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Trends in selective abortion of female foetuses in India: analysis of nationally representative birth histories from 1990–2005 and census data from 1991–2011

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Summary

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Author Contributions JKB was the Registrar General of India responsible for implementing and publishing the 2001 census. PJ and the academic partners in India (RGI-CGHR Collaborators) planned the Million Death Study in close collaboration with the Office of the Registrar General of India. MAK and PJ did the statistical analyses. All authors were involved with data interpretation, critical revisions of the paper, and approved the final version; PJ is its guarantor.

Conflicts of interest We declare that we have no conflicts of interest.

Background—India's 2011 census revealed a growing imbalance between the numbers of girls and boys at ages 0–6 years, which we hypothesise is due to increased prenatal sex determination followed by selective abortion of female foetuses.

Methods—We examined sex ratios by birth order among 0.25 million births in three rounds of the nationally-representative National Family Health Survey covering the period from 1990 to 2005. We estimated totals of selective female abortion by examining the birth cohorts of children aged 0–6 years in the 1991, 2001 and 2011 censuses.

Findings—The conditional sex ratio for second order births when the firstborn was a girl fell from 906 per 1000 boys in 1990 (99%CI 798–1013) to 836 in 2005 (99%CI 733–939); an annual decline of 0.5% (p for trend=0·001). Declines were much greater in mothers with 10 or more years of education than in illiterate mothers, and in wealthier households compared to poorer households. In contrast, no significant declines were noted in the sex ratio for second order births if the firstborn was a male, or for firstborns. Between the 2001 and 2011 censuses, more than twice the number of Indian districts (local administrative areas) showed declines in the child sex ratio as districts showing no change or increases. After adjusting for excess mortality rates in girls, the estimated number of selective female abortions rose from 0 to 2.0 million in the 1980s, 1.2 to 4.1 million in the 1990s, and 3.1 to 6.0 in the 2000s. Each 1% decline in child sex ratio at ages 0–6 years implied 1.2 to 3.6 million more selective female abortions. Selective female abortions totalled about 4.2 to 12.1 million from 1980–2010, with a greater rate of increase in the 1990s than in the 2000s.

Interpretation—Selective abortion of female foetuses, especially for pregnancies following a firstborn girl, has increased substantially in India. Most of India's population now live in states where selective female abortion is common.

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Introduction

The 2011 Indian census revealed about 7.1 million fewer girls than boys aged 0–6 years, a notable increase in the gap of 6.0 million fewer girls recorded in the 2001 census and the gap of 4.2 million fewer girls recorded in the 1991 census.[1] The overall child sex ratio of girls per 1000 boys at ages 0–6 years fell by 1.9% in the decade starting in 1991 (945 to 927) and by 1.4% in the decade starting in 2001 (927 to 914). More girls than boys die at ages 1–59 months, but this is mostly offset by more boys dying than girls in the first month of life.[2] The most plausible explanation for the "missing" girls in the 2011 census is prenatal sex determination followed by selective abortion of female foetuses. In most high-income countries, only slightly more boys than girls are born, with observed sex ratios at birth of 950 to 975 girls per 1000 boys.[3–5] This sex ratio varies little by birth order, or by the gender of previous births.[6, 7] In contrast, in India, the sex ratio for the second birth, when the firstborn is a girl, is much lower than if the firstborn is a boy.[8, 9]

The average number of children per Indian woman fell from 3.8 in 1990 to 2.6 in 2008[10] and households continue to prefer a son over a daughter (web table 1).11 Foetal ultrasound has become more available over the last decade. However, it remains uncertain to what extent ultrasound is being used to monitor foetal health, or for sex determination followed by selective abortion of female foetuses.[12, 13]

In this report, we examine the trends in sex ratio by birth order from 1990 to 2005 using three nationally-representative surveys and examine how any changes might have varied by education or wealth. We further examine cohorts of children from the 1991 to 2011 censuses to estimate the absolute numbers of selective abortions in the last three decades.

Methods

Survey Population

We derived annual birth histories and child mortality rates for 1990 to 2005 from three rounds of the National Family Health Survey (NFHS), a large-scale, nationally representative survey of rural and urban Indian households.[11, 14, 15] The NFHS-1, conducted in 1992–93, interviewed 89 777 ever-married women aged 13–49 in 25 Indian states. Sample selection for the NFHS-1 in rural areas used the 1981 census, with the exception of Assam, Delhi, and Punjab, which used the 1991 census. Urban sampling for the NFHS-1 used the 1991 census. The NFHS-2, conducted in 1998–99, interviewed 89 199 ever-married women aged 15–49 in 26 Indian states and used the same sampling as NFHS-1. The NFHS-3, conducted in 2005–06, interviewed 124 385 women aged 15–49 in 29 states. Both rural and urban areas used the 2001 census for sample selection. Details of the NFHS sampling strategy and other methodological details, including the generally high completeness of birth histories have been published.[11, 14, 15]

The Indian census is a complete enumeration of all living persons in the country, regardless of nationality, and was conducted over a three week period in February of 1991, 2001 and 2011. After a detailed house listing procedure, over two million trained surveyors enumerated all individuals in each home and on the street (for the homeless). Full details on census procedures,[1] and completeness (for the 2001 census),[16] are published. Provisional 2011 census results were used. The 2001 provisional and final totals differed only by 0.17%.[16]

Procedures

Female interviewers obtained a complete birth history from every woman surveyed in each NFHS, including the date of birth, gender, birth order, and mortality for all of her children, as well as her religion and education level. We used principal component analysis to create state-specific wealth quintiles based on the assets available in the household for rural and urban areas in each state (data not shown). The census enumerates the date of birth for each person; usually by interviewing the head of the household. Strict field instructions aimed to enumerate girls and boys equally and to minimise age misclassification.[17]

Statistical analysis

Overall sex ratios at birth are less reliable to estimate selective abortions as they might mask conditional sex ratios at higher order births.[8, 9] The trends in overall sex ratio at birth was around 900 girls per 1000 boys for much of the period from 2001 to 2008 (web table 2).[10] Thus, the main statistic presented is the conditional sex ratio of second order births following a firstborn girl. The sex ratio was calculated as the total number of female births per 1000 male births (Pf/(1-Pf)*1000); where Pf is the proportion of female to total births (N)). A natural variation of sex ratio is taken as 950 to 975 girls per 1000 boys, based on ranges reported in most high income countries where social pressures for fewer females do not exist.[3–7] The NFHS-1, NFHS-2 and NFHS-3 surveys included information about births during the periods from 1990–1992, 1990–1998, and 1995–2005, respectively. A weighted average of two data points was used for overlapping years. The results for sex-ratios weighted and un-weighted for sampling probability were similar (data not shown), and only the latter are presented. The Delta method was used to calculate 99% confidence intervals, with a variance of Pf/(N*(1-Pf)).[18] Three-year rolling averages were used to test for trends, with differences between trends compared by linear regression.

The absolute totals of missing girls were estimated from the seven years of children at ages 0–6 years in the 1991, 2001 and 2011 censuses (corresponding to children born in 1984–

1990, 1994–2000, and 2004–2010, respectively). For each of these 21 cohort years, we calculated the expected number of girls using a sex ratio at birth of 950 to 975 girls per 1000 boys.[3–5] Girls at ages 0–4 years have higher mortality rates than boys per birth and these girl/boy relative risks have widened over time, even though child mortality has fallen sharply (web table 3).[11] However, because more boys than girls were born every year, the absolute number of annual boy deaths exceeded the absolute number of girl deaths through most of the 1990s. We adjusted for the extra girl deaths at ages 0–6 years that would be expected had more girls been born. The estimate of excess girl deaths was based on annual infant mortality rates for girls and boys at ages 0–1 years from the United Nations.[19] Yearly infant mortality rates were combined with a constant proportionate age- and gender-specific mortality at ages 2–6 years, as derived from a nationally representative mortality survey in 2001–2003.[2] We excluded emigration, as net migration at all ages from India is less than 0.2% of the population.[20] All analyses were conducted in STATA (version 10.0).

Role of the funding source

The study was funded by the US National Institutes of Health, International Development Research Centre, Canadian Institutes of Health Research, and the Li Ka Shing Knowledge Institute. The funding sources had no role in the study design, conduct, data collection, analysis, or interpretation. PJ had full access to all data and final responsibility for the decision to submit for publication on behalf of all authors.

Results

A total of 265 516 births histories were analysed: 35 530 births from 1990–1992 (NFHS-1), 108 550 births from 1990–1998 (NFHS-2), and 121 436 births from 1995–2005 (NFHS-3). A total of 78 449 firstborns, 70 321 second order births, and 48 243 third order births were recorded.

The conditional sex ratio for second order births, if the firstborn was a girl, fell from 906 in 1990 (99%CI 798–1013) to 836 in 2005 (99%CI 733–939), at an annual average decline of 0.52% (p-value for trend=0.002; table 1 and figure 1). The sex ratio for third order births, if the two previous births were girls, was even lower, but the declines between 1990 and 2005 were not statistically significant (p-value=0.18; data not shown). This is partly due to the smaller absolute numbers of births than for first or second order births. The sex ratio for any firstborns or for second order births if the firstborn was a boy did not change between 1990 and 2005 (p-values for trends=0.70 and 0.023, respectively), staying near the natural range of 950–975 girls per 1000 boys. The overall sex ratio for any births, regardless of birth order did not change significantly between 1990 and 2005 (both at 942 girls per 1000 boys; p-value for trend=0.15), which was slightly higher than that reported by the Registrar General of India (web table 2).[10] The conditional sex ratio of the second order births if the firstborn was a girl or a boy differed significantly (p-value for test for differences <0.001).

The conditional sex ratio for second order births if the firstborn was a girl fell for mothers with grade 10 education or higher (figure 2A), but was unchanged in illiterate women (p-value for test for differences=0.002). The conditional sex ratios fell sharply among the 20% of the richest households in contrast to a non-significant increase among the 20% poorest households (p-value for test for differences <0.001; figure 2B). Declines in the conditional sex ratio were similar between rural and urban areas, although sex ratios were lower in urban areas, and declines did not differ between Hindu and Muslim households (data not shown).

Figure 3 shows the changes in the child sex ratios at ages 0–6 years between 2001 and 2011 censuses (web figure 1) among the 513 Indian districts (local administrative areas within each state) common to both censuses and reporting data as of April 29, 2011. Seventy-two percent (369) of districts showed any declines in the child sex ratio, and 49% (251) had declines greater than the national average decline 1.4%. Only 28% (143) of districts showed no change or increases in the child sex ratio.

Estimates of the contribution of selective female abortions to the 1991, 2001 and 2011 census cohorts of living children are provided in table 2. In the hypothetical case of no selective female abortion and equal death rates for boys and girls, the expected imbalance in the child sex ratio at ages 0–6 years would be much smaller than that observed. However, some imbalance would remain as the natural range of sex ratios at birth is 950 to 975 girls per 1000 boys.[3–5] After adjusting these natural sex ratios at birth and for the excess female deaths (arising from more girls being born), selective abortion of female foetuses likely accounts for most, if not all, of the remaining gap between observed and expected girls aged 0–6 years.

This estimated annual total of selective female abortions rose from 0–0.20 million, to 0.12–0.41 million, and to 0.31–0.60 million in the 1991, 2001 and 2011 censuses, respectively. Therefore the total number of selective female abortions rose from 0 to 2.0 million (average 1.0 million) in the 1980s, to 1.2 to 4.1 million (average 2.6 million) in the 1990s, and to 3.1 to 6.0 million (average 4.5 million) in the 2000s. At 2010 birth rates and child mortality rates, every 1% drop in the child sex ratio at ages 0–6 years implied about 1.2 to 3.6 million additional selective abortions. Overall, between 4.2 to 12.1 million selective female abortions occurred from 1980–2010.

Discussion

Our analyses find that selective female abortion in India has grown in the last two decades and accounts for most of the large and growing imbalance between the number of girls to boys at ages 0–6 years. Sex ratios for births that followed a firstborn girl fell sharply from 1990 to 2005, even though sex ratios for all births (regardless of birth order) did not. Increases in selective female abortion are likely due to persistent son preference[11] combined with decreases in fertility: third or higher order births as a proportion of all births fell from 49% in 1990 to 38% in 2005 in our study (and to 32% in 2008[10]; web table 2). Son preference varies little by education or income[11], but selective female abortion is more common among educated or richer households, presumably because they can afford ultrasound and abortion services more readily than uneducated or poorer households. Recent increases in literacy[1] and Indian per capita income[20] might have thus contributed to increased selective female abortion.

While large in absolute terms, selective abortion of female foetuses still accounts for only a minority of all annual female pregnancies (about 2–4%, or roughly 0.3–0.6 million, of the expected number of 13.3–13.7 million pregnancies in 2010 carrying a girl). Women with a first or second order girl are most clearly at risk of aborting subsequent female foetuses. We did not yet see any clear evidence of selective abortion of firstborn female foetuses. This is partly because India does not enforce a one-child policy, which led to the selective abortion of firstborn female foetuses in China.[21] However, selective abortions of first-order females might increase if fertility drops further, particularly in urban areas.

Although our birth data were only until 2005, a district-based household survey from 2005–2007 found similar conditional sex ratios for births following a firstborn female.[22] Thus, selective abortion remains common among the most recent cohorts of children captured in the 2011 census. Figure 4 shows a remarkable shift in the population living in states where the child sex ratios at ages 0–6 are below 915 girls per 1000 boys; rising from 10% in 1991, to 27% in 2001 and 56% in 2011. Thus, we conclude that most of India's population now lives in states where selective female abortion is commonly practiced.

The Indian government implemented a Pre-Natal Diagnostic Techniques (PNDT) Act in 1996 to prevent the misuse of techniques for the purpose of prenatal sex determination leading to selective female abortion.[23] It is unlikely that this Act has been effective nationally as few health providers have been charged or convicted.[24] This is not surprising given that most primary care occurs with unregulated private providers.[25] More than twice the number of districts showed declines in the child sex ratio between 2001 and 2011 censuses compared to the number of districts showing no change or increases in child sex ratio. However, the 170% rate of increase in selective female abortions from the 2000s to the 2010s is slower than the 260% rate of increase from the 1990s to the 2000s. Indeed, the 2011 census noted the child sex ratios at ages 0–6 years had increased somewhat in the states of Haryana and Punjab, and had stabilised in Gujarat[1], as seen in district-level analyses (figure 3) of the same data. It might be that the PNDT Act, plus the recent public attention to selective female abortion, has reduced the practice in some settings. Our results are consistent with reports that ultrasound and abortions are far more common in second and third order births than in firstborns.[26, 27] However, our method based on conditional birth histories is unlikely to be biased by misreporting of ultrasound use.[26]

Our study has some limitations. First, the sex ratios in the NFHS are based on birth histories, which vary considerably from year to year. This is in part due to random variation from only a few hundred or thousand births, as well as possible systematic under-enumeration of girls and recall biases for birth histories in retrospective surveys.[11, 28] However, our key analysis was of trends, where the yearly variation is less important. We therefore relied on actual enumerated children in the censuses to calculate absolute totals of missing girls rather than the NFHS birth histories. The census omission rates are small, and do not vary greatly by gender,[16] which might have otherwise resulted in spurious sex ratios. Second, our annual estimates of selective female abortions relying on the census are, by necessity, quite crude. The current study estimates are notably more conservative than those estimated from birth histories in the Sample Registration System (SRS; a large, continuous, nationally representative demographic survey of over 1 million homes).[10] Specifically, SRS-based estimates of annual selective female abortions were 0.59–0.74 million in 1997[8] and 0.48–0.67 million during 2001–2003[9] (web table 4). However, the 4–12 million estimate of selective female abortions from 1980–2010 is consistent with our earlier (cruder) estimate of about 10 million selective female abortions from 1985–2005[8], as well as Kulkarni's estimate of 8 to 18 million selective female abortions from 1981–2006.[29] Third, the exact contribution of selective female abortion to the measured gender imbalance at ages 0–6 years in the censuses also depends on child mortality rates. However, only in recent years did slightly more girls die compared to boys[2], and we adjusted our estimates for higher girl mortality had more girls been born. Fourth, the sex ratio range at birth of 950 to 975 girls per 1000 boys is based on observations in Europe and North America, and might not apply to Asian populations for unknown biological reasons.[30] However, such sex ratios at birth were documented in some Indian states as recently as 1991.[1] While unmeasured factors might reduce or increase overall sex ratios at birth, they are unlikely to be conditional on birth order.[5] Finally, we found in this study, as in earlier reports[8,9] and in unpublished data on birth histories in Indian diasporas (data not shown), a small and currently inexplicable excess of third girls following the birth of two earlier boys.

In sum, selective abortion of female foetuses, usually following a firstborn girl, has increased in India over the last few decades, and has contributed to a widening imbalance in the child sex ratio. Reliable monitoring and reporting of sex ratios by birth order in each of

India's districts is a reasonable part of any efforts to curb the remarkable growth of selective female abortions.

Panel: Research in context

Systematic review

In a systematic review with the search terms “female” [All Fields] AND “abortion” [All Fields] AND “trends” [All Fields] AND “India” [All Fields], we identified 35 studies, of which 22 were published after 1990. Only one, a small hospital-based study in Gujarat noted an increase in abortions from 1983 to 2003.[31] No studies were available that provided nationally representative data for India.

Interpretation

This study is the first to examine trends in selective female abortion in India at the national level using nationally representative data. The sex ratios of second order births following firstborn girls are compared to the second order sex ratios following firstborn boys. The study notes a sharp decline in the girl-to-boy sex ratio for second order births when the firstborn was a girl, falling an average of about 0.5% annually between 1990–2005. These declines are greater in educated and in richer households than in illiterate and poorer households. As family size in India has fallen substantially, it appears that selective female abortion is increasingly being used for second or higher order births if the firstborn was a girl, in order to ensure at least one boy in the household. The comparisons of the 1991, 2001 and 2011 Indian censuses suggest that the estimated number of selective female abortions rose from 0 to 2.0 million in the 1980s, to 1.2 to 4.1 million in the 1990s, to 3.1 to 6.0 million in the 2000s. Each 1% decline in girl-to-boy sex ratio at ages 0–6 years translates to 1.2 to 3.6 million more selective female abortions. The total of about 4 to 12 million selective female abortions from 1980–2010 is consistent with other estimates using other methods. The data also suggest that selective abortion has spread from a handful of states to most parts of the country. Thus, most of India's population now live in states where selective female abortion is common.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The Registrar-General of India first established the ongoing national census in 1881, and is currently collaborating with several of the authors on the Million Death Study (full list of authors at http://www.bmj.com/cgi/data/bmj.c621/DC1/1. External funding is from the Fogarty International Centre of the US National Institutes of Health (grant R01 TW05991–01]), International Development Research Centre (grant 102172), Canadian Institute of Health Research (CIHR; IEG-53506), and the Li Ka Shing Knowledge Institute and Keenan Research Centre at St. Michael's Hospital and University of Toronto (CGHR support). PJ is supported by the Canada Research Chair program. The opinions expressed here are those of the authors and do not necessarily represent those of the Government of India. We thank Rahim Moineddin and Wilson Suraweera for statistical help, Vicky Hsiao and Brendon Pezzack for graphics, and Daniel Rosenblum and Ansely Wong for comments.

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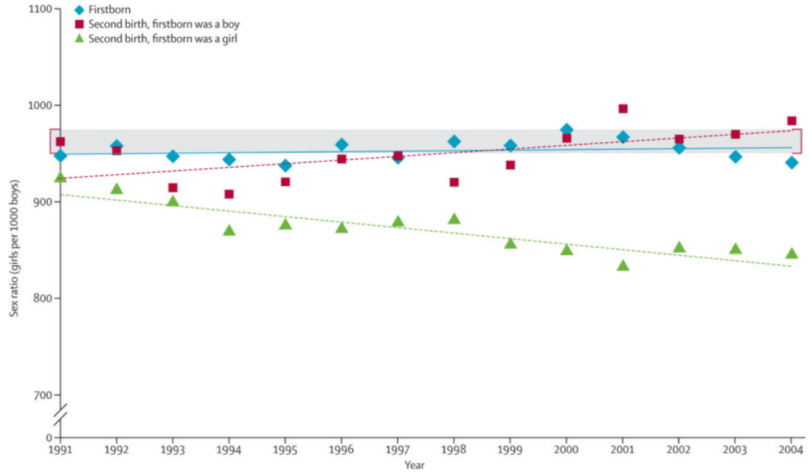

Figure 1. Sex ratio (girls per 1000 boys) of firstborn and second order births, conditional on sex of firstborn, from 1990–2005, in India

*Red brackets indicate the natural sex ratio range of 950 to 975 girls per 1000 boys.

Tests for trend: any firstborn, p=0.152; second birth, firstborn was girl, p=0.002; second birth, firstborn was boy, p=0.023.

The numbers of births for each figure are provided in web table 5.

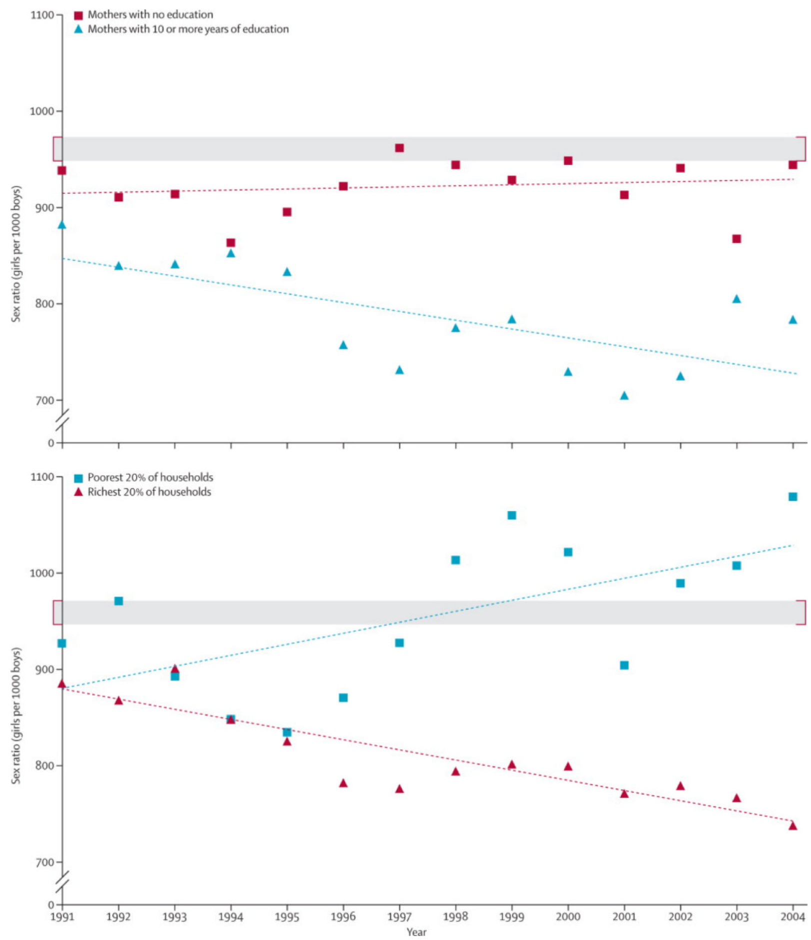

Figure 2. Sex ratio (girls per 1000 boys) of second order births, if firstborn was a girl, by mother's level of education and household wealth index, from 1990–2005, in India

* Red brackets indicate the natural sex ratio range of 950 to 975 girls per 1000 boys. Test for trend: illiterate, p=0.347; grade 10 or higher, p=0.014; poorest 20%, p=0.026; richest 20%, p=0.002.

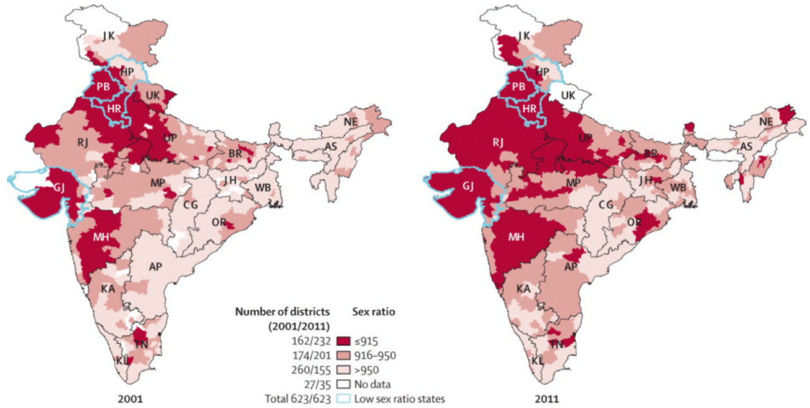

Figure 3. Relative changes (in percent) in the child sex ratio of girls to boys at ages 0–6, between 2001 and 2011, for the districts of India

Average national decline from 2001–2011 (including the 110 districts whose data are not shown here) was 1.4%. Mean values among the 513 reporting districts were as follows: mean decline=−3.1% among the 251 districts showing declines greater than the national average; mean decline=−0.7% among the 119 districts showing declines less than the national average; and mean increase=2.4% among the 143 districts showing no change or increases.

*The yellow highlighted states are Gujarat, Haryana, Himachal Pradesh, and Punjab, which have shown consistently lower child sex ratios at ages 0–6 years in the last three censuses.[1]

State names: Andhra Pradesh (AP); Assam (AS); Bihar (BR); Chattisgarh (CG); Gujarat (GJ); Haryana (HR); Himachal Pradesh (HP); Jammu & Kashmir (JK); Jharkhand (JH); Karnataka (KA); Kerala (KL); Maharashtra (MH); Orissa (OR); Punjab (PB); Rajasthan (RJ); Tamil Nadu (TN); Uttarakhand (UK); Uttar Pradesh (UP); West Bengal (WB); and Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura (collectively NE).

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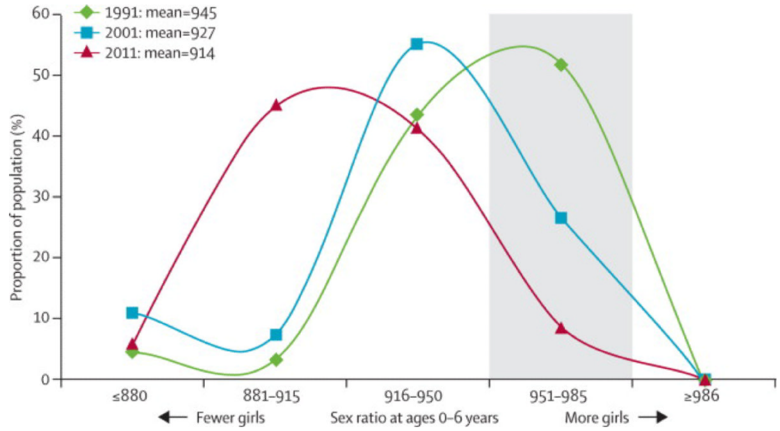

Figure 4. Distribution of the total population living in states with varying child sex ratios (girls per 1000 boys at ages 0–6 years), 1991, 2001 and 2011, in India

Mean national values for each of the censuses are shown. The vertical grey bar represents a natural sex ratio at birth of 950 to 975 girls per 1000 boys, where the distribution of child sex ratios at ages 0–6 years would be centred in the hypothetical absence of selective female abortion and equal girl and boy child mortality rates.

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
901 (828–973)	958 (880–1035)	958 (878–1037)	963 (885–1041)	919 (846–992)	1010 (929–1092)	950 (874–1026)	966 (888–1044)	987 (906–1067)	917 (842–992)	939 (862–1015)	966 (889–1042)
899 (796–1002)	897 (789–1004)	973 (854–1091)	968 (852–1083)	907 (801–1013)	887 (778–996)	1031 (905–1156)	988 (863–1113)	972 (853–1091)	938 (822–1053)	1003 (879–1126)	1013 (891–1136)
873 (773–972)	862 (758–966)	891 (780–1003)	861 (756–967)	881 (775–988)	899 (789–1008)	786 (689–884)	863 (753–974)	851 (744–957)	840 (737–943)	858 (751–964)	836 (733–939)
1079 (886–1292)	1083 (864–1302)	952 (749–1154)	1032 (881–1253)	1051 (819–1282)	1046 (826–1266)	1026 (805–1247)	995 (757–1233)	883 (672–1095)	867 (653–1082)	1000 (756–1244)	895 (667–1123)
820 (665–975)	847 (680–1013)	820 (649–991)	776 (623–929)	874 (702–1047)	908 (727–1089)	875 (702–1048)	717 (560–873)	887 (700–1074)	699 (548–850)	877 (690–1065)	768 (606–930)
960 (831–1089)	870 (746–994)	900 (763–1037)	918 (782–1054)	942 (805–1079)	908 (774–1042)	1015 (860–1171)	811 (675–946)	909 (762–1057)	960 (805–1116)	809 (671–948)	990 (822–1157)
986 (907–1064)	926 (848–1004)	971 (885–1058)	925 (843–1007)	903 (825–980)	924 (848–1001)	923 (842–1003)	894 (812–976)	932 (846–1017)	914 (829–998)	881 (793–970)	970 (876–1065)
927 (889–966)	919 (879–959)	942 (899–984)	928 (887–969)	913 (873–952)	943 (902–984)	934 (893–975)	912 (870–954)	936 (894–979)	898 (856–939)	911 (868–954)	942 (899–986)

ears 1995–1998 used average of NFHS 2 and 3; Years 1999–2005 used NFHS 3.

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Table 2

Estimates of annual and decennial gap in girls to boys at ages 0–6 in India due to selective abortion of female foetuses, in millions

Cohorts by birth year (census period)	Actual gap in girls-boys at ages 0–6 years (*ratio of girls per 1000 boys*)	Gap in girls-boys with the natural sex ratio at birth adjusted for higher girl mortality* Low (950)	High (975)	Estimated annual no. selective female abortions Low/High	Actual no. children surveyed in each census Total/Boys/Girls
Born 1984–1990 (1991 census)	4.23 (*945*)	0	1.38	0 / 0.20	150.41/77.32/73.09
Born 1994–2000 (2001 census)	5.96 (*927*)	0.81	2.86	0.12/0.41	157.86/81.91/75.95
Born 2004–2010 (2011 census)	7.11 (*914*)	2.14	4.20	0.31/ 0.60	158.79/82.95/75.84
		Decennial estimates of selective female abortions +			
		Low	High	Average	
1981–1990 Subtotals		0	1.97	0.98	
1991–2000 Subtotals		1.15	4.08	2.62	
2001–2010 Subtotals		3.06	6.00	4.53	
30-year totals		**4.21**	**12.04**	**8.13**	

* These hypothetical natural ranges of sex ratios at birth are adjusted for the number of excess girl deaths at ages 0–6 that would have resulted with a higher number of girls born (the excess of girl deaths based on annual infant mortality rates calibrated to the ratio of deaths at older ages were [in millions], 0.42, 0.67, 0.59 for a sex ratio of 950 for the 1991, 2001 and 2011 censuses, respectively, and 0.67, 0.88, 0.75 for a sex ratio of 975 for the 1991, 2001 and 2011 censuses, respectively). These effectively alter the sex ratio of 950 and 975 per 1000 girls at birth to about 933 and 968 per 1000 girls at ages 0–6 years.

\+ Based on sex ratios at birth of 950 and 975 girls per 1000 boys, adjusted for excess mortality in girls.