Trends in missing females at birth in India from 1981 to 2016: Analyses of 2·1 million birth histories in nationally representative surveys

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Summary

Background India accounts for half of the world's missing females at birth. It is unknown whether selective abortion of female fetuses, which accounts for the missing females, has changed in recent years for different birth orders. We sought to document the trends in missing females at birth following second or third order births at national and state levels.

Methods We document trends in India and its states during 1981-2016 in the conditional sex ratio (defined as the number of females born per 1000 males following the birth of an earlier daughter or daughters) using 2·1 million birth histories from five nationally representative household surveys. We estimated decadal variation in conditional sex ratio and quantified trends in the numbers of missing female births for major states of India. We used logistic regression to calculate the odds ratio of a second (or third) girl given the sex of the earlier child(ren), adjusting for education, wealth, religion, caste, and residence.

Findings Missing female births totalled 13·5 million during 1987-2016, rising from 3·5 million during 1987-96 to 5·5 million during 2007-16, with increases in nearly every Indian state. From 1979-83 to 2012-16, the sex ratio for second-born following an earlier daughter declined from 930 (99%CI 869-990) to 885 (859-912), and that for third-born following two earlier daughters declined from 968 (866-1069) to 788 (746-830). Gujarat, Punjab, Rajasthan, and Haryana had the most skewed sex ratios, comprising a third of the national totals of missing females at birth. Haryana, Punjab, and Maharashtra contributed to missing females in excess of their births. The probability of missing girls were mostly determined by earlier daughters, even after considering geography and education levels. The conditional sex ratio among the richest and more educated mothers improved modestly from 2007-16.

Interpretation In contrast to India's substantial improvement in female child mortality, missing females at birth, driven by selective abortion of female fetuses, continues to grow and spread across the states. Inclusion of a question on sex composition of births in the forthcoming censuses and in population registries can provide local information on selective abortion for each village and urban block of the country.

Funding None

Introduction

Missing female births worldwide rose from near zero per year in the late 1970s to about 1·6 million per year by 2005-10,[1] totalling about 30 million between 1980-2010 and contributing to significant numbers of missing females.[2] India accounts for almost half of global missing female births. Daughters in India face more discrimination than sons[3,4] due to a combination of socio-economic, cultural, and historical factors.[5,6] Selective abortion of female fetuses occurs within this context.[7,8] The Indian Government adopted the Pre-Conception and Prenatal Diagnostic Techniques Act in 1994, which banned prenatal diagnostic techniques for sex-selective abortions,[9] but the Act is considered largely ineffective. Between the 2001 and 2011 censuses, selective abortions appeared to have increased in nearly three-quarters of India's districts (small administrative areas, each with about 2 million people).[10] Following widespread publicity about selective abortion of female fetuses from 2006 onward,[7] national and some state-level governments attempted to enforce the laws and implement cash transfer schemes for girls,[11] while civil society helped raise awareness about the issue.

The overall sex ratio at birth, which is the primary statistic reported annually by the Government of India, stabilized briefly from about 2007-2012 but has fallen further since 2013.[12] This overall sex ratio is influenced by falling fertility rates and reduced family size so that a growing proportion of all births are first births. However, selective abortion of girls occurs mostly among second or higher-order births. Hence, a more robust metric is the *conditional* sex ratio of second or third births following earlier daughters.[7]

India has made rapid progress in reducing child mortality and narrowing excess mortality in girls, such that by 2015, there were approximately equal numbers of deaths among girls and boys below age five.[13] Selective abortion has been more common among the affluent and more educated,[6,14,15,] but it is not known whether this practice has changed among higher birth orders or how missing females at birth are distributed among Indian states.

We sought to document the trends in missing females at birth following second or third order births at national and state levels. We examine over 2 million nationally representative birth histories over 35 years from 1981 to 2016 to quantify trends in selective abortion and provide updated estimates of the absolute numbers of missing females at birth for each of the decades from 1990, 2000, and 2010 onwards.

These analyses should help enable the improved collection of data on the girl and boy population and birth histories in the upcoming 2022 census.

Methods

Survey Population

We analysed 2·1 million birth histories from five rounds of large nationally representative household surveys; four rounds of the National Family Health Survey (NFHS) (1992-1993, 1998-1999, 2005-2006, and 2015-2016); and one round of the District Level Household Survey (DLHS)-2002-2004. Details of sampling design and methodology for the NFHS and DLHS are published.[16–20] The NFHS is a cross-sectional survey of Indian households providing information on health outcomes and health services, covering over 99% of India's population. NFHS-1 interviewed 89 777 ever-married women aged 13-49 years in 25 states. Subsequent rounds interviewed women aged 15-49 years: NFHS-2 interviewed 89 199 women in 26 states; NFHS-3 interviewed 124 385 women in 29 states, and NFHS-4 interviewed 699 686 women in 36 states/UTs. All rounds of NFHS and DLHS-2 followed a stratified multi-stage sampling design. Census list of villages and urban enumeration blocks provide a sampling frame to select rural and urban primary selection units, respectively. Units were selected with probability proportional to size. Both surveys had a high response rate (the number of completed interviews per 100 eligible women), 96% in NFHS-1, 96% in NFHS-2, 95% in NFHS-3 and 4, and 87% in DLHS-2.[16–20]

We used DLHS-2 birth history data to evaluate the concordance in sex ratios at birth-by-birth order between DLHS and NFHS. Other DLHS rounds had truncated birth histories or did not cover most states, so they were unsuitable for this research. We restricted the analysis to birth histories to no more than 15 years prior to the survey to minimize recall bias, misreporting birth dates, and underreported births.[21]

Depending on the survey round, 61% to 68% of ever children born were born less than 15 years before the interview (data not shown). For the period where at least two rounds of survey data were available, we pooled the unit level data on births and computed the conditional sex ratio. We excluded multiple births from our analysis, which constituted about 1·5% of the total births, as twins could be both same-sex and dual sex births. We combined the newly formed states (Chhattisgarh, Jharkhand, Telangana, and Uttarakhand) with their mother states since separate information for these states was not available in the previous rounds of the NFHS. For each survey, we applied the selected survey weights to yield national or state-level representative estimates and used the published definitions of wealth index (based on ownership of consumer goods and household characteristics), religion, and education (which use the same definitions as in the Indian Census).[12–16]

Statistical analysis

We computed the conditional sex ratio as the number of female births per 1000 male births [Pf/(1-Pf) *1000], where Pf is the proportion of female to total births (N). Using a method developed earlier,[7] we calculated the sex ratio separately by birth order: firstborn, second born (one older brother or sister), and third born (two older brothers or sisters or one of each). For each stratum, we compared observed ratios to the natural sex ratio of 950 (most conservative) to 975 (less conservative) girls per 1000 boys.[7,14,22] This natural sex ratio takes into account biological norms (mostly a higher stillbirth rate in boys), and is observed consistently in populations where selective abortion is uncommon, showing little variation by birth order (hence, it is a myth that "boys run in the family".[23] We attributed deviations from this natural sex ratio as due to selective abortion of girls (Appendix pp3-5). We derived 99% CI based on the Delta method with a variance of Pf/[N*(1–Pf)].[24]

We estimated the absolute number of missing females at birth by comparing the deviation of observed girl births from the natural sex ratio, calculated by applying the natural sex ratio at birth on observed male births.[25] This method considers that total births in India already have a deficit of girls due to prenatal sex selection. We derived total births from the Registrar General of India's Sample Registration System (SRS), a demographic surveillance system providing annual state- and age-specific fertility data for women aged 15-49 (the SRS draws from the respective census rounds from 1981-2011). We derived male births by applying the sex ratio at birth from the NFHS to total births in India and states. Observed female births were the difference between total and male births. We assumed that there are no male sex-selective abortions in India.[7]

A multivariate logistic regression calculated the odds ratio for having a girl in the second or third order birth, given the sex of the earlier child (ren). We controlled for education (none, primary, secondary, and higher), wealth index (poorest, poorer, middle, richer and richest), religion (Hindu, Muslim, Christian, Sikh, and others), caste (scheduled caste, scheduled tribe, other backward class, and others) and geographic variables, viz., place of residence (rural, urban), and residing state of the mothers.

Role of the funding source

There was no funding for the study. NS and PJ had full access to all relevant data in the study and had final responsibility for the decision to submit for publication.

Results

Out of 2·1 million individual birth histories from 1981 to 2016, about 0·66 million (31%) of all births were first births, while about 0·29 million each was second-order births with one earlier son (14%), and second-order births with one earlier daughter (13%) (Table 1). Falling fertility rates were evident, as the proportion of all firstborn births rose substantially between NFHS-1 and NFHS-4, from about a quarter to well over a third, whereas the share of third or higher-order births fell, from about a third to one-sixth of all births.

For our analyses, the most informative births are approximately 0·29, 0·28, 0·08, and 0·10 million births after a first son, first daughter, or two first sons and two first daughters, respectively. Indeed, there were about 18 000 fewer third births following two earlier sons than two earlier daughters, consistent with the observations that families stop having more children when boys are born.[26]

The total number of missing females at birth from 1987 to 2016 was 13·5 million using the conservative value of a natural sex ratio of 950 girls per 1000 boys. Missing females rose from 3·5 million in 1987-96 to 4·5 million in 1997-2006 and to 5·5 million in 2007-16, indicating an annual average of 0·55 million selective abortions in the last decade (Figure 1 and Appendix pp 6-7). We observed a deficit of girls at all birth orders, including the first. However, almost three-fifths of missing females at birth were second- and third-born. Over the entire period, 6·9 million second- and third-born girls were missing nationwide, an average of 0·20 million per year. For these two birth orders over the 35 years, there were 835 000 missing females at birth in Gujarat, 648 000 in Punjab, 570 000 in Rajasthan, 485 000 in Haryana, and the most populous state of Uttar Pradesh, 1·4 million missing females at birth (Figure 2). Despite falling sex ratios for third-born, the absolute number of missing third-born girls fell modestly from 1·6 million in 1997-2006 to 1·3 million in 2007-16, due to the fact that the absolute totals of third-order births fell by about half (State-level estimates of missing females at birth are in Appendix pp 8-14, Appendix pp15-21, and Appendix pp22-28). Applying a natural sex ratio of 975 girls per 1000 boys to our estimates yielded 22·1 million missing females at birth from 1987-2016.

Figure 3 presents the trends in sex ratio at birth in India from 1981-2016, with each dot representing the five years preceding each survey. The sex ratios of the firstborn (Panel A) were within the natural range (950-975 girls per 1000 boys) or slightly below it, particularly from the early 2000s. The sex ratios of second- or third-born with an earlier son or sons (Panel B) were either within the natural range or slightly above it, in no particular pattern. By contrast, the sex ratio deviated substantially downward from the natural range following one earlier daughter (Panel C) and particularly following two previous daughters (Panel D). In the NFHS, the sex ratio of second-born following an earlier daughter was 930 in 1979-1983, fell to 848 in 2007-2011, and rose marginally to 885 in 2012-2016. The sex ratio of third-born following two daughters dropped sharply from 968 in 1979-1983 to 744 in 2007-2011, and then rose marginally to 788 in 2012-2016. The sex ratio following one or two earlier sons substantially

diverged from that following one or two earlier daughters from 1986 onward, consistent with the time period where prenatal ultrasound technologies became common in India.[27]

There was no clear trend from 1981-2016 in sex ratios for second-born among the poorest quintile or with mothers who could not read or write (Figure 4). However, this sex ratio declined over time in the richest quintile and among mothers having grade 10 or higher education but increased marginally from 2007-16. Among these same income and education groups, results showed even steeper declines in the sex ratio for third-born following two earlier daughters (Appendix p29). Logistic regression analyses of 157 931 births in the NFHS-4 (Appendix p30) showed that a first girl (as compared to a first boy) reduced the likelihood of a second girl by 41% (99% CI 39-43%), after adjustment for urban/rural residence, education, wealth quintile, caste, and state. For 106 867 third births, two earlier daughters reduced the likelihood of a third girl by 60% (58-62%). In each analysis, earlier daughter(s) was the dominant determinant of the second or third girl. Indeed, higher education levels increased the likelihood of a second- or third-born girl, but the counteracting effect of having earlier daughters was more dominant.

There was remarkable variation in the sex ratio following one or two earlier daughters across the states from 1981-2016 (Figure 2). For second-born after one earlier daughter, the sex ratio was substantially below the natural range in nearly every state and was most extreme in Punjab, Haryana, Gujarat, Rajasthan, Uttar Pradesh, Maharashtra, and Madhya Pradesh. The sex ratio for third-born following two earlier daughters was lower than for second-born following a daughter in every state. The sex ratio fell within the natural range only in Assam, Karnataka, and West Bengal, with all other states being lower than the natural range. This suggests that selective abortion of third-born girls is far more geographically widespread in India than is the case for second-born girls. Punjab had the most extreme sex ratio for both second-born (700; CI 661-740) and third-born (531; CI 479-583). Even Assam, Tamil Nadu, and Andhra Pradesh, where abortion of girls is believed less common, showed skewed ratios for third-born girls.

From 1987-1996 to 2007-2016, annual births in India rose only modestly from 24·4 million to 24·7 million, due to the combined effects of population growth and rapidly falling fertility rates. The ratio of the state contribution to missing females at birth for second-and third-born following earlier daughters compared to total births for three time periods (1987-96, 1997-2006, and 2007-16) are shown in Appendix p31. A ratio greater than one, indicating that the state has an excess contribution to missing females at birth compared to births, is seen in Haryana, Punjab, Maharashtra, Gujarat, Rajasthan, Uttar Pradesh, and Madhya Pradesh in 2007-2016. The contribution of Haryana, Punjab, and Maharashtra to missing second- and third-born girls is at least twice their share of total births in the country. Haryana, Punjab, Maharashtra, Gujarat, Tamil Nadu, and Himachal Pradesh had missing females at birth in excess of their contribution to third-born births.

The state-specific contrast of sex ratio for second-and third-born with earlier daughters from the first decade of observation (1987-96) to the last (2007-16) is shown in Figure 5. The sex ratio worsened for the whole of India and almost all states, for both birth orders. There were slight improvements in the sex ratio of second-born in Assam, Andhra Pradesh, Gujarat, Himachal Pradesh, Tamil Nadu, and West Bengal. Improvements in sex ratios for third-born were seen only in Jammu and Kashmir, Karnataka, and Kerala.

Discussion

Missing females at birth continues to grow in India and spread across the states. The major explanation for these missing females is prenatal sex determination followed by selective abortion. Various factors, including infections, smoking, hormonal and social factors, could reduce the overall sex ratios (Appendix pp3-5). However, such factors are unlikely to account for the marked discrepancies in sex ratios for second-born or third-born and changes over time.[7] Earlier analyses[7,14] suggests that female infanticide, which is now rare, plays little or no role in explaining the overall gap in missing females at girls at age 0-6.

Our findings are in contrast to recent claims that selective abortion of girls in India is slowing.[28] Conservative estimates of missing females at birth assuming 950 girls per 1000 boys as the natural ratio, reveal 13·5 million missing females from 1987-2016, rising from 3·5 million in 1987-96 to 5·5 million in 2007-16, an increase of nearly 60%. Our estimates on missing females at birth are consistent with the estimates provided by earlier studies.[1, 29,30] The preliminary reports from 22 states in the National Family Health Survey-5 also document worsening sex ratio at birth in eight.[31]

The increase in missing females at birth occurred in almost every Indian state. Selective abortion is more pronounced for third-born than for second-born following earlier daughters. Selective abortion continues to be more common in richer and more educated families than in the poorer or less educated families, the exact opposite of differences in childhood survival or health care access. The main determinant of missing female births at the second or third-order births is the presence of girls in the earlier birth order. The unfavourable trends in missing female births are in marked contrast to India's substantial improvement in female child mortality over the last decade or two.[13]

The reduction in the absolute number of missing third girls, which fell from 1·6 million to 1·3 million between 1997-2006 to 2007-16 is mostly due to falling fertility, despite the fact that conditional sex ratios for third-born girls worsened. Missing third-born girls are now far more geographically widespread in

India than is the case for second-born girls, suggesting that the use of selective abortion is as widespread as the preference for sons.[5] Widespread but variable levels of son preference across states are also interacting with reduced fertility rates, which vary across the states of India.[19] Notwithstanding differences in son preference, nearly every state—not only those widely known for selective abortion—now faces possible large deficits of missing females at births. Indeed, Maharashtra has emerged, surprisingly, as having a widespread selective abortion, particularly for third female births.

Platforms for addressing the issue already exist. India's large maternal and child health programs could identify women with earlier daughters as being particularly at risk of selective abortion and design incentive programs for these families. The Census planned for February 2021 is likely to be postponed to 2022 and offers a unique opportunity to document the national, state, and even village-level patterns of selective abortion. This would involve reporting not only the number of children aged 0-6 years (which has been done in past censuses) and sex ratios at birth but also on conditional sex ratio for second or third births. Inclusion of additional simple questions on sex composition of the previous children (Appendix p32) to the Census and the National Population Register could provide important local information on selective abortion for each village and urban block of the country. Reliable local reporting of the practice, with concomitant debate in the media, civil society, and even highlighted by the entertainment sector, might well yield benefits. Indeed, the modest improvement in the sex ratio from 2007-16 for second-and third-born girls among the richest quintile and most educated groups might be in response to the widespread media and social discussion of missing girls from 2006 onward.[32]

Our study has a few limitations. First, small sample sizes for particular states and years may reduce representativeness of the national surveys. For this reason, we rely mostly on pooled estimates of over ten years to ensure an adequate sample size. Secondly, birth histories have temporal variation and reporting biases.[21] As done earlier,[14] we minimized misreported date of birth, underreporting of births (particularly girl children), and sample implementation errors by restricting our analysis to 15 years prior to the survey, by combining NFHS and DLHS survey samples for overlapping periods, by presenting results by 5-year age groups and excluding states with insufficient numbers for analysis. Analyses of shorter recall periods (5 years) showed similar trends to those we present (data not shown). Moreover, while routine registration of births suffers from lower reporting of girls, this bias is smaller in the household surveys (Appendix p33). Stillbirths are not likely to have biased our results, as earlier reports document higher stillbirths among boys than girls, and the numbers of stillbirths were much lower than the numbers of missing females at birth.[7] Finally, we may have underestimated the true extent of missing females at birth by applying the more conservative natural ratio of 950 girls per 1000 boys. The use of a natural

ratio of 975[7,14] yielded over 22 million missing girls at birth. The stratification by education and demographic groups are subject to some biases, particularly in how wealth indices are calculated,[33] but these biases did not likely change substantially over time.

Our analyses document the levels and causes of missing females at birth, but not the consequences of this outcome. Selective abortion of girls is one of the most severe forms of gender discrimination contributing to an excesses of unmarried men and increasing violence against women.[3,4] Evidence-based strategies that include consideration of social determinants, such as equal inheritance laws for women, and emphasis on ensuring that policies are effectively implemented are urgently required to reduce selective abortion.[34,35] Without a reduction in selective abortion, the distortion of demographic profiles may have decades-long repercussions.[36-37]

Panel: Research in context

Evidence before this study

We searched PubMed and Google Scholar using the search terms “conditional sex ratio,” “sex ratio,” “missing girls,” “sex selection,” “sex-selective abortion,” and “India” in December 2020, without language and date restrictions. Only four studies computed the number of missing female births in India. Previous studies did not discuss the evolution of selective abortion of girl children at the sub-national level.

Added value of this study

Analyzing 2·1 million birth histories, we provide the total number of missing female births by sex of the previous children for each decade and by state. The total number of missing female births in India was 13·5 million from 1987-2016, rising from 3·5 million in 1987-96 to 5·5 million in 2007-16, an increase of nearly 60%. The missing female births among the second-and third-born (following earlier daughters) contributed about 56% of total missing female births. Missing third-born girls are widespread, notably in states such as Maharashtra and Uttar Pradesh. Punjab, Haryana, and Maharashtra’s share of missing girls in second-and third-order births is at least twice their share in total births in the country. Missing second- or third-born girls is mostly determined by earlier daughters, even considering education, rural/urban residence, religion, and other factors. Missing female births are more common in the richest quintile and unborn to women with higher education. There has been some improvement in sex ratios among higher education groups from 2007-16.

Implications of all the available evidence

Selective abortion of female fetuses continues throughout India. Evidence-based interventions to reduce the practice are needed. This includes adding simple questions to the 2022 Census to document selective abortion in each village and urban block. Without reductions in selective abortion, the profound demographic and social repercussions of missing girls at birth may continue.

Contributors

Conceived the idea and developed the study design: NS, PJ. Data analysis: NS, CM, PJ. Literature review: NS, CM. NS and PJ wrote the initial draft, and all authors were involved in commenting on subsequent revisions. NS and PJ are the guarantors who accessed and verified all data used in the study.

Data sharing

The NHFS and DLHS surveys are all open-access public use files available through https://www.iipsindia.ac.in/content/data-request.

Declaration of interests

We declare no competing interests.

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Table 1: Sample Description of the women and births: 1981-2016

Survey	Survey year	Total women	Births 15 years prior to the survey	Firstborn	Second born, one earlier son	Second born, one earlier daughter	Third born, two earlier sons	Third born, two earlier daughters	Third born, earlier son and daughter	Fourth born and higher
DLHS-2	2002-2004	383 593	904 354	271 629	123 285	116 813	39 281	44 010	79 749	229 563
NFHS-1	1992-1993	66 950	170 891	45 113	20 222	19 296	7753	7657	15 185	55 666
NFHS-2	1998-1999	65 456	161 523	44 907	20 530	19 415	7141	7658	14 397	47 476
NFHS-3	2005-2006	70 617	166 860	48 300	21 761	21 459	6781	8080	14 398	46 083
NFHS-4	2015-2016	348 610	693 228	250 233	106 712	104 694	24 004	35 111	53 058	119 416
	Totals	**935 226**	**2 096 856**	**660 182**	**292 510**	**281 677**	**84 960**	**102 516**	**176 787**	**498 204**
	% of all births		100%	31·48%	13·95%	13·43%	4·05%	4·89%	8·43%	23·76%

Notes: NFHS is the National Family Health Survey. DLHS is the District Level Household Survey.[16–20]

FIGURE LEGENDS

Figure 1: Trends in the absolute number of missing female births in India, 1987-1996, 1997-2006 and 2007-2016

Missing female births are estimated from absolute male births by birth order, applying a natural sex ratio of 950 female births per 1000 males.

Figure 2: Conditional sex ratio (girls per 1000 boys) of second or third born with one or two earlier daughters in India and bigger states, 1981-2016

Missing second or third girls are estimated from absolute male births (see methods and Figure 1 footnote). India totals include smaller states and union territories not graphed.

Figure 3: Trends in conditional sex ratio (girls per 1000 boys) by birth order from 1981-2016 in India

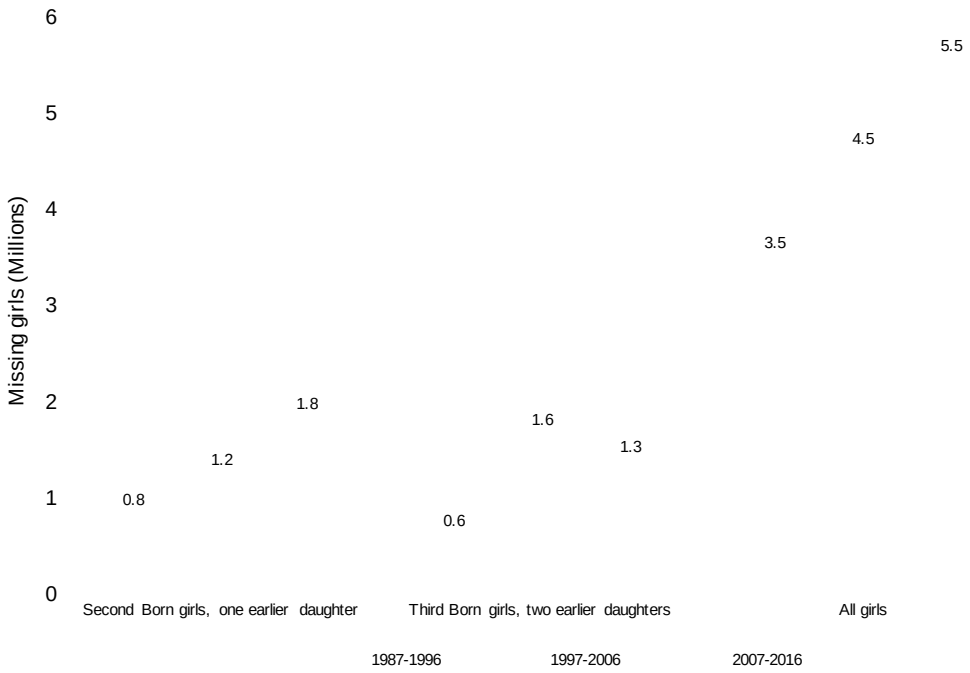
Each year on the horizontal axis represents the last of each five-year group.

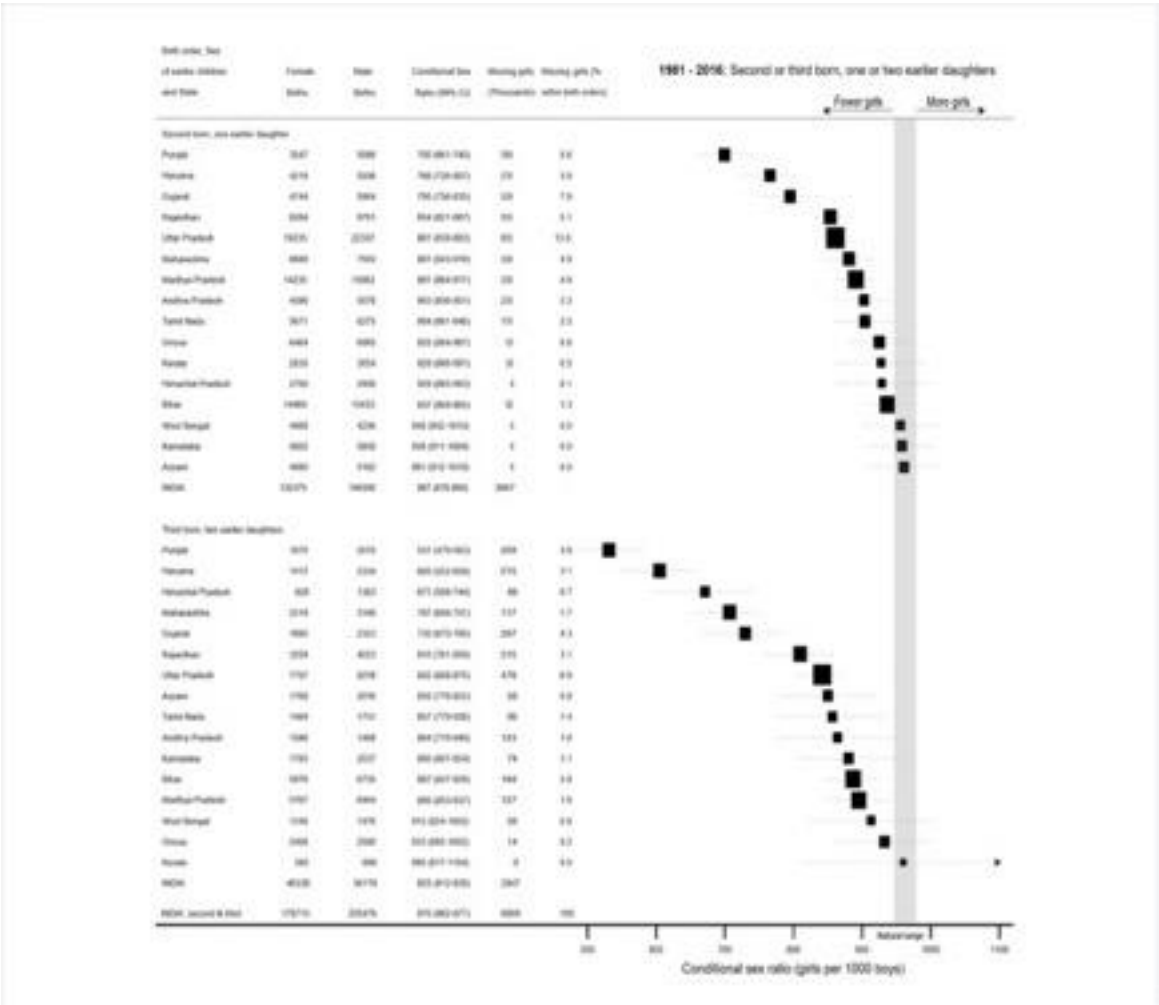
Figure 4: Trends in conditional sex ratio (girls per 1000 boys) by wealth quintile and education level for second-born following an earlier daughter from 1981-2016 in India

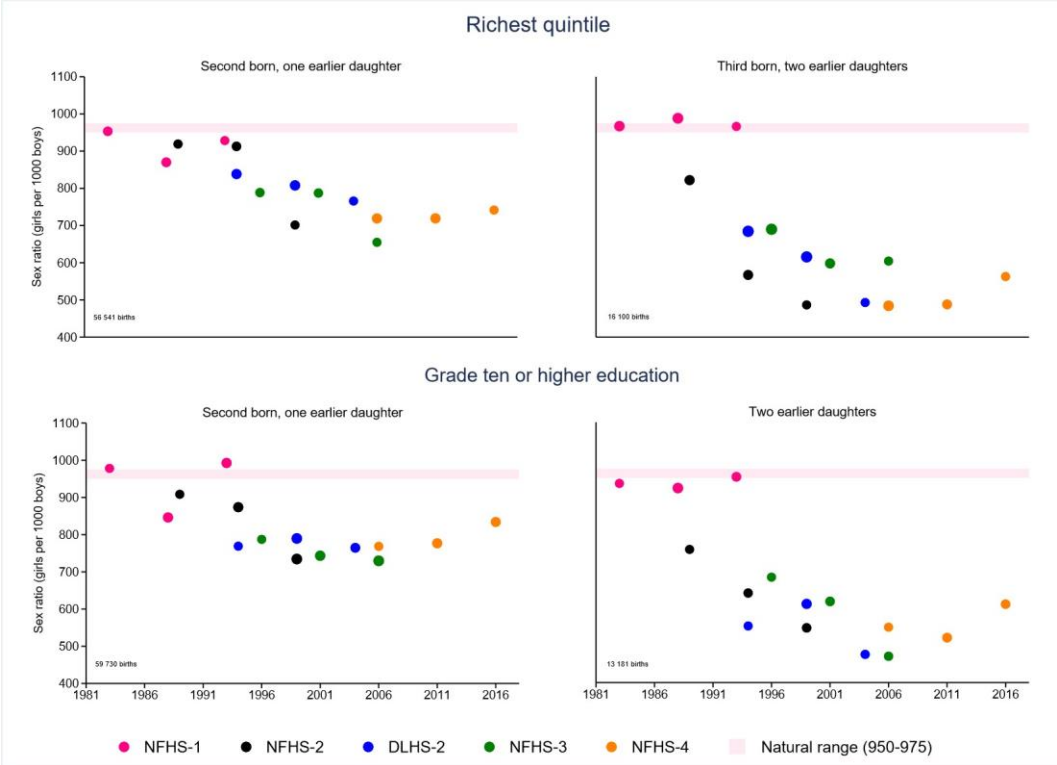
Each year on the horizontal axis represents the last of each five-year group.

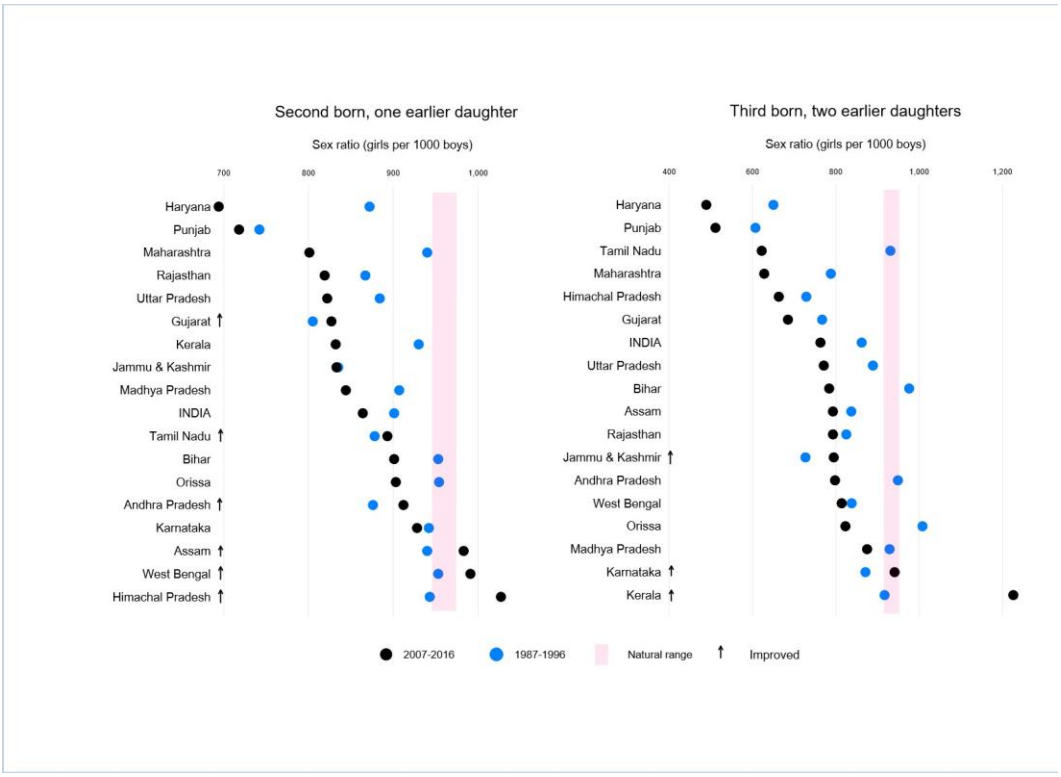
Figure 5: Change in conditional sex ratio (girls per 1000 boys) for second or third born with one or two earlier daughters in India and bigger states in 1987-1996 (orange circle) and 2007-2016 (blue circle)

The upward arrow represents states which showed an improvement in selective abortion of girls. The remainder showed a worsening in selective abortion of girls.


Missing girls (Millions)
6
5
4
3
2
1
0
0.8
1.2
1.8
0.6
1.6
1.3
3.5
4.5
5.5
Second Born girls, one earlier daughter
Third Born girls, two earlier daughters
All girls
1987-1996
1997-2006
2007-2016


1981 - 2016: Second or third born, one or two earlier daughters
Fewer girls
More girls
Conditional sex ratio (girls per 1000 boys)


Richest quintile
Second born, one earlier daughter
Third born, two earlier daughters
Sex ratio (girls per 1000 boys)
56 541 births
16 100 births
Grade ten or higher education
Second born, one earlier daughter
Two earlier daughters
59 730 births
13 181 births
1100
1000
900
800
700
600
500
400
1981
1986
1991
1996
2001
2006
2011
2016
NFHS-1
NFHS-2
DLHS-2
NFHS-3
NFHS-4
Natural range (950-975)


Second born, one earlier daughter
Sex ratio (girls per 1000 boys)
700
800
900
1,000
Haryana
Punjab
Maharashtra
Rajasthan
Uttar Pradesh
Gujarat ↑
Kerala
Jammu & Kashmir
Madhya Pradesh
INDIA
Tamil Nadu ↑
Bihar
Orissa
Andhra Pradesh ↑
Karnataka
Assam ↑
West Bengal ↑
Himachal Pradesh ↑
Third born, two earlier daughters
Sex ratio (girls per 1000 boys)
400
600
800
1,000
1,200
Haryana
Punjab
Tamil Nadu
Maharashtra
Himachal Pradesh
Gujarat
INDIA
Uttar Pradesh
Bihar
Assam
Rajasthan
Jammu & Kashmir ↑
Andhra Pradesh
West Bengal
Orissa
Madhya Pradesh
Karnataka ↑
Kerala ↑
2007-2016
1987-1996
Natural range
↑ Improved


Richest quintile
Second born, one earlier daughter
Third born, two earlier daughters
1100
1000
900
800
per 1000 boys)