of girls to every 1000 boys in the 0-6 age group. The child sex ratio for 2001 was 927 girls to 1000 boys at the national level. Many states and districts in the country registered a child sex ratio of less than 900 girls to 1000 boys. Prenatal sex selection was considered as the leading cause for the missing girls and an imbalanced child sex ratio.

While child sex ratio is principally determined by the sex ratio at birth, it is also influenced by a number of other factors such as under-registration of girls, differential infant and child mortality, and age misreporting. Therefore, imbalance in child sex ratio cannot be entirely attributed to the practice of prenatal sex selection. The 'sex ratio at birth', defined as the number of girls *born* for every 1000 boys *born*, is a more accurate and refined indicator of the extent of prenatal sex selection. The comparison of observed sex ratio at birth with normal sex ratio at birth gives an idea of girls missing at birth. Sex ratio at birth in India for the period (2006-08) was 904, while the internationally observed normal sex ratio at birth is 952 or more girls born per 1000 boys. Accordingly, it is estimated that the practice of prenatal sex selection has resulted in approximately 6 lakh girls being missed annually in India during the period 2001-07. This is roughly 1600 girls a day[1].

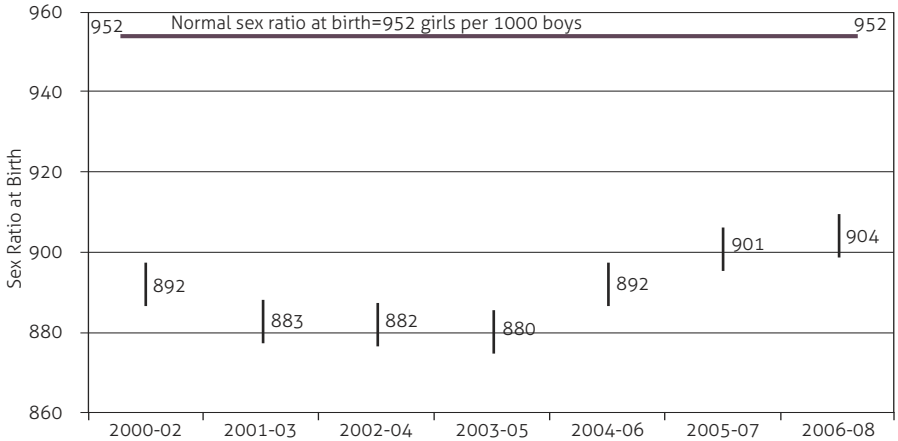
Data on sex ratio at birth is periodically collected at the national level by the Civil Registration System and the Sample Registration System (SRS). These reports are published annually by the Office of the Registrar General of India. The Civil Registration System data is not reliable due to gross under-registration of births in some states. Hence, SRS estimates are the most frequently used and quoted source of sex ratio at birth data. These estimates provide results at state and national level, but not for the district level.

Since sampling errors for annual estimates could be large, the SRS gives three-year moving averages of the sex ratio at birth rather than

[1] This estimate has been obtained following the methodology described in a paper by Kulkarni, P. M. (2007) ("Estimation of missing girls at birth and juvenile ages in India" Paper presented at the XXIX Annual conference of the Indian Association for the Study of Population, Banaras Hindu University, Banaras, October 2007). This methodology has been extended to the period 2001-07 and the estimates are given in Table 2.

annual estimates. From the published reports of the SRS, the sex ratio at birth for the three-year moving average period is presented in Figure 1. In order to meaningfully trace trends, the lower and upper limits of sex ratio at birth based on 95% confidence interval[2] have been computed. As per the SRS, the sex ratio at birth at the national level increased from 892 in 2000-02 to 904 in 2006-08. Considering the 95% confidence interval, the sex ratio at birth between these two points seems to have improved. However, in the recent years (between 2005-07 and 2006-08), the sex ratio at birth seems to have stagnated between 901 and 904, still a far cry from the normal sex ratio at birth.

Figure 1: Trends in Sex Ratio at Birth, India (with 95% Confidence Interval)



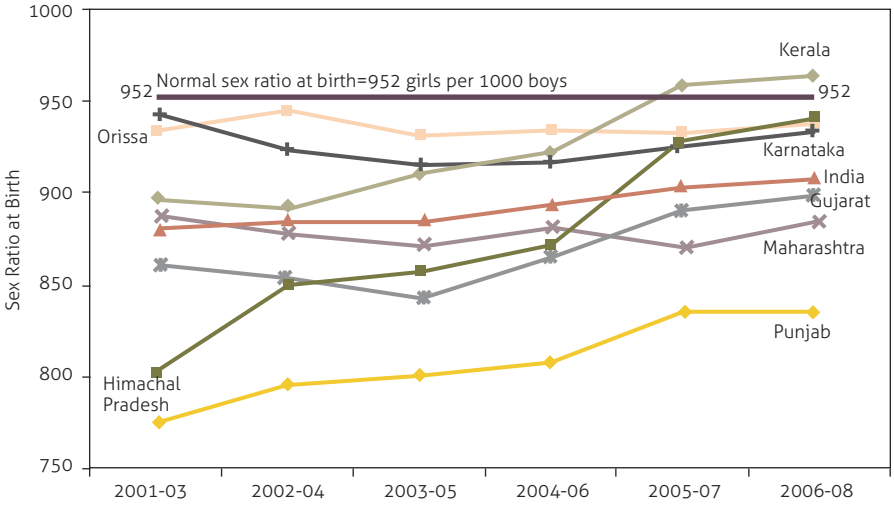
Source: SRS Annual Reports

As far as the trends and levels of sex ratio at birth in different states of India are concerned, they vary. Some are close to the normal sex ratio at birth, while others are somewhat below normal. Quite a few states have very low sex ratio at birth despite greater attention given to the issue following the 2001 Census. Table 1 and Figure 2 show the sex ratio at birth for selected states between the period 2001-03 and 2006-08. For the period 2006-08 the extent of variation between states is substantially large with the lowest

[2] 95% confidence interval means that if the sample from the same population is drawn numerous times, in approximately 95% of the time, the sex ratio at birth value will fall between the lower and upper limits of the range. For example, the observed sex ratio at birth is 883 for 2001-03. The calculated lower and upper limits of the range for this period are 878 and 888 respectively. Therefore, one can say with 95% confidence that the actual value of sex ratio at birth lies between the range of 878 and 888. Confidence interval is preferred because it indicates the precision and reliability of an estimate.

sex ratio at birth of 836 seen in Punjab, Haryana (847), J&K (862) and Rajasthan (870) at one end, and Kerala (964) and Chhattisgarh (975) at the other end.

Figure 2: Sex Ratio at Birth – Selected States, 2001-03 to 2006-08



Source: SRS Annual Reports

Table 1: Sex Ratio at Birth in India and Large States (SRS Data)

State	Sex ratio at birth	
	2006-08	2001-03
Punjab	836	776
Haryana	847	807
Jammu and Kashmir	862	816[x]
Rajasthan	870	855
Delhi	877	835[x]
Uttar Pradesh	877	853[*]
Maharashtra	884	887
Gujarat	898	862
Bihar	914	861[@]
Andhra Pradesh	917	932
Madhya Pradesh	919	922[#]
Jharkhand	922	865[x]
Assam	933	904
Karnataka	935	943

Table 1 continued...

State	Sex ratio at birth	
	2006-08	2001-03
Tamil Nadu	936	953
Orissa	937	934
Himachal Pradesh	938	803
West Bengal	941	937
Kerala	964	892
Chhattisgarh	975	964[x]
India	**904**	**883**

@ Bihar and Jharkhand combined; x this value refers to the period 2002-04; # Madhya Pradesh and Chhattisgarh combined; * Uttar Pradesh and Uttarakhand combined

Source: SRS Annual Reports

Estimation of Girls Missing at Birth

A sex ratio at birth of 880-900 implies that 50-70 girls are missing out of the expected 952 girls for every 1000 boys. Table 2 shows an estimation of missing girls, (India and selected states). The number of missing girls has been computed from the difference between observed numbers of girls born during the period 2001-07, and the numbers of girls that would have been born if the sex ratio at birth was normal, i.e. 952. The projected mid-year population and SRS based crude birth rate[3] were used to derive the total number of births in each middle year of a three year period for which sex ratio at birth is computed by the SRS. For example, the middle year for the three year period of 2000-02 is 2001. Based on the observed sex ratio at birth, the numbers of male and female births in 2001 were obtained from the total number of births in 2001. The difference between the observed numbers of girls born and the number expected to be born in 2001 (based on the normal sex ratio at birth of 952) is the estimated numbers of girls missing due to prenatal sex selection.

It must be recognized that the sex ratio at birth given by the SRS is only an estimate and is subject to sampling and non-sampling errors. Hence the estimates of missing girls only provide rough information and not precise values. Even allowing for such errors, the phenomenon of missing girls is a reality, since the numbers are quite large in some states.

[3] Crude birth rate is the number of children born each year for every 1,000 population in a given geographical area.

By using the methodology mentioned above, it was estimated that during 2001-07, the number of girls that were missing in India on account of prenatal sex selection was 6 lakh per year (on average), or 1600 per day (on average). Details are given in Table 2 wherein states such as Uttar Pradesh, Bihar, Rajasthan and Maharashtra together account for nearly 4 lakh out of the 6 lakh girls missing at birth in the country on an annual basis. The problem is especially acute in Punjab, where 16 percent of the total female births expected did not take place. In Haryana, Jammu and Kashmir, Delhi and Rajasthan between 9 and 12 percent of the total expected female births did not take place. During 2001-07 for the country as a whole, on an average nearly 5 percent of female births did not occur because of prenatal sex selection.

Table 2: Estimates of Missing Girls Due to Prenatal Sex Selection, 2001-07, India and Selected States (Computed from SRS data)

State	Estimated number of female births that did not occur each year due to prenatal sex selection	% of missing female births (out of the total female births)
Punjab	35,833	16.2
Haryana	33,588	12.9
Jammu & Kashmir	9,987	10.5
Delhi	11,883	8.9
Rajasthan	71,931	8.7
Gujarat	47,503	7.9
Uttar Pradesh	1,95,899	7.6
Himachal Pradesh	4,468	7.6
Bihar	76,160	6.0
Maharashtra	55,053	5.9
Jharkhand	12,718	3.4
Madhya Pradesh	17,261	1.9
Kerala	3,697	1.5
Andhra Pradesh	8,621	1.1
Assam	3,832	1.1
Karnataka	1,942	0.3
India	**6,01,468**	**4.8**

(Assumption: Normal sex ratio at birth = 952)

For Delhi, J&K and Jharkhand, the estimates are for the period 2004-07 since crude birth rate is not available for the relevant period.

Prior to 2004, the estimates for MP and Bihar also include the number of missing girls for Chhattisgarh and Jharkhand respectively as separate estimates for sex ratio at birth for these newly carved states were not available.

Future Directions

It is important to recognize that SRS data comes from a sample and the sampling frame is changed every 10 years. The last time the sampling frame changed was in 2004. For any data relying on a sample, certain sample-related errors are inevitable. Moreover, SRS does not provide data at district and sub-district levels, where actual programme implementation is handled. District and sub-district level data can become available only if coverage of birth registration under the Civil Registration System improves at all administrative levels. A few states, such as Kerala, Himachal Pradesh, Punjab and Tamil Nadu have achieved cent percent birth registration while states like Bihar, Uttar Pradesh and Madhya Pradesh have reported coverage only in the range of 17 to 53 percent.

Even when coverage under the Civil Registration System improves, it is important to assess whether improvements in sex ratio at birth have been due to better reporting of girls, or due to increase in the actual number of girls born. Some states may report dramatic improvements in sex ratio at birth, but further inquiry is necessary to reveal with confidence that these changes are indeed the result of increase in number of female births.

An all out effort to improve the Civil Registration System needs to be undertaken by national and state authorities and the data generated has to be validated before use. Only then will it provide reliable trends and information at different administrative levels.

Meanwhile, the extent of the problem of prenatal sex selection is evident, and intensive efforts are called for.

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