Fertility Decline and Increased Manifestation of Sex Bias in India

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Population Studies, Vol. 51, No. 3. (Nov., 1997), pp. 307-315.

Stable URL:
http://links.jstor.org/sici?sici=0032-4728%28199711%2951%3A3%3C307%3AFDAIMO%3E2.0.CO%3B2-H

Population Studies is currently published by Population Investigation Committee.

Population Studies, **51**, (1997), 307–315
Printed in Great Britain

Fertility decline and increased manifestation of sex bias in India

MONICA DAS GUPTA AND P. N. MARI BHAT

1. INTRODUCTION

One consequence of fertility decline in East Asian countries, such as South Korea and China, has been a steep rise in the sex ratio at birth. This suggests that fertility decline in societies characterized by strong son preference may be accompanied by increased manifestation of sex bias as reflected in excess mortality of girls. Similar trends may be found in India, especially its northern region. Fertility in India has been falling: between 1981 and 1991 Total Fertility declined from 4.5 to 3.6 (Registrar General of India 1970–75, 1979–81, 1990, and 1991).

In this paper we explore the relations between fertility decline and the net manifestation of sex bias, as well as evidence that this bias has increased in India. We begin by considering two countervailing ways in which fertility decline could affect the excess mortality of girls, that is mortality over and above that which would be expected given a normal sex ratio of deaths.[1] A fall in the proportion of higher-order births tends to reduce excess child mortality of girls, whilst increased mortality at any given birth order increases it. We use empirical examples to show the independent and combined effects of these factors on sex differences in survival. We continue by estimating the *additional* number of girls who went 'missing' between 1981 and 1991 as a result of increase in the excess mortality of girls, and the extent to which this increase can be attributed to sex-selective abortion or unreported infanticide, as opposed to excess mortality after birth. Finally, we examine whether regional patterns in sex bias have changed, in view of sharp regional differentials in the pace of fertility decline.

2. THE EFFECT OF FERTILITY DECLINE ON EXCESS MORTALITY OF GIRLS

In societies in which there is no particular preference for children of one sex, we would not expect to find bias, whether or not fertility has declined. Even in societies with strong son-preference it is not immediately obvious how declining fertility would alter discrimination against girls. Two effects may be operating – a 'parity' effect which leads to a reduction of sex bias, and an 'intensification effect' which increases it.

The 'parity' effect is based on the observation from studies in South Asia that excess mortality of girls was concentrated in higher parities (Das Gupta 1987; Muhuri and Preston 1991; Pebley and Amin 1991). Therefore, as fertility declines and the proportion of births of higher parity decreases, the excess mortality of girls will also fall (Figure 1).

The 'intensification' effect is based on the observation from studies in China and South Korea that excess mortality of girls at a given parity has become more pronounced as total fertility has fallen, because parents discriminate more at each parity (Hull 1990; Zeng Yi *et al.* 1993).

The explanation for this 'intensification' effect hinges on the view that when fertility declines, the total number of children couples desire falls more rapidly than the total number of desired sons. The differences in speed of these two trajectories narrows the space left for daughters, and results in greater pressure to remove girls. This seems to have been the case in India during the 1980s, when Total Fertility fell by 20 per cent (Registrar General of India 1981 and 1991), whilst the number of sons desired by women who did not have any fell by only 7.4 per cent (Operations Research Group 1980 and 1988). This suggests that willingness to raise daughters decreased during this period of fertility decline. A study in Punjab has also shown that while educated women desire smaller families, their desired number of sons fell by only 20 per cent compared with a 35 per cent reduction in the number of daughters desired (Das Gupta 1987).

Factors associated with a more rapid fertility decline, such as increases in women's education, do not themselves increase the likelihood of discriminating against daughters. On the contrary, they may well reduce this likelihood. If we find that mothers' education is associated with an increased risk of their daughters' mortality relative to sons, the reason may simply be that educated women's families are smaller. Whether or not excess mortality of girls will rise will depend on the net

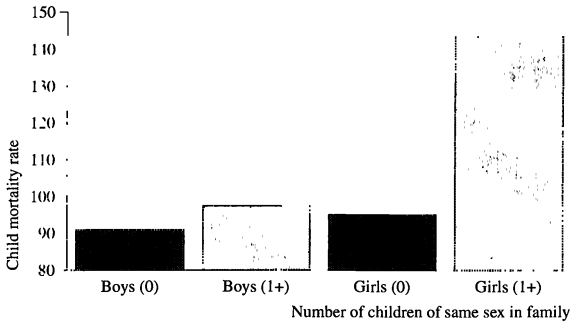

Figure 1. Sex differentials in child mortality by parity, rural Punjab (women aged 15–59).
Source: Based on Das Gupta 1987: table 4.

outcome of the offsetting effects of changes in family size and parity-specific intensification. This is pertinent to the useful analysis by Murthi *et al.* (1995)[2] of women's education and sex bias, as they argue against the possibility that women's education may increase sex bias.

The interaction of these effects

The actual magnitude of the sex differential in survival in a population is the result of a mixture of these mutually offsetting forces. Thus the net effect of declining fertility on sex differentials in child mortality cannot be predicted easily. To illustrate how the 'parity' and 'intensification' effects counterbalance each other, we have modelled these effects using data from India. We apply the parity-specific child mortality rates of the Khanna re-Study villages in Punjab[3] to the fertility levels of India in 1991 (moderate fertility) and Kerala 1991 (low fertility). The different fertility levels represent different distributions of births by parity. Two sets of parity-specific child mortality rates (at ages 0–4) are used, derived from the empirically observed rates in Khanna: (1) from the overall sample of mothers in Khanna and (2) from the mothers with three or fewer children. The parity-specific child mortality rates by sex of the mothers with small completed family size is used as an example of intensified gender bias.[4]

To look at the pure effect of the change in the distribution of births by parity, we varied the level of fertility and kept the sex bias unchanged (Table 1). The reduction in fertility brings excess mortality of women down from 9 per cent to zero. To look at the effect of intensified discrimination combined with the parity effect, we kept fertility constant at a low level, and varied the sex bias in mortality. The intensified sex bias raises the excess mortality of females from zero to 25 per cent. It is clear that

Table 1. *Effects of birth order changes and intensification on excess female mortality*

Fertility level	Sex difference in mortality	M/F child mortality	% Excess female mortality
Moderate fertility, moderate gender bias:			
India 1991 (TF = 3.6)	Khanna, all women	0.91	9
Low fertility, moderate gender bias:			
Kerala 1991 (TF = 1.8)	Khanna, all women	1.00	0
Low fertility, intensified gender bias:			
Kerala 1991 (TF = 1.8)	Khanna, low fertility women	0.75	25

Note on estimation: The male and female child mortality rates at each parity, amongst women in the Khanna study villages, were applied to the parity-specific distribution of births in India/Kerala to derive these estimates.

The parity-specific mortality rates are taken from the whole Khanna sample and from the sample with low fertility, as indicated.

Source for total fertility: Sample Registration System 1991.

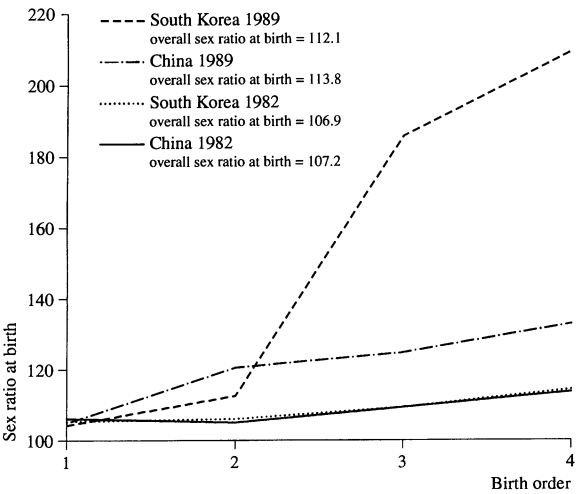

Figure 2. Sex ratio at birth, China and South Korea.
Source: Park and Cho 1995:66

the intensification effect in Khanna outweighs the parity effect: the effect of changes in the distribution of births by parity is outweighed by the effect of intensified sex bias at lower parities.

The interaction of these two offsetting effects can also be seen in the data from China and South Korea (Figure 2). In China the sex ratios at each parity after the first rose between 1982 and 1989, and the overall sex ratio of births rose from 107 to 114. This occurred despite the fact that fertility fell between 1982 and 1989, reducing the proportion of higher-order births. In this case, the 'intensification' effect outweighed the 'parity' effect.

Table 2. *Total fertility 1971–1991, India*

1971	1981	1991	Per cent decline 1971–81	Per cent decline 1981–91
5.2	4.5	3.6	13.46	20.00

Source: Sample Registration System 1970–75, 1981, 1991.

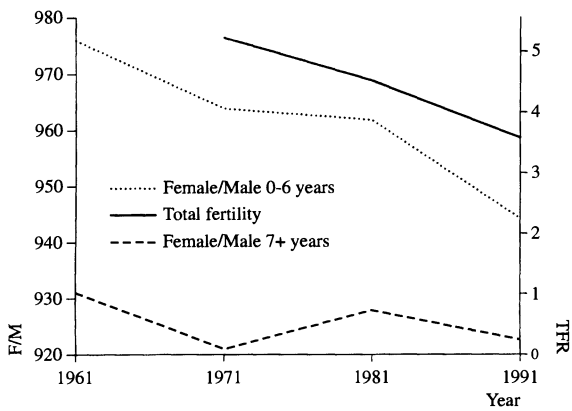

Figure 3. Fertility and sex ratio trends, India 1990–91.
Source: Total fertility, sample registration system 1970–75, 1981, 1991; sex ratios, census of India 1961, 1971, 1981, 1991.
Note: In the 1971 census women were undernumerated, so the sex ratios for that year are artificially low.

When we compare the 1989 data for China and South Korea, we see that sex ratios after the second birth were far higher in South Korea than in China. Yet the overall sex ratio at birth in China, at 114, was higher than that of South Korea at 112. This is because fertility was much lower in South Korea than in China, resulting in a much smaller proportion of births taking place at higher birth orders. Here the 'parity' effect outweighs the 'intensification' effect. If the proportion of births at each birth order had been the same in South Korea as in China in 1989, that is if only the 'intensification' effect was at work without an offsetting 'parity' effect, the overall sex ratio at birth in South Korea in 1989 would have been as high as 124 males per 100 females (Li 1992; Park and Cho 1995).

In both China and South Korea, the 'intensification' effect appears to have outweighed the 'parity' effect so far, so that the sex ratios at birth have risen (Figure 2). That this is also true of India is suggested by the fact that the proportion of boys in the population aged 0 to 6 increased between 1981 and 1991, the period when fertility decline in India was most rapid (Table 2 and Figure 3). The rising sex ratios of children in these countries have focused attention on the increased mortality of girls which has accompanied their fertility decline. It is important to bear in mind that without the countervailing parity effect, the sex ratio would have risen even more sharply.

CHANGES IN THE EXCESS MORTALITY OF GIRLS

The most striking features of the trends in the sex ratios of children in India between 1981 and 1991 is that they have risen in all the States, including those in the South where the sex ratio has been more balanced than in the North (Table 3). However, the regional pattern of trends remains in line with previous patterns of intensity of sex bias. The increase in the sex ratio was most pronounced in the Northern States and least in the Southern. The increase in the North-west is particularly impressive, because sex ratios at the beginning of the period were already the highest in the country.

Estimates of 'missing women' implied by increasing sex ratios

To estimate the number of additional deaths of females indicated by the increasing sex ratio between 1981 and 1991, we applied the sex ratios for 1981 to the population in 1991 to estimate the expected number of females, if the sex ratio had remained the same. We did this separately for the child population (aged 0–6) and for the rest of the population (aged 7+). The results are presented in Table 4.

These estimates are sensitive to changes in levels of enumeration between censuses. When levels of enumeration fall, females tend to be more undercounted than males, as Dyson (1996) has shown. But post-enumeration checks carried out after the Census of 1991 showed that levels of enumeration had not changed since 1981. Dyson, who has looked more closely into levels of enumeration by sex (Dyson 1996), found no evidence of change in enumeration of females in the 1991 Census, except in the State of Bihar. This view is supported by the fact that there is no relationship between the increase in the sex ratio during the first six years of life and that for ages 7 and over in the States (Table 4).

Our calculations indicate that the undercount of females in Bihar is concentrated almost entirely amongst those aged 7+. The estimated proportion 'missing' amongst 0–6 year-old girls in Bihar is in line with that of the other States, while the estimate for the population aged 7+ is completely out of line with the results for other States (Table 4). Excluding Bihar from the estimated proportion of

Table 3. *Trends in sex ratios 1981–91, major states of India (males per 1000 females)*

State	Juvenile sex ratio (ages 0–6) 1981 (1)	1991 (2)	Per cent change 1981–91 (3)
South			
Andhra Pradesh	1008	1027	−1.88
Karnataka	1026	1042	−1.56
Kerala	1031	1044	−1.26
Tamil Nadu	1034	1055	−2.03
North-Centre			
Bihar	1019	1043	−2.36
Madhya Pradesh	1022	1050	−2.74
Rajasthan	1048	1092	−4.20
Uttar Pradesh	1070	1078	−0.75
NorthWest			
Haryana	1109	1138	−2.61
Punjab	1101	1143	−3.81
West			
Gujarat	1056	1078	−2.08
Maharashtra	1046	1057	−1.05
East			
Orissa	1005	1034	−2.89
West Bengal	1019	1034	−1.47
India[a]	1040	1058	−1.73

[a] Excludes Assam and Jammu and Kashmir.
Source: Census of India 1991: 13.

females 'missing' makes little difference to the estimate for girls aged 0–6, but makes a substantial difference to the estimates for those aged 7+.

We can, therefore, have confidence in the estimates of 'missing' girls aged 0–6 in Table 4, which shows that 1.3 million additional girls went additionally 'missing' between 1981 and 1991. However, despite the lack of evidence that these estimates are affected by changes in levels of census enumeration, it is appropriate to be cautious about the precision of intercensal estimates. A cautious view would be that over a million additional girls aged 0–6 went additionally 'missing' during 1981–91.

It should be noted that these estimates refer only to the *additional* numbers who went 'missing' during the decade as a result of a *rise* in excess mortality of females: the sex ratios in 1981 were already very high and indicate that the base level of excess mortality of females in 1981 was already substantial (Sen 1990; Coale 1991).

Of the total of more than 1.8 million 'additional missing females' of all ages (excluding Bihar), more than 61 per cent were children. There has been only a 0.22 per cent increase (again excluding Bihar) in the percentage 'missing' above age 7 (Table 4). In Kerala, Punjab, and West Bengal, the number of females aged 7+ in 1991 actually exceeded the number estimated on the basis of the sex ratios of 1981, which shows an improvement relative to males in survival at these ages. This is consistent with other data which suggest that declining fertility in India has led to a reduction in the excess mortality of adult females, especially at peak reproductive ages, whilst increasing discrimination against female children (Das Gupta and Visaria 1996).

Evidence of sex-selective abortion

There is evidence of a significant volume of sex-selective abortion in India between 1981 and 1991. The evidence includes data on the sex ratio of births, and a comparison between the trends in the sex ratios of children with child death rates.

1. Comparison of Trends in Sex Ratios of Children and Child Death Rates.

Although the sex ratio of children clearly rose between 1981 and 1991 (Figure 3), there is little evidence from the age-specific death rates of children that this was caused by a rise in the mortality of girls relative to that of boys.[5] In the country as a whole the sex ratios of age-specific death rates for children during their first five years of life remained almost constant between 1979–81 and 1990–91 at around 0.91 (Registrar General of India 1979–81, 1990, 1991, 1992). There is no reason to suspect that this can be explained by less complete registration of the deaths of girls. However, this does not mean that the two sets of figures contradict each other. Sex ratios and death rates of children in different parts of the country are in close agreement regarding the magnitude of excess mortality of girls. The imbalance between the age-specific child death rates is greater in States in which the sex ratios of children are higher. The coefficient of correlation between the age-specific child death rates in each State and their sex ratio of children is 0.73 when all the major States are included, and the R^2 is 0.54.[6]

An increase in the sex ratio can be the result not only of a rise in the relative mortality of girls *after birth*, but also of an increase in sex-selective abortion or of an increase in the infanticide of girls, when the child is not reported as either a birth or a death.[7] In trying to establish how much of the change in the sex ratios of children can be attributed to sex-selective abortions as opposed to unreported infanticide, it must be borne in mind that the sex ratios of children in India were increasing before 1981, before the spread of the

Table 4. *Estimates of the numbers of 'missing women' added during 1981–91, major States of India*

State population	Number (in thousands)			Per cent of the population		
Total	Age 0–6	age 7+	Total	Age 0–6	Age 7+	Total
South						
Andhra Pradesh	95	3	98	1.76	0.01	(0.30)
Karnataka	59	19	78	1.60	0.10	(0.35)
Kerala	23	−87	−64	1.24	−0.67	(−0.43)
Tamil Nadu	72	16	88	1.98	0.07	(0.32)
North-Centre						
Bihar	195	1394	1589	2.25	4.29	(3.86)
Madhya Pradesh	173	159	332	2.71	0.62	(1.04)
Rajasthan	173	40	213	4.09	0.24	(1.02)
Uttar Pradesh	105	342	447	0.78	0.66	(0.69)
North West						
Haryana	39	5	44	2.63	0.08	(0.57)
Punjab	58	−88	−30	3.79	−1.11	(−0.32)
West						
Gujarat	69	94	163	2.09	0.56	(0.81)
Maharashtra	68	74	142	1.04	0.23	(0.37)
East						
Orissa	77	86	305	2.94	0.66	(1.05)
West Bengal	85	−302	−217	1.49	−1.12	(−0.67)
India*	1314	2102	3416	1.85	0.65	(0.87)
India (excluding Bihar)	1119	708	1827	1.79	0.22	(0.52)

Source: Based on the Census of India 1991. The sex ratios for 1981 are given in Census of India 1991:13.

* Excluding Assam and Jammu and Kashmir. Note that India includes several States other than the major ones shown here, so the total for India is higher than that for the major States shown here.

Note on the method of estimation

The 1981 sex ratios of the population aged 0–6 and 7+ respectively were applied to the population of 1991, to obtain estimates of the expected number of females in 1991. The actual number of females was then subtracted from the expected number, to obtain an estimate of the number of *additional* women who went missing during the decade 1981–91. This is in addition to those who were already missing in the excessively masculine sex ratios of 1981.

technology for detecting the sex of a fetus (Figure 3). Unfortunately, we have no data at the national level that would enable us to estimate sex differentials in child mortality before 1971, so that we do not know whether this is due to a change in the prevalence of infanticide or of excess mortality in childhood,[8] but the possibility of unreported infanticide of girls cannot be dismissed. Until there is access to sex-selective abortion, parents may be under pressure to resort to infanticide. Improvements in medical technology and in the utilization of medical services can also increase excess mortality of girls by reducing the psychological burden of removing them.

We can derive a very rough estimate of the proportion of excess deaths among girls that result from post-natal as opposed to pre-natal mortality, or unreported infanticide. For the decade 1981–91 we estimate that about 4.2 million excess post-natal deaths occurred amongst girls,[9] which suggests that there were about four excess post-natal deaths for each excess prenatal death among girls. At first it seems outrageous to suggest that between 1981 and 1991 more than a million female fetuses were aborted in India. Yet the total number of births is so large that viewed in this context the estimate becomes less startling. Even if all these additional 'missing' girls were to be attributed to sex-selective abortions, they constitute less than one per cent of the number of girls who would have been born, and less than 0.5 per cent of the total number of births during this decade.[10]

DATA ON THE SEX RATIO AT BIRTH

There is reason to believe that a significant number of sex selective abortions were performed in India. There have been widespread reports of clinics which offer this service in many parts of the country, especially during the second half of the decade. The services offered by these clinics are not restricted to urban residents, but are also available to people living in rural areas where roads and transport services are of reasonable quality. Whilst there are no estimates of the total number of sex-selective abortions performed, reports suggest that the clinics have been doing a brisk trade for several years.

These reports are consistent with information on the sex ratio of births in hospitals from several parts of the country, which was 112.23 during the decade 1981–91 according to the Census of India (1992). Of course, the estimates may overstate the prevalence because women who have access to hospital services for their delivery tend also to have easier access to medical services designed to select the sex of their child.

Community-based data are more representative than hospital-based data for estimating the prevalence of sex-selective abortions. Such data are available from a study conducted in Punjab in which it was found that in 1988 the sex ratio of births in a sample in a rural community was 119.20, and in hospitals 121.80 (Sachar *et al.* 1990). Given the easier access to sex-selection technology in the towns, the small gap between the rural community sample and hospital deliveries reflects the strength of motivation for individuals to abort some of their female children. However, it must be borne in mind that the rural population in the Punjab enjoy easier access to urban facilities than is available in much of the rest of the country, and that Punjab forms part of the region which has historically shown the most extreme sex ratio in India.

Ideally, it should be possible to estimate the extent of sex-selective abortion by looking at the sex ratios at birth for the country as a whole, but the sample registration system publishes only the percentage distribution of births of each sex by parity. This too is recent, and the accuracy of the data on parity has still to be evaluated, so that the data are of only limited use for our objective.

From the data as presented we can calculate the *increase* in the sex ratio at birth as parity increases, but we do not know the sex ratio for all births. We have therefore assumed a sex ratio of 106 for first births and estimated the ratios for subsequent births on this basis. In some cases this procedure almost certainly leads to an underestimate of the actual sex ratios for each parity. For example, in Punjab the overall sex ratio of reported births is probably about 114, and this would raise the sex ratio for births at each parity to levels far higher than those we have shown.

The data for five States (Punjab, Haryana, Maharashtra, Madhya Pradesh, and Tamil Nadu) suggest that the sex ratio at birth increases with parity (Figure 4). This is a pattern familiar in China and South Korea where parents exercise their preference for sons to obtain the desired number of sons without exceeding the limit of the total number of children they wish to bear. Data for the other States do not show this clear pattern.

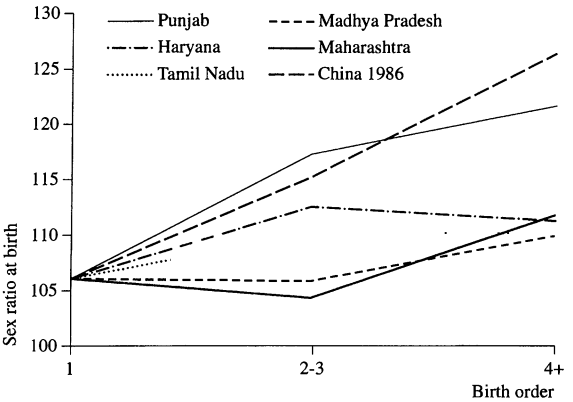

Figure 4. Sex ratio at birth by parity, 1990–91.
Source: For India; sample registration system 1990, 1991. For China, calculated from Hull (1990).
Note: The figures here represent the sex ratio at birth of parities 2–3 and 4+*relative* to that of parity 1. They do not represent the actual sex ratios at birth, since the data do not specify the actual ratio at parity 1. We have assumed a sex ratio at birth of 106 at parity 1. To make the data comparable to those for the Indian States, China's sex ratio at birth at parity 1 has been brought down to 106, from the actual observed ratio of 107.93. The sex ratio at the other parities have been adjusted accordingly. Thus the data shown here for China as well as the Indian States are not actual figures, but they accurately represent the relative *rise* in sex ratios at birth after parity 1.

The sharpest rise in the sex ratio at birth with parity is found in Punjab, where the figures for 1990–91 approximate those for China in 1986. This is consistent with much other evidence that discrimination against girls is stronger in Punjab than other Indian States. The neighbouring State of Haryana comes second to Punjab.

It is interesting to note that Punjab, Haryana, and Maharashtra are States where anecdotal accounts in the media suggest that the practice of sex-selective abortion is most widespread. Tamil Nadu is notable because it is the first Southern State to show this discrimination against girls. However, the results must be treated with caution because the sample registration system is mainly interested in estimating vital rates and has only recently given any attention to data on parity-specific sex ratios at birth.

FERTILITY DECLINE AND CHANGES IN SEX BALANCE

In India there are large regional differences in fertility decline and in the intensity of sex discrimination in different regions. This raises the question of whether fertility decline has altered earlier regional differentials in the manifestation of sex discrimination. The large regional variations in

Table 5. *Total fertility 1981 and 1991, major States of India*

State	1981	1991	Percent decline 1981–91
South			
Andhra Pradesh	4.0	3.0	25.00
Karnataka	3.6	3.1	13.89
Kerala	2.8	1.8	35.71
Tamil Nadu	3.4	2.2	35.29
North-Centre			
Bihar	5.7	4.4	22.81
Madhya Pradesh	5.2	4.6	11.54
Rajasthan	5.2	4.6	11.54
Uttar Pradesh	5.8	5.1	12.07
NorthWest			
Haryana	5.0	4.0	20.00
Punjab	4.0	3.1	22.50
West			
Gujarat	4.3	3.1	27.91
Maharashtra	3.6	3.0	16.67
East			
Orissa	4.3	3.3	23.26
West Bengal	4.2	3.2	23.81
India	4.5	3.6	20.00

Source: Sample Registration System 1981, 1991.

the timing, extent, and pace of fertility decline are shown in Table 5. The most dramatic declines were found in Kerala and Tamil Nadu where total fertility in 1991 was 1.8 and 2.2 respectively. There has also been an impressive decline in the Northwestern States of Punjab and Haryana, where fertility was high in 1971. This sets the Northwestern States apart from the rest of the Northern region where fertility declined much more slowly.

There are also strong regional differences in the manifestation of sex bias, with bias being more pronounced in the North than the South (Dyson and Moore 1983). This is reflected in regional differences in sex ratios which have persisted for over a century (Visaria 1961). The most balanced sex ratios for children were found in the Southern States, and the highest in the Northwestern States of Punjab and Haryana (Table 3). The heaviest concentration of excess mortality of girls recorded in the Census of 1981 was also found in the Northwest. Thus the maximum decline in fertility occurred in the South, where historically sex discrimination has been lower. It may be thought that a greater intensification of sex bias following the more rapid fall in fertility in the South might overcome the lower *intensity* of bias and lead to a convergence of observed sex bias between the North and the South, as measured by sex ratios of children.

To examine this hypothesis we considered the relationship of the decline in total fertility between 1981 and 1991 (Table 5) in each major State with a change in the sex ratios of children during the same period. Considering all States together there is clearly no overall relationship between changes in fertility and in the sex-ratio of children. (Figure 5). However, the old patterns re-emerge when we look at the distribution of States on this diagram. For a given fertility decline the sex ratio of children increased more in the Northern States. The increase in the sex ratio of children was large in Rajasthan and Madhya Pradesh, but when ranked by fertility decline these States occupied very low positions. In Punjab, fertility fell rapidly, but the change in the sex ratio was still disproportionately high. Changes in the sex ratio were lowest in the Southern States of Kerala and Tamil Nadu, compared with their more rapid fertility declines. Kerala is especially notable, as its sex ratio increased least, despite having occupied a leading position in fertility decline. It seems that the well-known Indian regional pattern of intensity of sex discrimination has persisted in spite of the fact that fertility declined more in the South than in the North.

CONCLUSIONS

In societies characterized by a strong preference for sons, fertility decline has two opposing effects on discrimination against girls. On one hand, there are fewer births at higher parities where discrimination against girls is strongest, and this reduces discrimination (the 'parity' effect). On the other hand, parity-specific discrimination becomes more pronounced at lower levels of fertility, and makes for increased discrimination (the intensification effect). These two effects counterbalance each other in determining the net change in excess mortality of girls as fertility decline proceeds.

In India, as in China and South Korea, the increase in the sex ratio of children which has accompanied fertility decline suggests that the intensification effect has outstripped the parity effect, at least till now. Nevertheless, the parity effect must be kept in mind, because it explains why the sex ratios of children did not increase even more sharply than has been observed.

Fertility decline in India has reduced adult females' disadvantage in mortality because of reduced reproductive stress, but increased that for children. During the 1980s, the decade when fertility in India declined most rapidly, the sex ratios increased even in the Southern States where discrimination had not traditionally been as strong as in the North. However, it is noticeable that sex

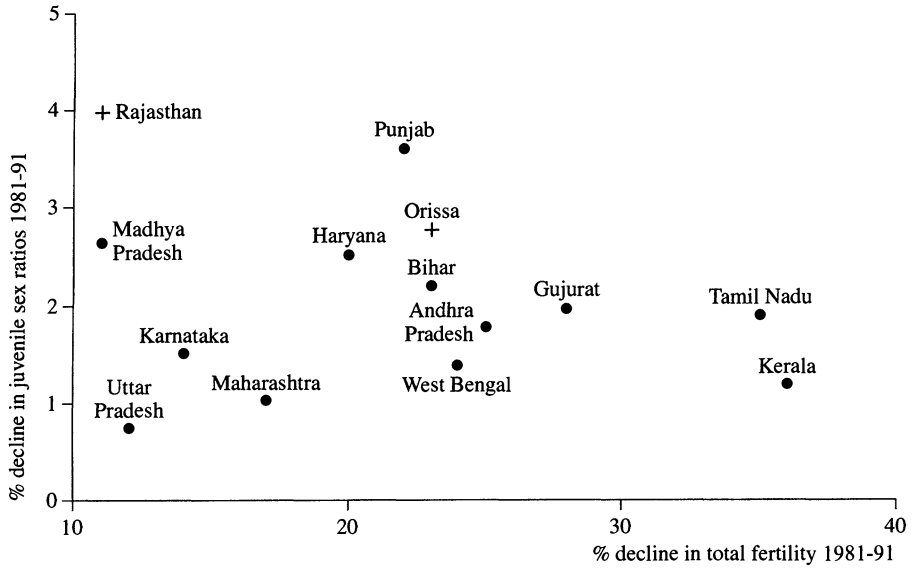

Figure 5. Decline in juvenile sex ratios and in total fertility, 1981–91.
Source: Census of India 1991; Sample Registration System 1991.

ratios have changed less in the South than in the North, despite the much more rapid fertility decline in the former area. This shows that increased manifestation of sex bias (in excess mortality of girls) is greatest where the manifestation was already highest, and that the regional patterns of sex bias persist.

The increases in the sex ratio of the population during the 1980s were concentrated amongst children. The data suggest that more than a million *additional* girls went 'missing' between 1981 and 1991, over and above the numbers already implied to be missing by the skewed sex ratios of 1981. Meanwhile the sex ratios in child mortality have not changed, which suggests that most of the change can be attributed to sex-selective abortion, or unreported infanticide. These are, of course, rough estimates because the data on which they are based do not make precise calculations possible. The spread of sex-selective technology during the 1980s would suggest that much of this could be due to sex-selective abortion as opposed to infanticide, but we must bear in mind that the trend of rising child sex ratios was evident long before the spread of this technology.

Even if we were to assume that the whole increase in the sex ratio is attributable to sex-selective abortion, to record over a million such abortions is not very large for a population the size of India's. It amounts to less than 0.5 per cent of all births during this decade and constitutes less than 1 per cent of girls born. This is much less than might have been inferred from discussions of the functioning of sex-selective abortion clinics. To put this into perspective, the estimated number of sex-selective abortions in South Korea amounts to some five per cent of actual births of females (Park and Cho 1995).

Excess mortality of girls continues after birth and still constitutes the main method of removing female children in India. The figures indicate that there may have been four times as many excess deaths of female children which occur *after* rather than *before* birth, or as unreported infanticides. In terms of the impact of sex discrimination on fertility and mortality rates, it is evident that levels of sex-selective abortion are far too low to account for a significant part of the reduction in total fertility. However, excess mortality of girls does increase the child mortality rate significantly: during 1981–91 the excess mortality alone constitutes a child mortality rate of 46 per 1000 female live births.[11]

India may perhaps gradually converge to patterns of discrimination against girls similar to those found in China and South Korea, where sex ratios at birth are rising, but differences between the mortality of the two sexes after birth are small. It is possible that pre-natal sex regulation may replace post-natal regulation as a method of controlling the sex composition of families, because the psychological burden of abortion is lower than that of neglecting a living child. This may result in skewing the sex ratio even further. On the other hand it should result in a higher proportion of girls being born in families that actually want them, or are at least willing to tolerate them, and thus perhaps improve the way they are treated.

NOTES

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Comments from Stan Bernstein, Tim Dyson, Debraj Ray and Jennifer Zeitlin on this paper are gratefully acknowledged. This research was funded by a grant from the United Nations Population Fund to Harvard University, USA.

[1] To obtain a 'normal' sex ratio of deaths we use the West model life tables, which are derived from societies characterized by low or non-existent excess female mortality. The appropriateness of these model life tables for this purpose was confirmed by Paul Demeny, who drew up these life tables along with Ansley Coale (personal communication).

[2] The authors do not agree with our views on the 'intensification' effect and state there is evidence which shows that, in fact, the number of desired sons has fallen more rapidly in India than the total number of desired children. However, the references that they cite do not support this view. To substantiate their point further they point out that declining fertility in Kerala has not resulted in increased sex bias; this merely confirms that we should not expect to find an intensification effect in societies in which sex bias is weak or non-existent.

[3] The data on sex differentials in child mortality by birth order are derived from maternity histories of all ever-married women aged 15–59, collected in 1984 in rural Punjab in a study conducted by Das Gupta.

[4] Note that the intensification of gender bias may be somewhat overestimated here. This could happen because some women may have stopped childbearing at lower parities because they were fortunate in experiencing low mortality rates among their sons.

[5] In all the data sets considered here, there are problems with the quality of the data, but they are unlikely to affect our results. These would be affected only if there were changes in the completeness of the enumeration of females or their deaths, and there is no evidence for this, as discussed above. Thus, the sex ratios and death rates seem to be reliable indicators of *changes* in the relative situation of girls over time.

[6] This is based on the sex ratios of children in the 1991 Census (Census of India 1991:13), and the age-specific death rates from the Sample Registration System for 1990 and 1991 (Registrar General of India 1990 and 1991).

[7] A small part of the increase in the sex ratio of children could also be expected as a natural consequence of improvements in child survival. Since infant mortality is higher among boys than among girls, a fall in the infant mortality rate results in a higher proportion of boys surviving. However, as the ratio of boys' to girls' death rates during the first five years of life has not changed, the absolute decline in the death rates of girls during their first five years of life is greater than that of boys. Consequently we should expect a marginal increase in the proportion of *females* rather than of males in the juvenile population.

[8] The female population in the Census of 1971 was undernumerated (Dyson 1996).

[9] Using birth rates and child mortality rates from the sample registration system, we estimated that there were 240.5 million births between 1981 and 1991. The total number of child deaths was 18.8 million girls and 18.3 million boys. From the sex differential in mortality during the first five years of life in the West Model Life Tables (Level 17) we estimated that there should only have been 14.6 million deaths of girls, given that there were 18.3 million deaths of boys. This gives an estimate of 4.2 million excess deaths among girls.

[10] See the calculations of the total number of births in fn. 9.

[11] See the calculations in fn. 9 and Table 4. The estimated number of excess deaths implied by the age-specific death rates was 4.2 million between 1981 and 1991, and the estimated additional number missing based on juvenile sex ratios was 1.2 million.

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