Trends and Differentials in Sex Ratio at Birth in India Based on NFHS Data

Son preference is a deep-rooted cultural phenomenon in many countries including India, which results in discriminatory and harmful practices against women and girls. Many couples would like the family line to continue and in patrilineal societies male offspring are needed for this purpose. Moreover, certain rituals, especially those related to death (burial or lighting the funeral pyre) and ancestor worship are traditionally performed by sons. Such values may be considered sentimental or ritual for those following them. Even for more practical and material needs such as old age security, traditionally sons are valued over daughters. This may involve living with the son's family during old age, especially when the elderly can no longer work or take care of day-to-day household management, as well as financial support. In patrilocal (or virilocal) arrangements, sons and their families are expected to reside with parents whereas a married daughter would reside with the parents of her husband. Expenses towards getting daughter married, especially dowry and costs of the celebration, if expected to be borne by the family of the bride, lead to 'disvaluing' of daughters. Overall, for various reasons, the perceived value of sons differs from that of daughters. With the availability of the technology of sex detection during pregnancy, the strong son preference has led to pre-natal sex selection in several parts of the world causing the sex ratio at birth to be more masculine than the normal level (Guilmoto, 2009)[1]. Even though India has enacted laws banning the use of pre-natal diagnostic techniques for sex detection, the practice seems to be continuing in some regions of the country as seen from the estimates of the sex ratio at birth (SRB).

Gender-biased sex selection is measured through Child Sex Ratio (CSR) and Sex Ratio at Birth. The child-sex ratio has often been used to comment on sex selection. While Child Sex Ratio is principally determined by sex ratio at birth, it is also influenced by several 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 gender-biased sex selection. Sex ratio at birth, defined as the number of girls born for every 1000 boys born is a more refined indicator of the extent of gender biased sex selection as it is not affected by post birth factors such as mortality or age misreporting. The instances of gender-biased sex selection is obviously not recorded but the numbers of cases can be estimated indirectly based on the deviation of the observed SRB from the natural level. Various studies have shown that SRB is usually close to 105 male births per 100 female births (in the range 104 to 106), or around 952 female births per 1000 male births, in the absence of any distortion.

Data on SRB in India is provided by the Sample Registration System (SRS) and published by the Office of the Registrar General of India (ORGI) as a three-year moving average[2]. The decennial census of India data on 'births last year' to married women and on 'the number of children ever born' to ever married women allows to compute the sex ratio of births for the previous census year and for all births to women. Moreover, the SRB for a period prior to the census can be obtained indirectly by reverse surviving the number of children by age and sex obtained from the census enumeration. In addition, the National Family Health Surveys (NFHS) obtained complete fertility histories of the respondents which makes it possible to compute SRB for various time periods. It is important however to note that SRS and NFHS estimates are based on a sample, it is subject to sampling and non-sampling errors.

In India, several data sources provide SRB, however, most often these estimates do not align with each other. The SRS give a continuous series, but these are seen to be underestimates of the female births to male births ratio. Based on the assessment of various estimates, it has been found that that the census based indirect estimate obtained by the reverse survival method is the most plausible SRB, however it is available only once in 10 years. One could correct the SRS estimates based on the ratio of SRS estimate to the indirect census-based estimate, by dividing it by 0.978 in the case of female births to male births ratios; as a round figure, the correction thus raising the SRS estimate by 2 percent (Kulkarni, 2020)[3]. The correction factor is based on the 2011 census data and the SRS estimates for the period 2004-10).

The objectives of this paper are to trace trends in SRB using unit level data from various rounds of the NFHS and analyse differentials in SRB based on demographic characteristics such as birth order and sex composition of previous children and by geography.

[1] Christophe Z. Guilmoto 2009. 'The Sex Ratio Transition in Asia', Population and Development Review Vol. 35, No. 3 (Sep. 2009), pp. 519-549, published by Population Council, New York
[2] Office of the Registrar General and Census Commissioner (India). Sample Registration System Statistical Report 2020. New Delhi, India.
[3] Kulkarni, P. M 2020. 'Sex Ratio at Birth in India: Recent Trends and Patterns' 2020. United Nations Population Fund (UNFPA), New Delhi, India

Trends

♦ The sex ratio at birth for children born in the last five years preceding the survey, has improved from 919 in NFHS-4 to 929 in NFHS-5, which is statistically significant (Figure 1). The improvements seem to be mainly driven by higher SRB in urban areas, while in rural areas, no significant improvement is observed during these two rounds of the survey.

Fig 1: Trend in Sex Ratio at Birth In India by Place of Residence, NFHS-4 (2015-16), NFHS-5 (2019-21) and SRS (2018-20) - Female Births per 1000 Male Births

♦ Although SRB in India for the period 2018-20 by SRS is 907, but after applying the correction factor, it comes out to be 926 female births per 1000 male births, which appears very close to the estimates from the NFHS.

♦ The SRB in rural areas has remained at the same levels from the previous two rounds of the NFHS and is also in conformity with the SRS estimates.

♦ In urban areas, the SRB from the latest round of NFHS is 924, which is close to 929 estimated from the SRS. However, the data indicate a significant improvement in SRB from 899 in 2015-19 to 924 in 2020-21.
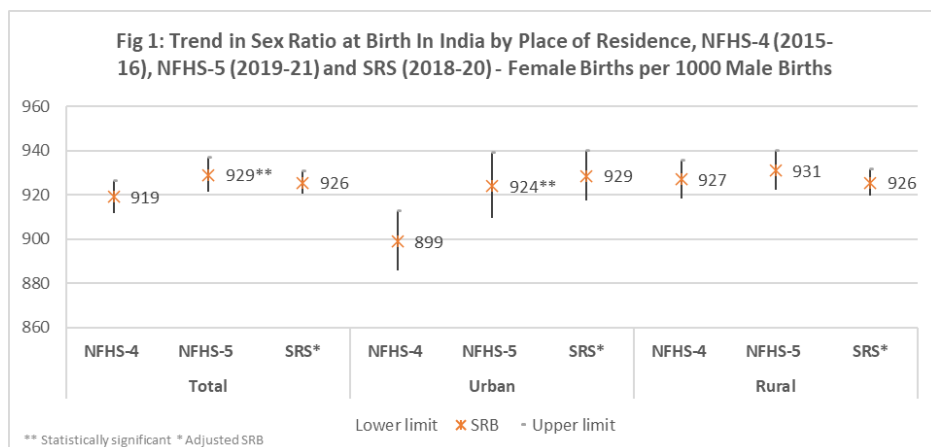
SRB by Birth Order

In the case of gender biased sex selection, one would expect it to take place after the first child is born, and thus affect SRB at births of higher orders (parity). To examine if this is the case in India, SRB estimates were obtained by birth order from the NFHS-4 and NFHS-5 data. These are for the period 2005-2009 and 2010-2014 from the NFHS-4 and for 2015-18 from the NFHS-5 (one year less for the recent reference period for births will not affect the findings). The end cut-off year is decided as to avoid the year in which data collection of the surveys were on. The SRB has been estimated only for the first three orders since in the samples the number of births at higher orders are small and the estimates would have relatively large sampling errors.

♦ At the national level, the SRB for first order births have been stable at around 927 – 929 in the previous two periods, however, it declined from 937 for the period 2005-09 (Figure – 2).

Fig 2: SRB by Birth Order, 2005-09, 2010-14 (NFHS-4) and 2015-18 (NFHS-5), India, *(Female births per 1000 male births)*

♦ One would expect a lower SRB at the second birth in case of prevalence of son preference. For the previous two time periods, it is lower than the SRB for first birth order, but surprisingly, for the recent period (2015-18), the SRB has not only shown an increase but exceeds the SRB for the first birth, though it is more masculine than the natural level (that is, significantly below 952).

♦ At the third order births, the SRB is more masculine than the natural level during all three times periods, the lowest at 852 during 2010-14, and showing a slight increase to 884 for the recent period, though much below than the normal level.
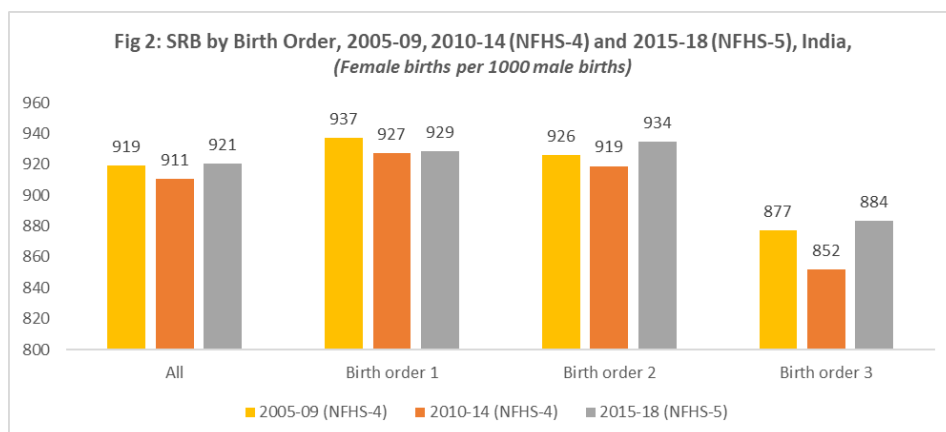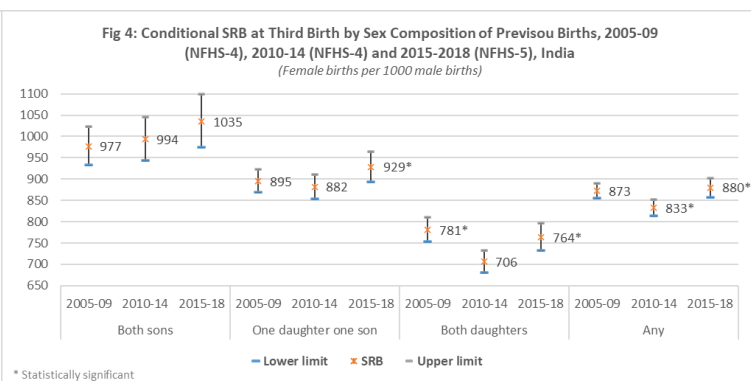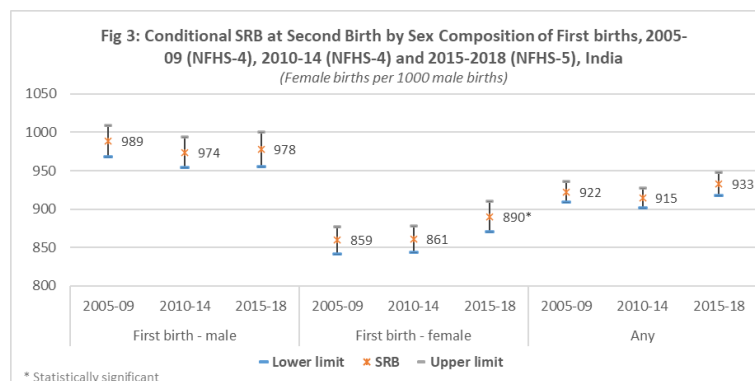
Conditional SRB

From the fertility histories collected in the NFHS, it is possible to compute SRB conditioned on the sex composition of previous children. This has been done from the data of the latest two rounds, NFHS-4 and NFHS-5 for three time periods, prior to these surveys. First, SRB at the second birth has been computed for those whose first child was a son and those whose first child was a daughter. Further, given that the SRB at the third order shows large deviations from the natural range as seen above, SRB at the third birth has been computed by sex composition of the first two births. It must be noted that child loss could influence such decisions and in case twins are born, there is no sequential decision making at that stage. Therefore, in computing SRBs, twin births and those after a child loss are not considered in the analysis. The sample weights have been applied in the analysis.
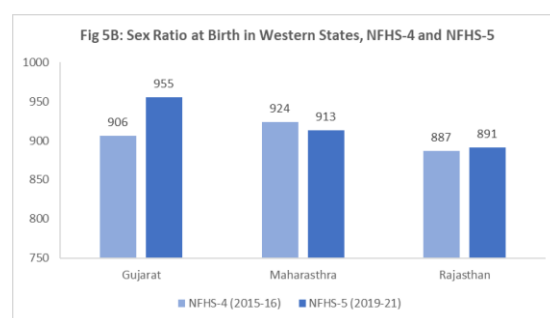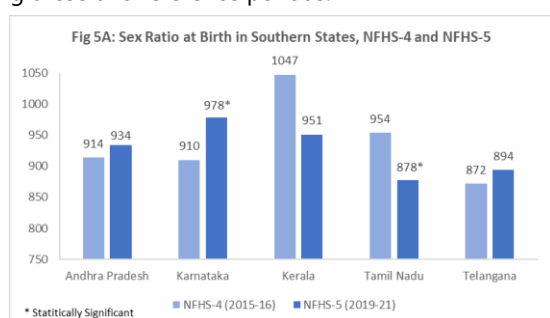
♦ At the national level, the SRB at the second birth when the first child is a daughter is more masculine than that when the first child is a son and significantly lower than 952 female births per 1000 male births in all three time periods.

- SRB at second birth with a previous girl child, showed a significant increase from 861 during 2010-14 to 890 in 2015-18, but remains far below than the natural level (Figure – 3).
- Sex selection at the third birth following two daughters seems to be very widely prevalent (Figure – 4). In case of two previous daughters, the SRB at third birth order was as low as 706 during 2010-14, and it is 764 during 2015-18. On the other hand, the
- SRB is higher than the natural level at third birth if previous two children are sons, clearly indicating that a strong son preference persists.

Fig 3: Conditional SRB at Second Birth by Sex Composition of First births, 2005-09 (NFHS-4), 2010-14 (NFHS-4) and 2015-2018 (NFHS-5), India
(Female births per 1000 male births)

Fig 4: Conditional SRB at Third Birth by Sex Composition of Previsou Births, 2005-09 (NFHS-4), 2010-14 (NFHS-4) and 2015-2018 (NFHS-5), India
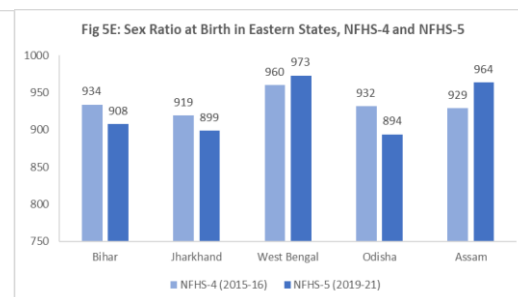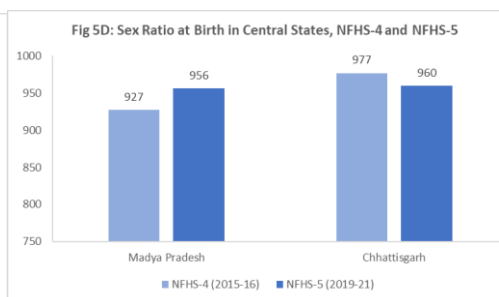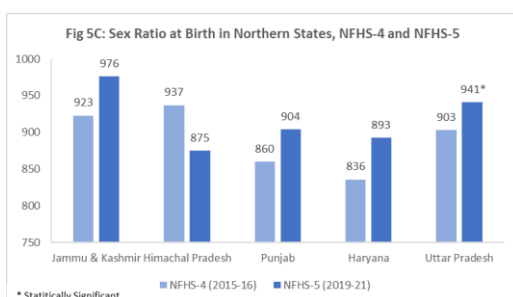*(Female births per 1000 male births)*

Differentials by State

- The level of SRB varies by state. The Southern part of the country has a better ratio (Figure – 5A), except Tamil Nadu and Telangana. The SRB improved significantly in Karnataka from 910 among children born during five years preceding the NFHS-4 survey in 2015-16, to 978 in NFHS-5. In Kerala, the SRB was 1047 in NFHS-4, which declined to 951 in NFHS-5, but this decline is not statistically significant. However, a statistically significant decline of SRB was observed in Tamil Nadu from 954 to 878 during these two reference periods.

Fig 5A: Sex Ratio at Birth in Southern States, NFHS-4 and NFHS-5

Fig 5B: Sex Ratio at Birth in Western States, NFHS-4 and NFHS-5

- In Western India, there has been an increase in SRB in Gujarat from 906 to 955 during the two rounds of surveys, though it is not statistically significant. Rajasthan, with a quite low level of SRB at 891 in NFHS-5 remained at the same level in its previous round at 887.
- In Himachal Pradesh, a notable decline in the SRB from 937 in NFHS-4 to 875 in NFHS-5 is seen, though not demonstrating statistical significance, which might be due to a smaller sample size. Among northern states, the SRB increased significantly in Uttar Pradesh from 903 to 941 during the two rounds of NFHS and it also showed improvements in Punjab and Haryana, but the levels of SRB in these two states are far below than the natural level.

Fig 5C: Sex Ratio at Birth in Northern States, NFHS-4 and NFHS-5

Fig 5D: Sex Ratio at Birth in Central States, NFHS-4 and NFHS-5

Fig 5E: Sex Ratio at Birth in Eastern States, NFHS-4 and NFHS-5

- The SRB is above the natural level in Madhya Pradesh and Chhattisgarh with 956 and 960 respectively as per NFHS-5 (Figure – 5D). In the eastern region, West Bengal and Assam recorded an increasing trend in SRB, though of a smaller magnitude. However, in three states, namely Odisha, Bihar, and Jharkhand a worsening trend in the SRB over two rounds of NFHS was witnessed (Figure – 5E).