Essays in Honour of Asok Mitra

Enduring Conundrum: India's Sex Ratio

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to become stronger. This is an additional factor that may worsen the female life disadvantage in India as a whole.

The foregoing discussion of the sex ratio in 1991 and the prospects for its future brings us back to Asok Mitra's review where he raised a large number of empirical and analytical issues. Satish Agnihotri and Nirmala Banerjee have discussed some of these issues in their papers in this volume.

References

Basu, Alaka Malwade. 1999. 'Fertility Decline and Increasing Gender Imbalance in India, Including a Possible South Indian Turnaround,' *Development and Change*, 30(2): 237–63.

Chunkath, Sheela Rani and V.B. Athreya. 1997. 'Female Infanticide in Tamil Nadu—Some Evidence,' *Economic and Political Weekly*, 32(17): WS21.

Das Gupta, Monica and P.N. Mari Bhat. 1997. 'Fertility Decline and Increased Manifestation of Sex Bias in India,' *Population Studies*, 51: 307–15.

Mitra, Asok. 1979. *Implications of Declining Sex Ratio in India's Population*, New Delhi: Allied Publishers (reprinted in this volume).

Rajan, Irudaya et al. 1991. 'Decline in Sex Ratio: An Alternative Explanation?' *Economic and Political Weekly*, 26(51): 2963–64.

Srinivasan, K. 1994. 'Sex Ratios: What They Hide and What They Reveal,' *Economic and Political Weekly*, 29(51–52): 3233–34.

Sudha, S and S. Irudaya Rajan. 1999. 'Female Demographic Disadvantage in India 1981–1991, Sex Selective Abortions and Female Infanticide,' *Development and Change*, 30(3): 585–618.

Trovato, Frank and N.M. Lalu. 1996. 'Narrowing Sex Differentials in Life Expectancy in the Industrialised World, Early 1970s to Early 1990s,' *Social Biology*, 43: 20–36.

Visaria, Pravin M. 1971. '*The Sex Ratio of the Population in India*,' Monograph No. 10, Census of India 1961, New Delhi.

Zheng Yi et al. 1993. 'Causes and Implications of the Increase in China's Reported Sex Ratio at Birth,' *Population and Development Review*, 19(2): 283–302.

Unpacking the Juvenile Sex Ratio in India[1]

Satish Balram Agnihotri

This paper elaborates the diverse and complex pattern of sex ratio imbalances in India through the analysis of juvenile (0–9 years) age group data at the district level. Conventional analyses which use the state level data for all age group do not adequately capture this diversity.

Two features of juvenile mortality need attention: a) these are highly skewed in favour of younger ages and b) sex differentials in mortality reverse beyond infancy. During infancy there is an excess male mortality which is mainly biological in nature. Between 1–4 years age group there is excess female mortality which is largely behavioural in nature. In many regions of contemporary South Asia, the excess female mortality has intruded within infancy itself. These features of under–5 mortality result in significant differences in the 0–4 and 5–9 age group sex ratios; the latter being the most sensitive indicator of gender bias against the girl child.

Separate analysis of the sex ratios in the 0–4 and 5–9 age group had never been attempted so far. It enables one to identify regions where excess female mortality is sharp. But it also reveals regions having unusually feminine sex ratios resulting from excess male infant mortality, an aspect that has escaped attention so far. Regions where excess male infant mortality and excess female child mortality combine to give an impression of 'balanced' sex ratios are also identified.

Comparison of the sex ratios patterns between 1961 and 1991 indicates groups and regions which need attention on a priority basis and the nature of interventions called for. Implications of these patterns for women and child welfare policies, Census of 2001, and academic research are also discussed.

An Outline

Sharp regional variations in sex ratios have been a subject matter of a long debate in India beginning with the first population Census in 1891 (Kanitkar 1991). A century later this still remains a perplexing problem (Bardhan 1986; Kanitkar 1991; Nath 1991). The problem is further confounded by the highly masculine sex ratios at the all India level which have continued to become increasingly masculine throughout this century.

A number of features of the sex ratio patterns in India have been recognised in the literature. It is by and large accepted that the low FMRs (henceforth FMRs) in the population are a result of an excess female mortality resulting out of the discrimination women face in access to life sustaining inputs compared to men (Dasgupta 1987; Dyson and Moore 1983; Kishore 1993; Miller 1981; Murthi et al. 1995; Visaria 1971). In terms of regional variations, the existence of a north-south divide has also been recognised which refers to the highly masculine sex ratios in the north-western parts of the country and less masculine sex ratios in its southern and eastern parts (Agarwal 1994; Agnihotri 1996; Dyson and Moore 1983; Malhotra et al. 1995; Miller 1981, 1984; Sopher 1980). Among the correlates of the sex ratios, importance of economic factors like female workforce participation (Bardhan 1974; Miller 1981; Murthi et al. 1995; Rosenzweig and Schultz 1982;) and dowry (Rao 1993; Subramaniam 1996) and the importance of cultural factors e.g. kinship (Dasgupta 1995; Dyson and Moore 1983; Goody 1990; Kapadia 1994) has been highlighted. The need to synthesise the two sets of factors has also been recognised (Bardhan 1986) and followed up (Agnihotri 1997; Kishore 1993) in the literature. Beyond these, however, the analyses have reached a plateau. One of the reasons for this, it is felt, is that the data have not been disaggregated enough to accommodate the diversity in the sex patterns by factors like age, social groups, kinship and prosperity. The present analysis attempts to break new grounds for discussion by following such disaggregation in terms of age groups and social groups. It uses the district level sex ratio data in the juvenile or 0–9 year age group which is free from the effects of sex selective migration (Agnihotri 1996; Miller 1981; Sopher 1980). However, another important reason for focussing on this age group is excess female mortality in the 0–5 year age group.

Excess female mortality in the 0–5 age group is a distinguishing feature of contemporary South Asia. While discrimination against girl children existed in pre-industrial Europe, United States and Japan (Ginsberg and Swedlund 1986; Johansson 1987, 1991, 1996; Klassen 1994) the consequent sex differentials in mortality were pronounced mostly in the 10–19 year age group. But in South Asia today, such discrimination results in marked excess of female over male mortality in the 1–4 age group and, in many regions, in the 1–11 month age group or the post-neonatal period (Chatterjee 1990; Harriss 1989; IIPS 1995). Since most of the juvenile deaths in India (above 90 per cent) take place in the 0–5 age group (Government of India 1988; IIPS 1995), the sex differentials in under–5 mortality (U–5 MR) essentially determine the juvenile sex ratio.

Two important features of the under–5 mortality have been overlooked in the sex ratio debate although these have important demographic consequences. First, is the highly skewed nature of the under–5 mortality rates towards younger ages; nearly 60 per cent of the deaths under 5 years of age occur during infancy or the first year of life (Government of India 1988, 1991; IIPS 1995). Of these, nearly 60 per cent occur within the first month. The second feature is the reversal of sex differentials in mortality beyond infancy (*ibid.*); there is an excess of male mortality during infancy and an excess of female mortality in the 1–4 year age group. Together, these result in significantly different patterns of sex ratios in the 0–4 age group and the 5–9 year age group. FMR 0–4, or the FMRs in the 0–4 age group, essentially reflect the effect of excess male infant mortality and are significantly higher than the FMR 5–9. The 5–9 age group reflects the effects of excess female mortality and are lower than the FMR 0–4. The excess male infant mortality is largely a biological phenomenon (Waldron 1983) while the excess female child mortality is a behavioural phenomenon (Harriss 1989; Miller 1981). The FMR 5–9 emerges, therefore, as the most appropriate variable to reflect the effects of discrimination against girl children. If such discrimination is very strong, affecting the post-neonatal girl mortality, it is also reflected in the low values of FMR 0–4. Otherwise, FMR 0–4 by and large show the effect of infant mortality levels indicating through these the state of the health environment. This is elaborated in some detail. Separate analysis of the sex ratios in the 0–4 and 5–9 age group has not been attempted in the literature except Agnihotri (1996).

A significant difference in the sex ratios among the major social groups is another important aspect of the sex ratio patterns that has received little attention in the literature (except Agnihotri 1995, 1996). Sex ratios between the tribal and the non-tribal population and among the latter, between the Scheduled Castes (SCs) and the rest of the population differ significantly (*ibid.*). Separate analysis of the sex ratio data for these three groups reveals the seriousness of the adverse survival situation for the girl children among the SCs in the north. But it also identifies regions where unusually high FMR 0–4 among some of the groups, particularly the tribals, indicate excess male infant mortality as a consequence of a poor health infrastructure.

The analysis helps identify regions and groups among which the girl child, the male infant, and the female infant are at risk. Cases where both male infants and the girl child suffer high mortality can also be identified even if the FMR in the juvenile age group in such cases give a spurious appearance of being 'balanced.' Further, high level of female infanticide or sex selective abortions of female foeti can also be prima facie identified through unusually low values of FMR 0–4. The possibility of inferring the sex differentials in mortality from FMR data has important methodological implications.

Finally, the recently released 5-year age group data from the 1991 Census are analysed to see if the situation has worsened for the girl children between 1981 and 1991. Such analysis is limited, however, since the 5-year age group data are not yet available separately by social groups.

The discussion is organised as follows. Section II reviews the debate very briefly and analyses the demographic consequences of the under–5 mortality patterns. Section III analyses the district level data on mortality and the FMRs in the 0–4 and 5–9 age groups from the 1981 Census. Section IV disaggregates the FMR data by the three social groups. Section V discusses the trend in the FMR data between 1981 and 1991. Section VI discusses the policy and research implications.

II

The proportion of women in the Indian population—927 women per thousand male population—is strikingly below the world average of about 990 (Sen 1987) and has steadily declined throughout this century (Bose 1991). The declining trend is shown in Table 1.

These low levels of FMRs had triggered Sen's rather dramatic observations about nearly 30 million 'missing women' in the Indian population. These women would have been present in the country's population if the sex ratios were close to, say, the African sex ratios. There may be a difference of opinion over the choice of the 'standard' sex ratio and the exact number of the 'missing' women (e.g. Klassen 1994) but the number would remain dramatically high.

Neither the decline nor the low levels of the FMRs are, however, uniform across the country and sharp regional variations have been observed among these. Using the sex ratio data for the juvenile age group Sopher (1980) and later Miller (1981, 1984) have highlighted the existence of what is come to be

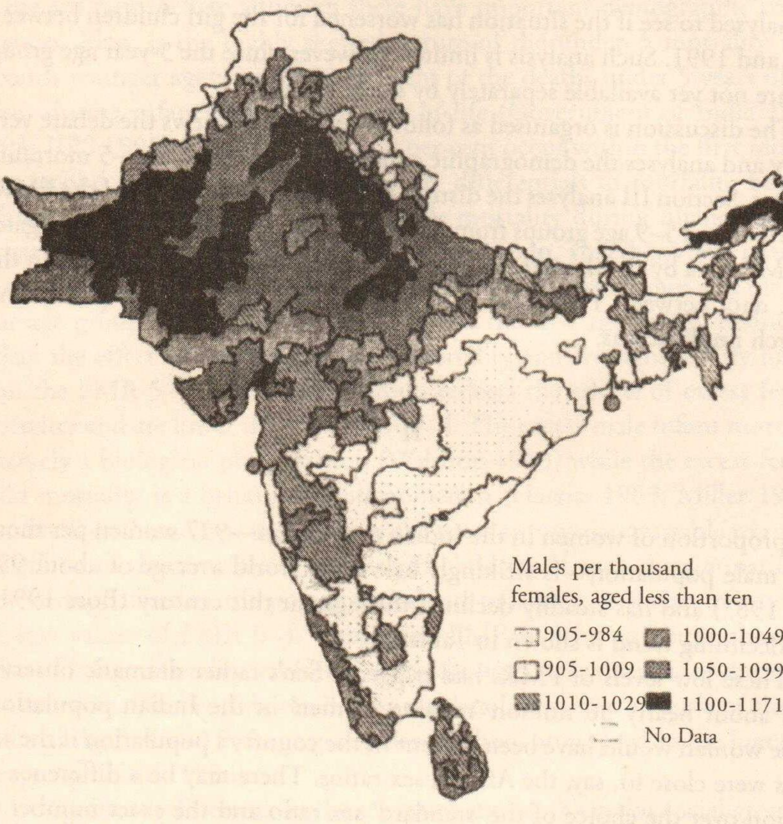
Table 1

Declining FMRs in the Indian Population: 1901–1991

Year	*1901*	*1911*	*1921*	*1931*	*1941*	*1951*	*1961*	*1971*	*1981*	*1991*
FMR	972	964	955	950	945	946	941	930	934	927

Figure 1

South Asia: Juvenile Sex Ratio



Juvenile sex ratios by district (urban and rural populations combined), India (1961), Pakistan (1961), Bangladesh (1961), and Sri Lanka (1971). Juveniles are children under ten years of age; sex ratio refers to the number of males per 1,000 females. (Source: Miller, 1984) known as the north-south divide. Figure 1 shows the spatial distribution of the juvenile sex ratios. Preponderance of male children in the north-western regions of the country and the less masculine nature of the sex ratios in the south-eastern part is clear from the map. This north-south sex ratio divide is characterised by a physical 'barrier' along the Narmada river and the Vindhya Satpura hill range. This belt is mostly inhabited by the tribal population and extends from Bharuch in the west to Chhotanagpur in the east.

The use of juvenile age group eliminates the effects of sex selective migration (Agnihotri 1996; Miller 1981; Sopher 1980) and shifts the focus of the debate to the problem of excess female over male mortality. Visaria (1971) and Miller (1981, 1984) has convincingly demonstrated that the problem of the low FMRs mainly arises due to sex differentials in mortality and cannot be attributed to reasons like low FMRs at birth, or the under enumeration of the girl children.

A Ten Lap Race

While the juvenile age group FMRs are free from the problem of sex selective migration and highlight the north-south divide, these need to be unpacked further into the 0–4 and 5–9 age group FMRs. This is necessitated due to a 'fault line' in the under–5 mortality which, as observed earlier, accounts for over 90 per cent of the juvenile deaths. The excess of male mortality during infancy and the excess female mortality in the 1–4 age group give rise to significantly different patterns in the FMRs for the 0–4 and the 5–9 age group. This can be understood with the help of an analogy of a ten lap race for the first ten years of life.

A certain number of male and female children join this race at birth. In the first lap there is a large dropout rate for both the sexes with more male infants dropping out compared to female infants. More female children begin dropping out in the next four laps while male drop out rate comes down. The female drop out remains pronounced until the fifth lap. In the sixth to tenth lap the drop out rate is insignificant for *both the sexes.*

The average of the *first five laps* shows a large number of female participants due to their preponderance in the first lap. The average in the *last five laps* will, however, show higher proportion of male participants. It will primarily reflect the proportion of male and female children who *entered the sixth lap.*

What if the female drop out rate is high right in the first lap? Fewer females will reach the second lap. As their drop out rate is high in the second to fourth laps, there numbers will continue to decline. The ratio of female to male children in the first five laps (FMR 0–4) will be low. It can even go below the initial ratio one began with i.e. the female to male ratio at birth (FMR$_0$) if there is a net excess number of girl children dropping out. Even the starting ratio can become low if many of the girl children are *prevented from joining the race* through sex selective removal (prenatal selection or infanticide!) in the 'qualifying round' i.e. foetal stage.

In a harsh health environment male infants are more vulnerable. So, the harsher the environment, the higher will be the male drop out in the first lap. This would give a high FMR in the first five laps. If the girl child drop out rate is comparable to that of the boys in the subsequent laps (i.e. there is no discrimination against them), the number of girl children will remain high even in the sixth to tenth laps. *Unusually high FMRs in the 0–4 age group would therefore indicate excess male infant mortality.* If the FMRs continues to be high in the 5–9 age group it would indicate continuing poor performance of male children in an adverse health environment.

The *gap between FMR 0–4 and FMR 5–9 will indicate excess girl child mortality.* The more severe the proportion of girls dropping out during the second to the fifth lap, the lower the proportion of those entering the sixth lap and the lower the FMR 5–9 compared to FMR 0–4.

Similarly the gap between FMR 0–4 and the FMR$_0$ will indicate the extent of the excess male infant mortality. As infant and child mortality declines substantially, FMR 0–4 values will come closer to FMR$_0$. Only when excess girl child mortality is very high the FMR 0–4 values go below FMR$_0$. *Unusually low FMR 0–4 values therefore indicate excess female infant mortality and unusually high FMR 0–4 values signify unusually high male infant mortality.*

Different Combinations of Sex Differentials in Mortality

The sex differentials in infant and the child mortality can combine in different possible ways to give rise to different FMR patterns in the 0–4 and 5–9 age groups. Assigning three levels for these differentials; *high, moderate and low,* nine combinations are possible. These and the corresponding FMRs in the juvenile age group are described in Table 2.1.

The balanced (?) FMRs in the top left hand corner shows that high male mortality during infancy can mask the excess female mortality in subsequent

Table 2.1

Possible Combinations of Sex Differentials in Infant and Child Mortality

Excess Mortality	*Girl Child (High)*	*Girl Child (Moderate)*	*Girl Child (Low)*
Male Infant (High)	Balanced (?)	High	Very High
Male Infant (Moderate)	Low	High/Balanced	High
Male Infant (Low)	Very Low	High	Balanced

years. Similarly, very high levels of FMRs would arise out of unacceptably high levels of both male mortality and it is necessary to make a *distinction between balanced FMRs and high FMRs.* So far such a distinction has not been reported in the literature.

Different Combinations of Female to Male Mortality Ratios

While different combinations of the levels of sex differentials in mortality can indicate the likely pattern of the FMRs in the juvenile age group, it is also possible to infer the levels of these sex differentials by examining different combinations of FMRs in the 0–4 and 5–9 age group. Nine combinations are possible if we assign three levels for each of the FMRs; *high, moderate and low.* Implication of each of these combinations for the male and the female mortality can be qualitatively described as done in the Table 2.2.

The combination of moderate to high FMR 0–4 and moderate FMR 5–9 will be frequently encountered in the absence of gender bias. When the FMR 0–4 values are moderate or high and the FMR 5–9 values very low, adverse survival conditions are indicated. These conditions are alarming when both the FMR 0–4 and FMR 5–9 are very low.

It is unusual to have very low FMR 0–4 and moderate FMR 5–9 and where FMR 0–4 are very low but FMR 5–9 are very high, it is worthwhile checking enumeration errors.

Very high FMR 0–4 and very high FMR 5–9 indicate adverse survival conditions for the male child not just during infancy but also beyond it. Such regions need attention to ascertain the causes of male vulnerability. As we will see later, a harsh health environment, low levels of health infrastructure and general malnutrition may be the possible causes for such a pattern of FMRs.

It is thus possible to identify *regions of excess mortality* for the female child, the male infant, and the female infant *from the FMR data.* The extent of the excess mortality can be judged through the drop between FMR 0–4 and FMR 5–9 and between FMR_0 and FMR 0–4. This has important methodological implications since disaggregated mortality data are hardly available whereas FMR data are available at disaggregated levels.

Table 2.2

Possible Combinations of FMR 0–4 and FMR 5–9

FMR levels	*Very Low FMR 0–4*	*Moderate FMR 0–4*	*High FMR 0–4*
Very Low FMR 5–9	Alarming (Female)	Adverse (Female)	Serious (Female)
Moderate FMR 5–9	Unusual	Frequent	Frequent
High FMR 5–9	Check Data	Infrequent	Alarming (Male)

III

The qualitative conclusions above can be verified using the district level sex ratio data from the 1981 Census for 402 districts in the country. However, the data used here are taken from the Indian District Development Data base (Vanneman and Barnes 1992). The IDDD uses 366 districts units combining some of the districts from smaller states into a single unit and provides compatibility between Census data from three different decades i.e. 1961 to 1981. For the Scheduled Caste (SC) and the Scheduled Tribe (ST) population, the special tables for the SCs and STs from 1981 Census have been relied on. 1981 is incidentally the first Census to provide separate 5 year age group data for the SC and the ST population. The district level infant and child mortality estimates are also based on the 1981 Census (Government of India 1988). However, these estimates are available only in respect to the total population. Separate mortality estimates by social groups are not available.

Range and Distribution of Female to Male Mortality Ratios

Figures 2a to 2c provide the distribution of FMR 0–4, FMR 5–9 and FMR 0–9. Mean of the FMR 0–4 is much higher than FMR 5–9 as expected. FMR 0–4 values are less dispersed, close to a normal distribution and rarely fall below 875. FMR 5–9 are quite dispersed, relatively skewed and can assume quite low values. FMR 0–9 are a combination of the two. *Difference between FMR 0–4 and FMR 5–9*: T—test for paired samples shows *significant differences between FMR 0–4 and FMR 5–9* (T = 15.23***). Further, the positive association between excess male infant deaths and high FMRs in 0–4 and in 5–9 age group and negative association between excess female deaths and FMRs is strong (Table 3).

Different Levels of Female to Male Ratios and their Combinations

More useful light is thrown on the distribution of these FMRs by assigning each of them four different levels; *low* (below 910), *moderate* (910 to 960),

Table 3

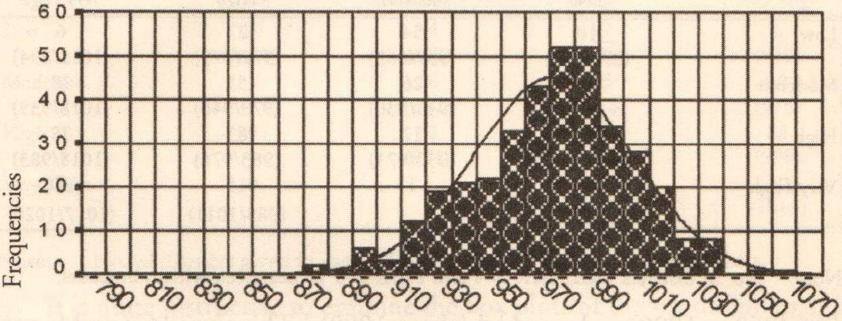
Correlation between Sex Differentials in Mortality and FMRs

	Excess Male Infant Mortality	*Excess Under–5 Female Mortality*
FMR 0–4	0.39***	–0.53***
FMR 5–9	0.51***	–0.86***

Distribution of FMRs : 1981 Census : 366 Districts (Total Population)

Figure 2a

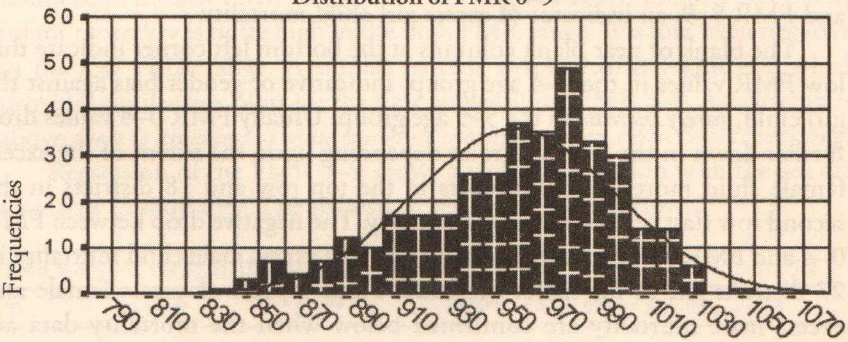
Distribution of FMR 0–4



Std. Dev = 32.17 Mean = 976 N = 366.00

Figure 2b

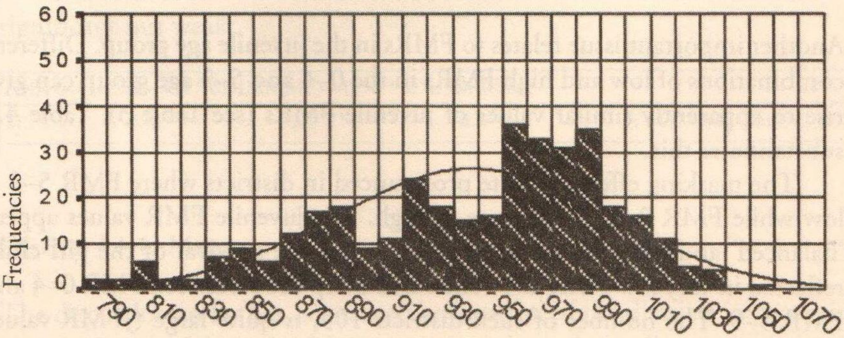
Distribution of FMR 0–9



Std. Dev = 40.72 Mean = 958 N = 366.00

sFigure 2c

Distribution of FMR 5–9



Std. Dev = 55.04 Mean = 942 N = 366.00

Table 4.1

Mean Values of FMR 0–4 and FMR 5–9 by FMR Levels
(Total Population)

FMR 5–9 Range	*FMR 0–4 Range*			
	Low	*Moderate*	*High*	*Very High*
Low	10 (897/863)	54 (937/863)	27 (977/879)	6 (1012/894)
Moderate	1	26 (945/930)	55 (979/940)	18 (1018/939)
High	0	12 (950/971)	83 (983/978)	28 (1018/983)
Very High	0	1	15 (983/1011)	30 (1017/1020)

Note: No. of districts with FMR 0–4 and FMR 5–9 values given within brackets.

high (960 to 1000) and *very high* (above 1000).[2] This gives 16 possible combinations. The number of districts in each of them is presented in Table 4.1. Mean values of FMR 0–4 and FMR 5–9 for these districts are indicated in each of the cell. Together these give an idea of the drop between FMR 0–4 and FMR 5–9; an indicator of excess girl child mortality.

The blank or near blank columns at the bottom left corner indicate that low FMR values in the 0–4 age group, indicative of gender bias against the girl child, *rarely increase* in the 5–9 age group. Usually FMR 0–4 values drop further down in the 5–9 age group depending upon the extent of the excess female child mortality. All districts in the top row and 18 districts in the second row (last cell) come in this category. The negative drop between FMR 0–4 and FMR 5–9 on the other hand signifies excess male child mortality in 27 districts left of the major diagonal. These aspects of excess female and excess male mortality are confirmed below when the mortality data are examined.

The Masking Effect in the Juvenile Female to Male Ratios

Another important issue relates to FMRs in the juvenile age group. Different combinations of low and high FMRs in the 0–4 and 5–9 age group can give rise to apparently similar values of juvenile FMRs (see Table 3). Table 4.2 substantiates this.

The masking effect, is quite pronounced in districts where FMR 5–9 is low while FMR 0–4 is moderate to high. The juvenile FMR values appear 'balanced' and hide the adverse condition for the survival of the girl child reflected in very low FMR 5–9 values and sharp drop between FMR 0–4 and FMR 5–9. The number of such districts 105, is quite large (JFMR values underlined).

Table 4.2

Mean Values of JFMRs by Different FMR Ranges
(Total Population)

FMR 5–9 Range	*FMR 0–4 Range*			
	Low	*Moderate*	*High*	*Very High*
Low	10 (866)	54 (897)	27 (925)	6 (947)
Moderate	1	26 (937)	55 (958)	18 (976)
High	0	12 (961)	83 (980)	28 (999)
Very High	0	1	15 (997)	30 (1019)

Note: No. of districts given in each cell with mean of FMR values in brackets.

It is quite instructive to examine the box plots of the sex differentials in mortality for the four FMR ranges described above. These plots (Figure 3.1) confirm the association between the FMRs and the sex differentials in mortality indicated in Table 3. Excess female under–5 mortality is quite pronounced in the low FMR range. It is less at high FMRs. Similarly, excess male infant mortality is quite high in the high FMR range. It is low, even negative, in the low FMR range. A similar pattern is revealed in Figure 3.2 which provides similar box plots for the four ranges of the FMR 5–9. As anticipated above *there is an excess of male under–5 mortality when FMR 5–9 is very high.*

Regression of the FMR 5–9 shows a strong association with the sex differentials in mortality. The regression results are given below:

FMR 5–9 = 962 + 0.3 * SDIMR(MF)—2.2 * SDU5MR(FM)				... 1.1
T:	515***	2.7***	–26***	F: 520*** Adj. RSq. = 0.74

If sex differentials in both infant and under–5 mortality are set to zero, FMR 5–9 is given by the constant term 962 corresponding to the sex ratios at birth.

The association between FMR 0–4 and sex differentials in mortality is significant but weak:

FMR 0–4 = 980 + 0.4 * SDIMR(MF)—0.58 * SDU5MR(FM)				... 1.2
T:	528***	3.7***	–6.9***	F: 61*** Adj. RSq. = 0.25

District Level Maps

The discussion so far has not taken the location of the districts into consideration. It is useful to take this into account through the district level map of

Figure 3.1

Box-plots of Sex Differentials in Mortality of FMR 0–4 Levels

N = Number of Districts: 1981 Census

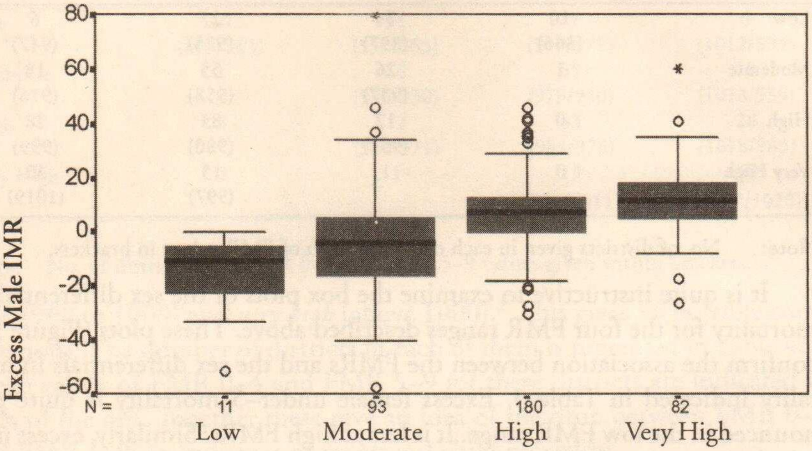


Figure 3.2

N = Number of Districts: 1981 Census

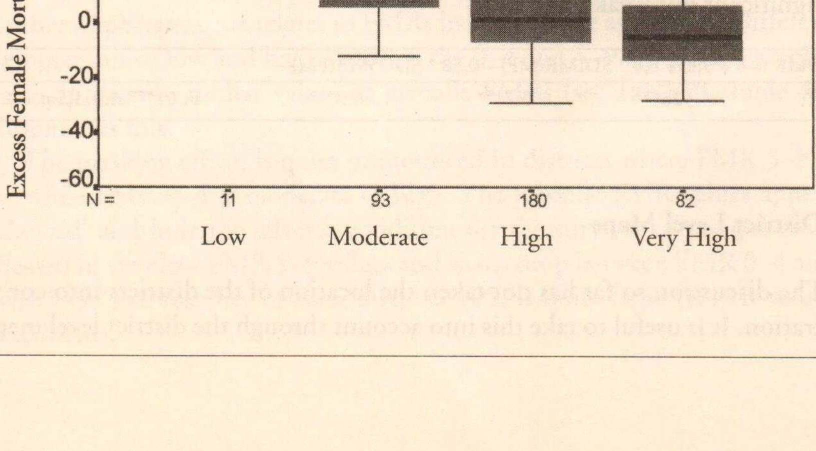


Figure 3.3

Box-plots of Sex Differentials in Mortality of FMR 5–9 Levels

N = Number of Districts: 1981 Census

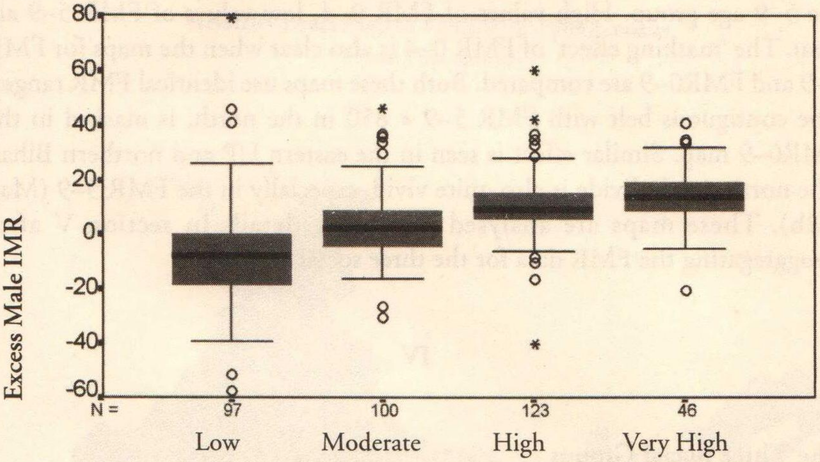
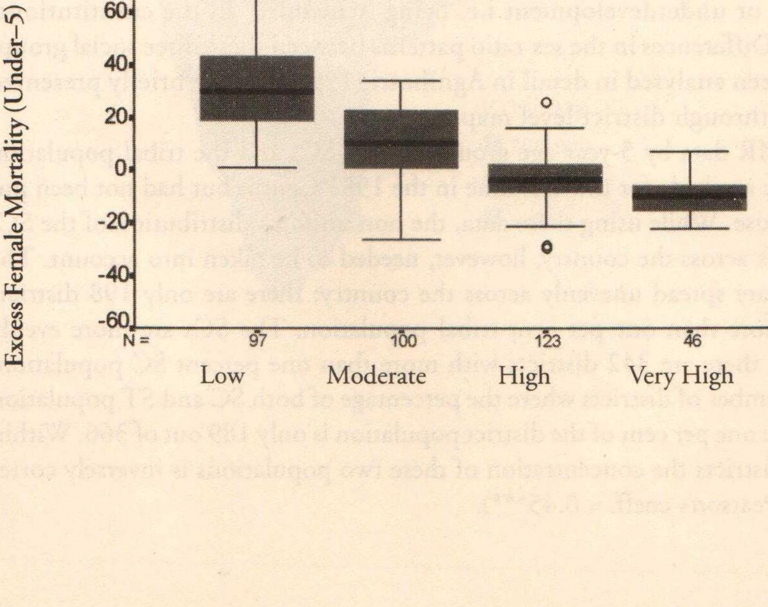


Figure 3.2

N = Number of Districts: 1981 Census



the three FMRs i.e. FMR 0–4, FMR 5–9 and FMR0–9. This is essentially a logical extension of the juvenile sex ratio maps presented by Sopher (1980) and Miller (1981). Figures 4a to 4c give the spatial distribution of the three FMRs for the overall district population.[3]

The maps vividly show the differences between the FMRs in the 0–4 and the 5–9 age group. High values of FMR 0–4, low values of FMR 5–9 are clear. The 'masking effect' of FMR 0–4 is also clear when the maps for FMR 5–9 and FMR0–9 are compared. Both these maps use identical FMR ranges. The contiguous belt with FMR 5–9 < 850 in the north, is masked in the FMR0–9 map. Similar effect is seen in the eastern UP and northern Bihar. The north-south divide is also quite vivid, especially in the FMR 5–9 (Map 4.2b). These maps are analysed in further details in section V after disaggregating the FMR data for the three social groups.

IV

The Three Social Groups

Analyses of the sex ratio patterns in India have overlooked an important aspect; differences in the FMR patterns among the SCs, the STs, and the rest of the population. Even a preliminary analysis using state level data clearly indicates a need to study the sex ratios patterns among the SC and the ST population separately from those for the general population (Agnihotri 1995a). It shows that these two groups cannot be clubbed together under the shared feature of poverty e.g. coming from weaker sections[4] or underdevelopment i.e. being 'scheduled' in the constitutional sense. Differences in the sex ratio patterns between these three social groups have been analysed in detail in Agnihotri (1996) and are briefly presented below through district level maps.

FMR data by 5-year age groups for the SCs and the tribal population became available for the first time in the 1981 Census but had not been put to any use. While using these data, the non uniform distribution of the SCs and STs across the country, however, needed to be taken into account. The tribals are spread unevenly across the country; there are only 198 districts with more than one per cent tribal population. The SCs are more evenly spread; there are 342 districts with more than one percent SC population. The number of districts where the percentage of both SC and ST population is above one per cent of the district population is only 189 out of 366. Within these districts the concentration of these two populations is inversely correlated (Pearson's coeff. = 0.45***).

Figure 4a

District Level Map of FMR 0–4: 1981 Census
(Total Population)

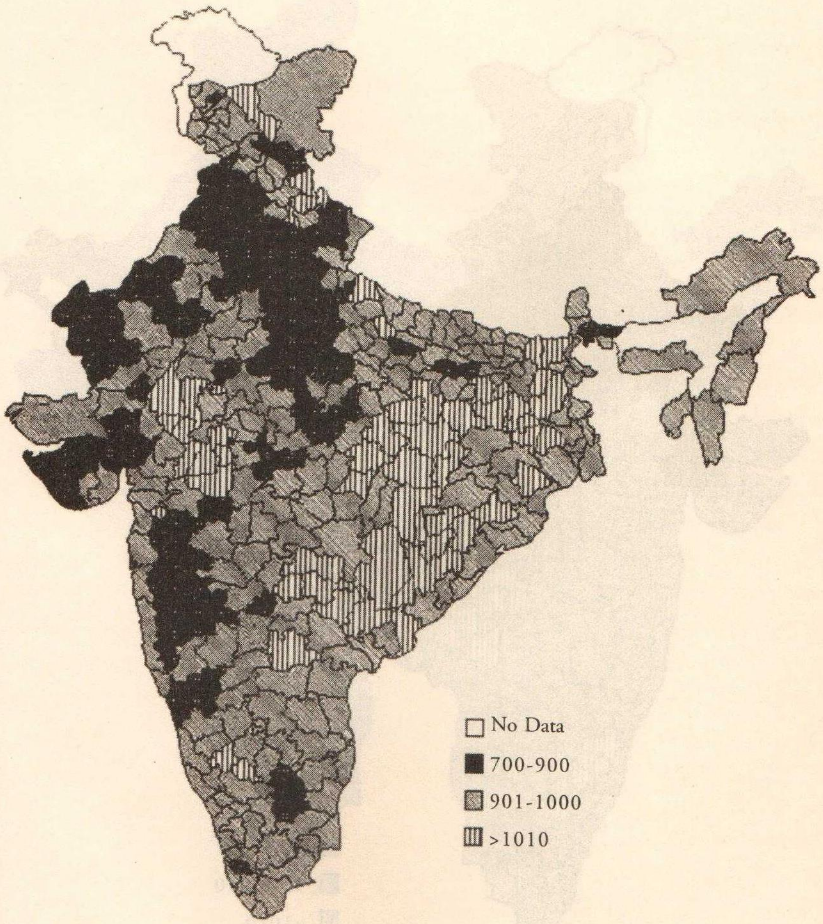


Figure 4b

District Level Map of FMR 5–9: 1981 Census

(Total Population)

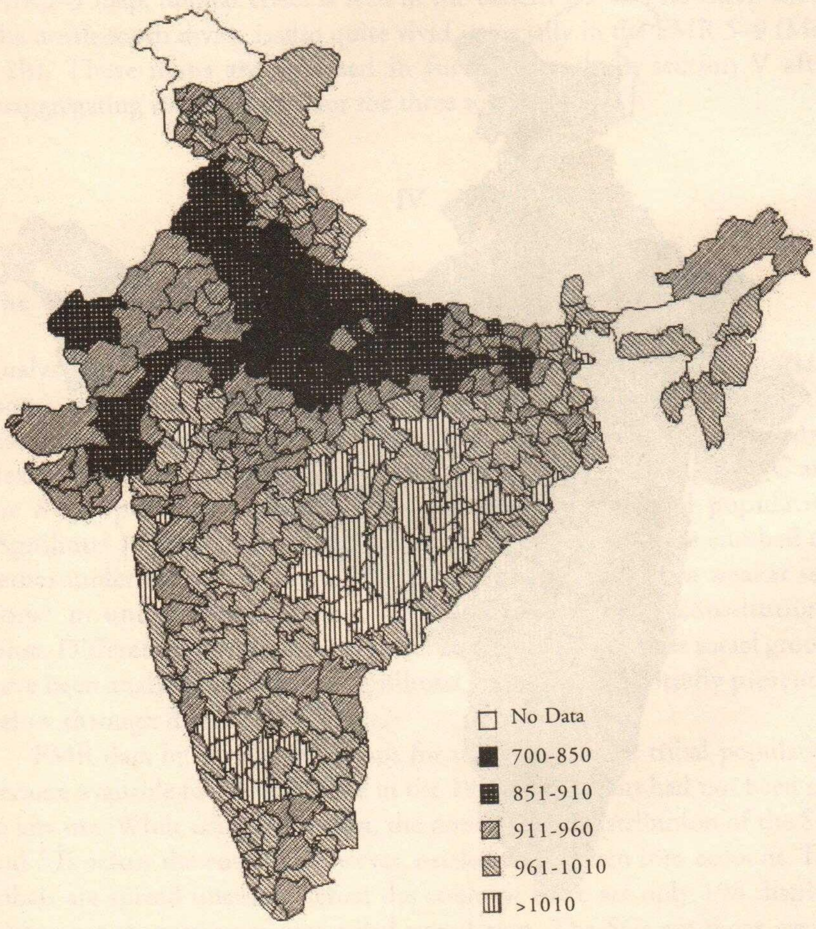


Figure 4c

District Level Map of FMR 0–9: 1981 Census
(Total Population)

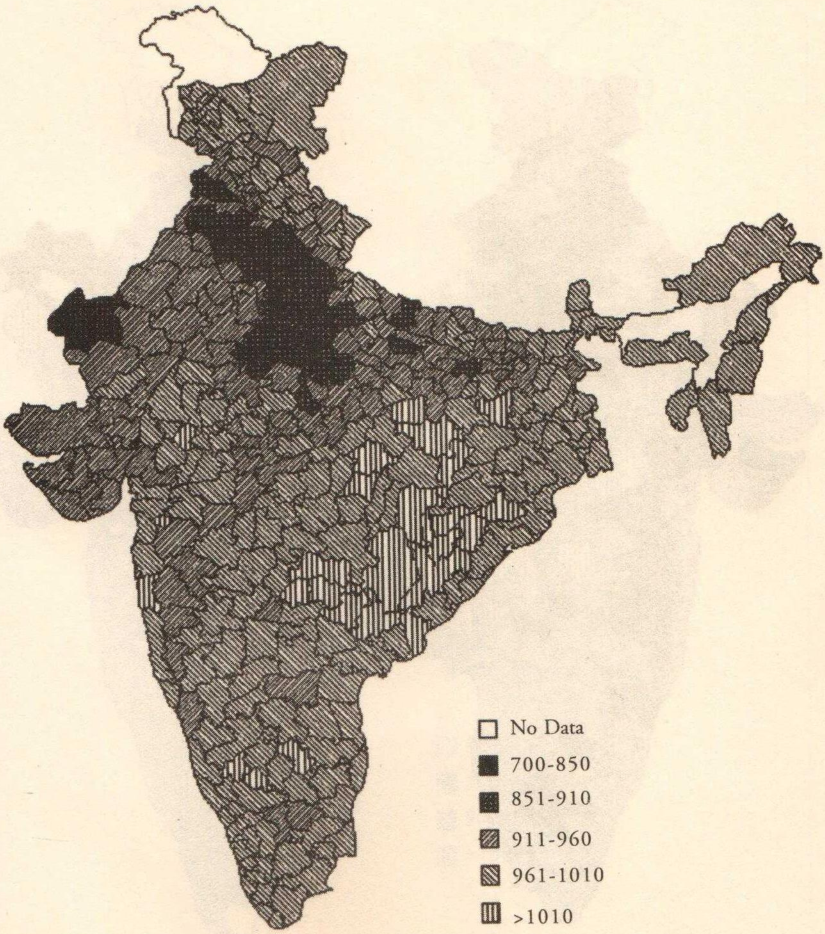


Figure 5.1a

District Level Map of FMR 0–4: 1981 Census
(General Population)

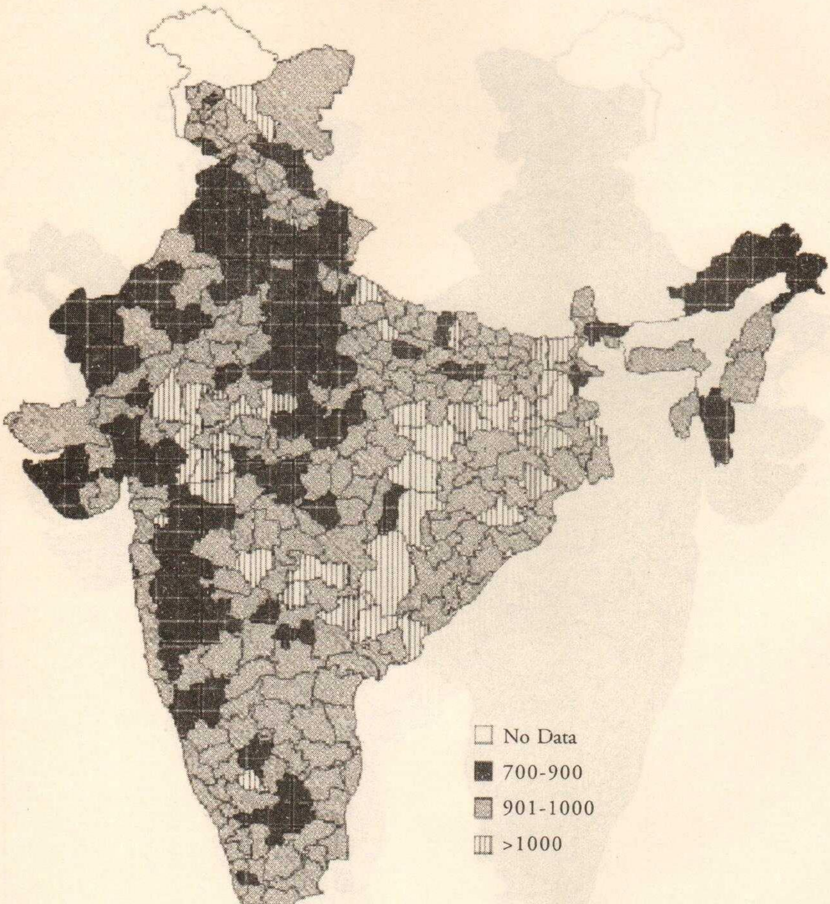


Figure 5.1b

District Level Map of FMR 0–4: 1981 Census (Scheduled Caste Population)

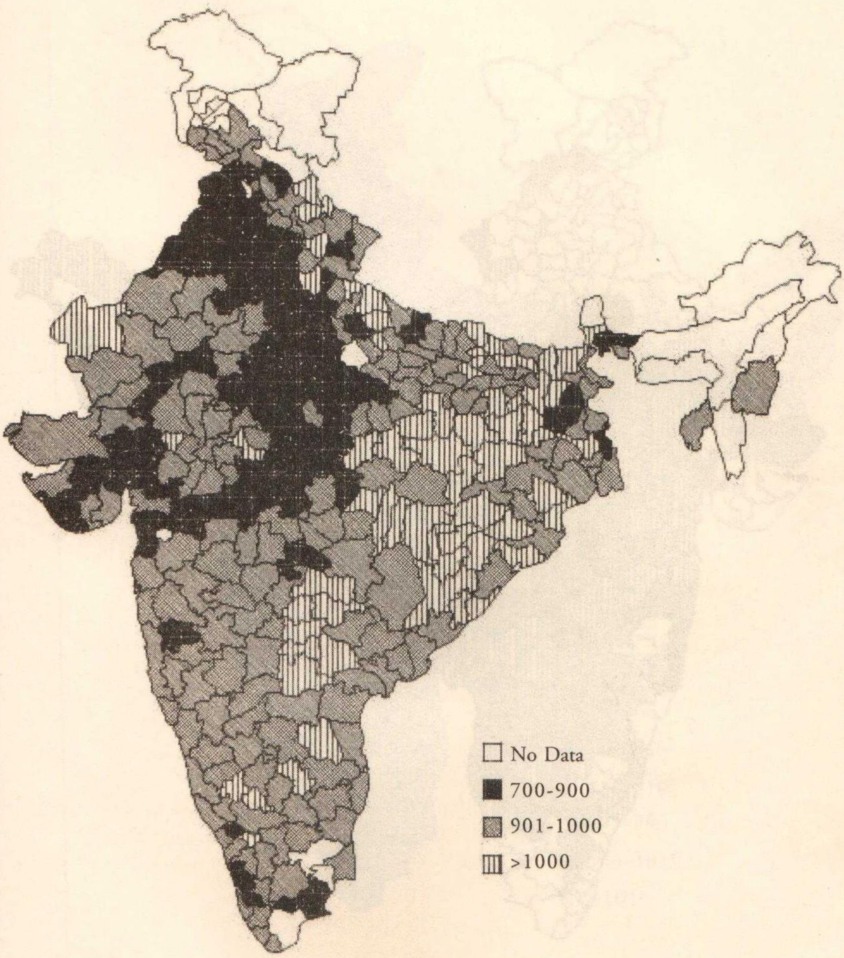


Figure 5.1c

District Level Map of FMR 0–4: 1981 Census

(Scheduled Tribe Population)

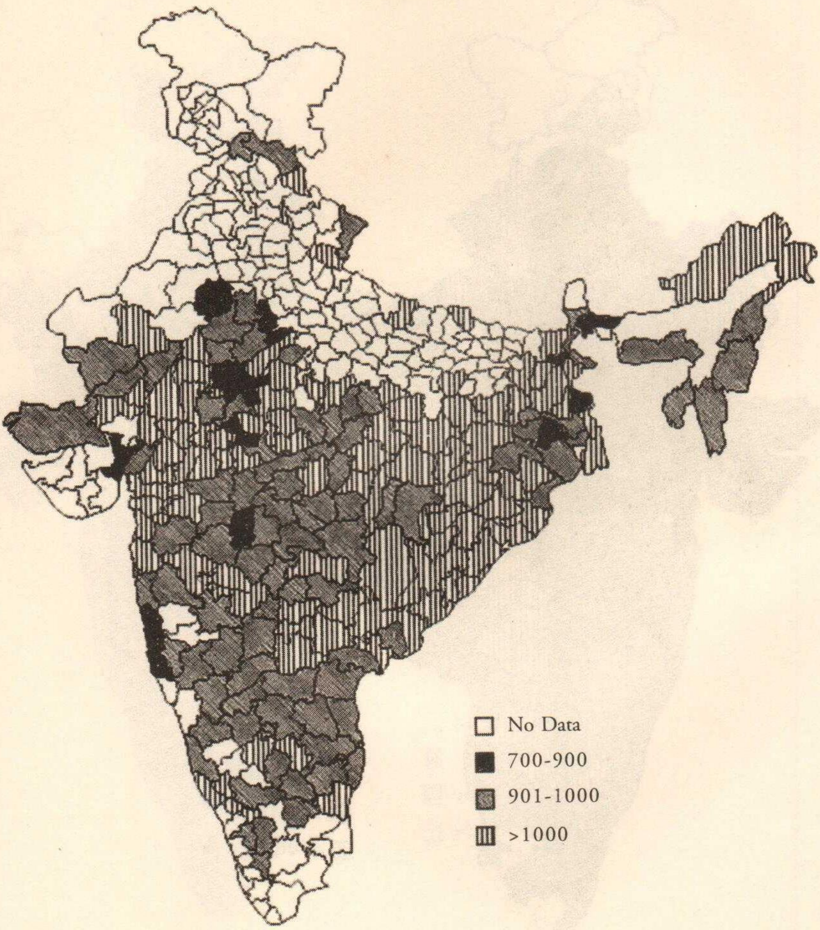


Figure 5.2a

District Level Map of FMR 0–4: 1981 Census
(General Population)

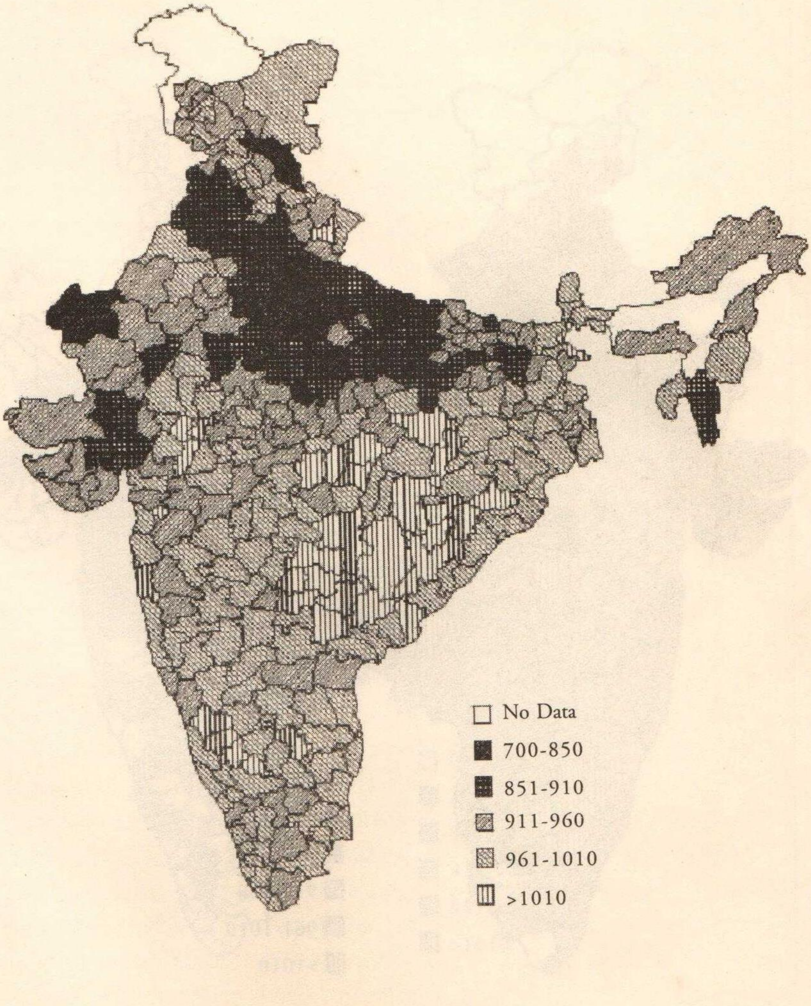


Figure 5.2b

District Level Map of FMR 5–9: 1981 Census
(Scheduled Caste Population)

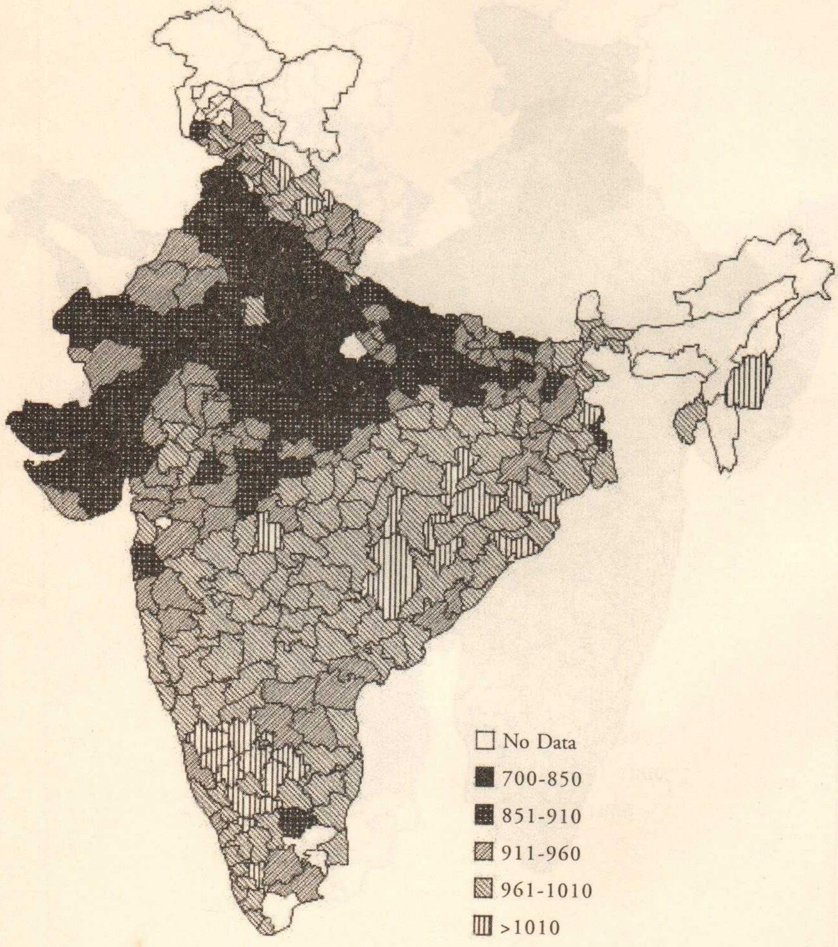
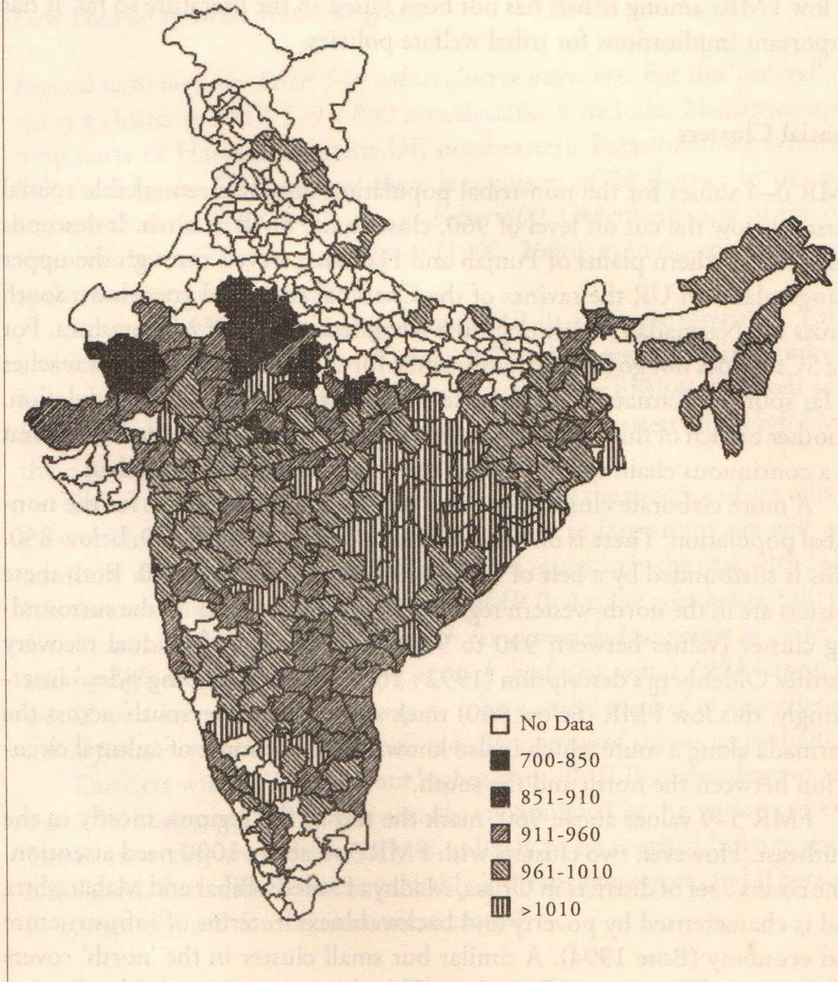


Figure 5.2c

District Level Map of FMR 5–9: 1981 Census
(Scheduled Tribe Population)



Spatial Mapping of Female to Male Ratios by Social Groups

Figures 5.1a to 5.1c present the spatial distribution of FMR 0–4 for the general, Scheduled Caste and tribal population. Figures 5.2a to 5.2c show the corresponding distribution for FMR 5–9. The patterns are quite striking and do not need much elaboration. The generally high values of FMR 0–4 compared to those of FMR 5–9 are clearly brought out by comparing figures 5.1 with figures 5.2 . Higher FMR values among tribals are also vivid. However, districts with low FMR 5–9 among the tribals are also noticeable. The issue of low FMRs among tribals has not been raised in the literature so far. It has important implications for tribal welfare policies.

Spatial Clusters

FMR 0–4 values for the non-tribal population display a remarkable spatial cluster below the cut off level of 960, close to the FMR at birth. It descends from the northern plains of Punjab and Haryana, travels through the upper Ganga plains in UP, the ravines of the Chambal river, and goes down south across the Narmada river through the Khandesh region of Maharashtra. For the SCs it does not go further south, while for the 'general' category it reaches as far south as Karnataka.[5] The pattern is similar for the overall population. Another branch of this belt encircles the hilly regions of Rajasthan and Gujarat in a continuous chain except Nagaur and Sikar districts in Rajasthan.

A more elaborate clustering is seen in the case of FMR 5–9 for the non-tribal population. There is one clear cluster of very low FMR 5–9, below 850. This is surrounded by a belt of FMR 5–9 between 850 and 910. Both these clusters are in the north-western regions. The FMRs 'recover' in the surrounding cluster (values between 910 to 960). This pattern of gradual recovery justifies Oldenberg's description (1992 : 2658) 'pit with sloping sides.' Interestingly, this low FMR (below 960) track spreads into the 'south' across the Narmada along a route which is also known to be the route of cultural circulation between the north and the south.[6]

FMR 5–9 values above 960, mark the rest of the regions, mostly in the southeast. However, two clusters with FMR 5–9 above 1,000 need attention. One covers a set of districts in Orissa, Madhya Pradesh, Bihar and Maharashtra and is characterised by poverty and backwardness in terms of infrastructure and economy (Bose 1994). A similar but small cluster in the 'north' covers hilly region of Gujarat and Rajasthan. This cluster is surrounded by districts with FMR 0–4 < 960 and stands out like a 'mound'—reverse of the 'pit'! These high FMR values in these two clusters could be a result of both excess infant mortality and absence of a gender bias against the female child. It should be noted that the FMRs are high among all the three social groups.

Another region in the north that needs attention is the eastern UP and Bihar belt. Here, FMR 5–9 values are low i.e. between 850 and 910 but the FMR 0–4 values are above 960. In terms of the 16-fold classification described above both excess male infant mortality and excess female mortality would be high in this region and the appearance of 'balanced' FMRs can be misleading.

Low Female to Male Ratio Regions

Regions with very low FMR 5–9 values deserve attention. For the 'general' category a cluster of FMR 5–9 < 850 is noticeable. It includes 21 districts spanning parts of Haryana, western UP, northeastern Rajasthan and ravines of MP. Among the SCs however there is a cluster of 24 district in the same region *where the FMR 5–9 values go below 800.* Oldenberg's use of the term *'Bermuda triangle for the girl children'* (1992: 2658), even though sensational, aptly characterises this region.

Similarly, two isolated cases of low FMR 0–4 deserve attention; Lahaul and Spiti and Kinnaur districts in Himachal Pradesh, and Salem in Tamilnadu. Lahaul and Spiti and Kinnaur districts have very low FMR 0–4 as well as low FMR 5–9. Being situated in a zone surrounded by districts with high FMRs, these present an anomaly that needs investigation.

Salem district has already been in the news for the practice of sex selective infanticide (George et al. 1992). Such practice in large numbers will automatically show up in low 0–4 FMRs and this is precisely the case with Salem. It is the only district in the south where FMR 0–4 value goes below 900 (876 for the non-SC/ST).[7] *A focused search for extremely low values of FMR 0–4 among different regions and groups at block levels (for which 1991 Census data would soon become available), may be a very useful method of detecting areas where female infanticide or foeticide may have assumed serious proportions.*[8]

Districts where FMR 5–9 are higher than FMR 0–4 also deserve attention. This category will not be usually encountered as the pattern of excess female mortality that sets in early is unlikely to be reversed in later years of childhood. Such cases, if stray, probably indicate data errors, and if persistent or systematic, call for detailed micro study.[9]

Different Levels of FMR 0–4 and FMR 5–9

While the maps above highlight the differences in the female to male ratio patterns among the three social groups, it is useful to examine different possible combinations of FMR 0–4 and FMR 5–9. This is done on the same

Table 5.1

Different Combinations of FMR 0–4 and FMR 5–9 (SC population)

FMR 5–9 Range	*FMR 0–4 Range*			
	Low	*Moderate*	*High*	*Very High*
Very Low	18 (883/770)	24 (933/802)	11 (979/841)	0
Low	2 (906/862)	34 (933/871)	31 (981/890)	9 (1022/896)
Moderate	2 (903/970)	15 (947/938)	34 (980/935)	25 (1026/930)
High	0	6 (951/980)	53 (984/980)	33 (1025/980)
Very High	0	2 (950/1008)	11 (985/1008)	30 (1014/1010)

lines as the 16-fold classification for the overall population above. However, for the SC population, another level of FMR 5–9, very low (below 850) has been added.

Introduction of the category 'very low' makes immediate sense. These 53 districts in the top row, represent *unusually high levels of female mortality*. This effect is equally worrying in the nine districts where the FMR 0–4 are very high while FMR 5–9 levels drop below 900. *Estimation of the levels of child mortality for the SC population in these districts deserves immediate priority.* A list of districts where FMR 0–4 is low and FMR 5–9 is very low, is specifically given below to draw attention to the magnitude of the problem. These are all located in a belt that covers Haryana, western UP and the Gwalior division of MP.

Table 5.2

Districts with Very Low FMR Values Among the SCs

District	*FMR 0–4 (SC)*	*FMR 5–9 (SC)*	*FMR 0–4 (Gen)*	*FMR 5–9 (Gen)*
Kurukshetra	904	828	873	878
Karnal	900	835	938	884
Jind	906	782	872	851
Faridabad	878	759	929	863
Gurgaon	908	795	965	905
Morena	870	731	930	826
Bhind	860	742	924	804
Datia	888	782	940	852
Shivpuri	910	809	948	890
Bharatpur	889	717	940	836
Saharanpur	868	790	945	861
Muzaffarnagar	849	749	958	867
Meerut	908	792	960	859
Ghaziabad	852	752	935	860
Bulandshahar	810	715	926	842
Jalaun	908	746	954	888
Jhansi	906	810	948	906
Hamirpur	876	728	950	847

These districts readily reveal the serious survival adversities faced by the SC girl children. FMRs in their case, particularly in the 5–9 age group are alarmingly low, and lower than those for the general category.

There is another set of districts where high FMR 0–4 values mask very low FMR 5–9 *if juvenile FMRs are used.* These districts are mostly located in the eastern UP and northern Bihar region. This region has conveyed an impression of more balanced FMRs compared to the upper Gangetic region (Libbee 1980; Miller 1981; Sopher 1980). *Such 'balance' camouflages both high male infant mortality and high girl child mortality.*

Districts where FMR 0–4 and FMR 5–9 are both high are invariably located in the southeast. While the absence of bias against the girl child in these regions is not denied, the suspicion of higher infant male mortality cannot be avoided.

Among the tribals the FMRs are distributed differently. This distribution is shown in Table 5.3.

The first striking feature of this table is the high FMR 0–4 values. There are only 3 districts where these values go below 910 and another 13 where these are below 960. This signifies absence of excess female mortality during infancy among tribals.

FMR 5–9 values are also high by and large. In fact there are only 11 districts in Rajasthan where FMR 5–9 for the tribals go below 900. Even the 45 districts with FMR 5–9 values are between 900 to 950, mainly lie in the plains of Rajasthan and northern MP. However, in about 16 out of these 56 districts (top row in Table 5.3 above), there is a disturbing drop from high levels of FMR 0–4 to low levels of FMR 5–9. These FMR 5–9 values are not high by the standards of tribal FMRs even though these are higher compared to those for non-tribal population.[10]

However, the point of more serious concern is, the *unusually high FMR values among the tribals.* The set of 36 districts where both FMR 0–4 and FMR 5–9 assume very high values, need special scrutiny. As previously men-

Table 5.3

Different Combinations of FMR 0–4 and FMR 5–9

(ST Population)

FMR 5–9 Range	*FMR 0–4 Range*			
	Low	*Moderate*	*High*	*Very High*
Low	1	4 (930/842)	7 (982/885)	4 (1009/896)
Moderate	2	6 (945/930)	25 (981/939)	28 (1033/942)
High	0	2 (988/981)	27 (988/981)	52 (1030/980)
Very High	0	1	8 (990/1000)	36 (1021/1022)

tioned, absence of discrimination against the girl child may be one contributing factor for the high FMRs. However, *the possibility of excess male foetal wastage and infant mortality driven by poverty and underdeveloped health infrastructure cannot be ruled out.* The National Family Health Survey (NFHS) does reveal poorer ante-natal care and immunisation coverage of the tribal children and supports such a concern (IIPS 1995).

The above analysis clearly bring out the differences in the FMR patterns among the three social groups and the need to study these separately. Such data were not available before the 1981 Census. The 1991 Census data by 5-year age groups is yet to become available for the SC and ST population separately. As the next section shows, a number of useful inferences can still be drawn from the recently released 5-year age group data for the 1991 Census for the overall population.

V

The use of juvenile age group FMR data offers several advantages. They are free from the effects of sex selective migration and are able to reflect the consequences of the under–5 mortality patterns. Besides these, they also reflect the decennial changes in the sex ratio patterns more readily, compared to the all age group FMRs. It is useful to compare, therefore, the trends in the JFMRs between 1981 and 1991. The 1991 Census data used here (Source: Office of the Registrar General of India: personal communication) cover nearly 440 district units. These are not quite comparable with the 1981 data on an overall basis for a number of reasons. First, a number of new districts have been created between 1981 and 1991. Second, the 1981 Census could not be conducted in the state of Assam, while in 1991 the Census operation could not be conducted in the state of Jammu and Kashmir. Third, the 1991 data used here covers a large number of districts in the northeast. In the IDDD data base, these districts have been merged together. Finally, the 1991 data are provisional and not yet available separately by the three social groups. These differences not withstanding, a number of important trends can still be identified.

It is useful to begin with the 16 fold combination of FMR 0–4 and FMR 5–9 for the 1991 FMR data. The distribution of districts is given in Table 6. To facilitate comparison with the 1981 data the number of districts in the 1981 Census are given in parentheses.

Two trends are unmistakable. Both lead to decline in the FMRs but one is desirable and the other is not. The desirable decline has occurred among the very high FMR 0–4 category districts; from 82 in 1981 to 30 in 1991. Of

Table 6

Distribution of Districts by Levels of FMR 0–4 and FMR 5–9

FMR 5–9 Range	*FMR 0–4 Range*			
	Low	*Moderate*	*High*	*Very High*
Low	41	45	25	1
	(10)	(54)	(27)	(6)
Moderate	4	62	67	15
	(1)	(26)	(55)	(18)
High	–	46	91	12
		(12)	(83)	(28)
Very High	2	8	20	2
		(1)	(15)	(30)

these 30 districts, 15 in the northeast were not included in the 1981 IDDD as separate units. The decline is effectively from 82 units in 1981 to 15 units in 1991 signifying a reduction in the infant mortality rates and the concerned agencies can take a justifiable pride in it. It remains to be seen, however, if the decline in the infant mortality has occurred among the ST and the SC population.

The number of districts in which the FMR 0–4 has deteriorated to low levels (< 910) has increased from 13 in 1981 to 47 in 1991. Most of these districts are in the northwestern region of the country except Salem and Dharmapuri in Tamilnadu, Kottayam in Kerala, and Sangli in Maharashtra. Similarly, the number of districts where FMR 0–4 is below 960 has increased from 106 in 1981 to 208 in 1991 pushing further and deeper into the southern states. This trend is disturbing and indicative of increasing girl child mortality in the post-neonatal period and the 1–4 age group. The 47 districts with low FMR 0–4 could signify high rates of sex selective abortions or even female infanticide. Given that this is the region where the FMR values among the SC population are significantly lower than those for the overall district population, an analysis of the 5-year age group FMR ratio figures from the 1991 Census assumes priority. The increase in areas with FMR 0–4 < 960 is quite conspicuous and so is the shrinkage of area where FMR 0–4 and FMR 5–9 had very high values in the 1981 Census.

An interesting pattern is noticeable in the FMR 5–9 maps. The number of districts where the FMR 5–9 values were alarmingly low i.e. below 850 has in fact reduced from 27 in 1981 to 12 in 1991. In certain parts of the eastern UP and Bihar, the FMR 5–9 values have marginally improved, while in some of the regions notably northern Rajasthan, these have deteriorated. Given the decline in the FMR 0–4 values, the overall FMRs in the juvenile age group are bound to be lower. In fact, the number of districts where the FMR 0–9 is below 910, has increased from 49 in 1981 to 71 in the 1991.

In the absence of the data on mortality and separate data by social groups for the 1991 Census, further inferences cannot be drawn at this stage. This is proposed to be done at a later date when the data become available. However, for the purpose of policy intervention the available data provides adequate preliminary information.

VI

Implications for Policy and Further Research

What significance do these results have for the policy and analytical purpose? First, the analysis of sex ratio data must move away from aggregate levels, e.g. state level or all age group level data to more disaggregated data. Even within the 0–9 age group, the data need to be unpacked by the 5-year age groups. This is compatible with the available Census classification even if fortuitously. It is a happenstance, that 90 per cent of the juvenile deaths take place below the age of 5 years. But this means that FMR 5–9 are not affected by the mortality in the 5–9 age group but reflect the excess girl child mortality in the 1–4 age group.

The demographic consequences of the fault line in the under–5 mortality has important implications. These allow the FMR data to indicate the nature of the sex differentials in mortality. The role of excess male infant mortality had not been highlighted in the analyses of sex ratios in the literature. FMR 0–4 is an effective indicator of its incidence.

However, low values of FMR 0–4 can serve as an early warning signal about the worsening survival conditions for the girl children within the first year of life. Whether the low levels are a result of excess mortality in the post-neonatal stage, or female infanticide or sex selective abortions is a matter of further investigation. The analysis brings the role of excess female mortality in early years of childhood in sharper focus. More importantly, it offers a method of identifying survival disadvantage based on the FMR data *even in the absence of suitably disaggregated mortality estimates*.

Different FMR patterns among the SC and the ST population groups necessitate a separate analysis of sex ratios among them. The overwhelming pattern in the available analyses e.g. Kishore (1993) or Murthi et al. (1995), is to use the proportion of SC, ST population. Given the nature of differences this is not adequate.

Above patterns provide certain urgent agenda for the Census organisation. First, the child mortality rates based on the 1981 Census must be estimated for the SC and the ST population separately and made available for analysis. Second, 5-year age group data by social groups for the 1991 Census must be released on a priority basis. Child mortality rates should also be estimated from the 1991 data and made available for analysis. Finally, districts and population groups with alarmingly low FMR 0–4 values or alarmingly high drop between FMR 0–4 and FMR 5–9 values should be selected for focussed micro level studies. This has been done on the basis of 0–6 age group FMRs in 11 districts, but the problem is much deeper and needs to be identified with the help of FMR 0–4 values disaggregated by social groups.

Recognition of the effects of excess male infant mortality rates in regions with very high FMRs is a *new feature of this analysis.* It has shown that very high FMRs, say, above 1000, should cause concern and indicate a need for improving health infrastructure in regions with such high FMRs. Where such infrastructure exists, access to it has to be ensured. The cogent message that 'availability does not guarantee access' has been brought out in Sen's entitlements analysis in general terms and in Kynch and Sen (1983) in the particular context of women's access to health care system. Such an access will result in an *inevitable and desirable reduction in unusually high FMRs.* At state or all India level the overall FMR will drop further once the districts with FMR>1000 no longer remain available to compensate for the districts with alarmingly low FMRs. But this should not be misread as indicator of the increasingly adverse survival condition for the girl children. Currently both the academic and the policy mind set treats higher FMRs as necessarily better and reduction in FMRs as necessarily undesirable. *It is time that a distinction is made between high FMRs and balanced FMRs.* This analysis suggests a range of 960 to 980 as a balanced figure or 'norm.' Districts with FMRs below this level have to catch up with the 'norm,' districts with FMRs above this need closer scrutiny.

Another point that merits urgent attention in this context is of very low FMRs among poorer groups among whom levels of infant mortality rates and the consequent excess male infant mortality are bound to be high (Jain and Visaria 1988; Khan 1993). This necessitates a rethinking of the traditional explanation for the high FMRs observed among the poor. It is usually presumed that discrimination against the girl children among the poor is less. This is not disputed. But part of the high FMRs among the poor may also arise due to excess male infant mortality. 'Balanced' FMRs among them should be treated with caution for it may arise from a combination of both high male infant mortality and high excess of female child mortality. And if the FMRs are low these could indicate *very strong discrimination against the girl child.*

Visaria had once suggested that sex ratios at birth may vary by ethnicity (Visaria 1971). This was based on his observations of the black population in different regions in the world with lower sex ratios at birth compared to other population groups. In Indian context, the study of FMR at birth for the tribal population vis-à-vis non tribal population may be of some interest. FMR at birth for the tribals may turn out to be higher. But this may be due to health environment and not due to 'ethnicity' reasons. This can perhaps be verified through a comparison of the sex ratios at birth between the tribals in the central and the north eastern belt as the health environment and infrastructure for the latter is of a better quality (NSSO 1994; Raza and Ahmed 1990).

Woman and Child Welfare Policy

The first and foremost point to be recognised is the need for plurality in the design of policy interventions. The contents of these interventions have to differ altogether between regions as disparate as, say western UP plains and tribal Orissa. The programme design has to be sensitive to the different patterns of FMRs both spatially and socially.

Unusually low and high FMRs put a big question mark on the design and implementation of welfare programmes in general and ICDS (Integrated Child Development Scheme) in particular. In low FMR areas *ensuring the survival of girl children beyond neonatal period must assume topmost priority.*[11] This means ensuring the access of these children to health care and nutrition. This is not the place to go into the mechanics of targeting. However, if selective targeting is problematic, it may be necessary to cover all children up to the age of 5 universally.

Growing masculinisation of sex ratios (Miller, 1989) in the northwest and across the north-south divide is vividly captured by the district level maps of FMR 0–4. These and the low FMR 5–9 values should be used as a criterion for restricting the flow of developmental assistance to 'non-performing' districts. Districts with low values of both FMR 0–4 and FMR 5–9 should be specially targeted for this purpose. Such restrictions have a precedent. In the rural development assistance a specified portion of assistance is earmarked for afforestation programme because of the problem of deforestation. There is no reason why similar expenditure cannot be earmarked for ensuring the survival of the girl children and prevention of avoidable deaths of male and female infants unless the polity decides that the problem is not 'sufficiently' alarming. Such restrictions on developmental assistance can also be placed under the special component plan dealing with the welfare of the SC population and the tribal sub plan assistance concerned with the welfare of the tribal population.

Very high FMR regions place a question mark on the effectiveness of immunisation programme in particular and on the level and quality of health infrastructure in particular. In these regions priority has to be given to *reduction in mortality rates in general and infant mortality rates in particular*. While the 1991 results show a welcome decrease in the unusually high values of FMR 0–4 and FMR 5–9, this momentum should be continued further.

To Sum Up

Sex ratio patterns in India are complex and diverse. Their analyses have to be sensitive to this diversity in its spatial, social, cultural and economic aspects. Present analysis has pursued only two of these factors age and social groups using the juvenile age group data. This has provided new and rich insights for policy as well as research. In the interest of brevity, it is difficult to go into the nuts and bolts of the policy implications of the patterns. But the agencies, groups and scholars working on the problem of the survival of the girl child in India will immediately recognise the usefulness of this disaggregated analysis and draw their own lessons from it. It is hoped that this approach will gain a wider acceptance in the analyses in the future and lead to a more effective understanding of the problem and design of more focussed and effective policy interventions.

Notes

1. This is a marginally modified version of my paper submitted at the International Conference on Women in Asia-Pacific at Singapore, August 11–13, 1997.
2. The cut off values for these levels do not have any 'analytical' justification except for 960 which is close to the FMR at birth. These were basically chosen by examining the spatial distribution of FMRs which reveal contiguous district clusters with these FMRs as cut off points.
3. To facilitate quick reference against the FMR maps, an administrative map of India with district boundaries (Map I) and a physical map (Map II) are also provided in the Appendix at the end of the article.
4. 'Weaker sections' is a very commonplace label in official parlance and records for SCs, STs, and women!
5. Except East Nimar (969) and Bijapur (965).
6. See Bharadwaj (1973: Ch. II and V), Sopher (1980: Ch. 10), Spate (1971, Ch. 6) and Schwartzberg (1992: IIIA and related maps) on the point of cultural circulation between the north and the south.
7. This increases to 922 in the 5–9 age group signifying absence of excess female mortality beyond neonatal period. Interestingly the FMR 0–4 for the SC in Salem is 995 which indicates that infanticide may not be commonplace among the Scheduled Castes. Figures for 1991 are not yet available.
8. This has been suggested by this author in respect of Scheduled Castes in Bihar to Adithi an NGO working on infanticide in Bihar. The 1981 Census data provide caste-wise 5-year age group data for Scheduled Castes. A preliminary analysis reveals that certain Scheduled Castes among whom female infanticide is allegedly spreading also happen to have very low FMR values in the 1981 Census data. But this study, a sensitive one, is nascent and awaits 1991 Census data by castes for 5-year age group.
9. There are 7 such instances for tribal groups, 16 for the SC, and 31 for the general population. These are mostly stray cases except for one continuous belt of 8 districts in Maharashtra and 3 in Karnataka for the general category which warrants scrutiny if the pattern is repeated in 1991. Similarly for SC there is a contiguous belt of four

districts in Kerala viz. Waynad, Trichur, Ernakulam and Kottayam. Bilaspur (Himachal), Betul (MP) and Jalpaiguri (WB) show this trait for both the SC and general category.

10. This drop cannot be explained away using the excuse of 'under enumeration of girl children' work except by invoking under enumeration in the 5–9 age group and its absence in the 0–4 age group. That is quite unrealistic. Moreover, the tribal groups are far less likely to practice under reporting of the girl children given their social structure.
11. This does not mean that the problem of infanticide or sex selective abortions is less important. The contention simply is that the girl children who have escaped death in or before neonatal period must not be allowed to die through 'entitlements failure.'

References

Agnihotri, S.B. 1995. 'Missing Females: A Disaggregated Analysis,' *Economic and Political Weekly*, 30(33): 2074–84.

—— 1996, 'Juvenile Sex Ratios in India: A Disaggregated Analysis,' *Economic and Political Weekly*, 31(52): 3369–82.

—— 1997, 'Workforce Participation, Kinship and Sex Ratio Variations in India,' *Gender, Technology and Development*, 1(1): 75–112.

Bardhan, P.K. 1974. 'On Life and Death Questions,' *Economic and Political Weekly*, 9(32–34): 1293–1304.

—— 1986, 'On the Economic Geography of Sex Disparity in Child Survival in India: A Note,' *Proc. of SSRC on Sex Differentials in Mortality and Health Care in South Asia*, Dhaka, January.

Bharadwaj, S.M. 1973. *'Hindu Places of Pilgrimage in India,'* London: University of California Press.

Bose, A. 1991. *'Population of India—1991 Census Results and Methodology,'* New Delhi: B.R. Publishers.

—— 1994, *'Demographic Zones in India,'* New Delhi: B.R. Publishers.

Chatterjee, M. 1990. *'Indian Women: Their Health and Economic Productivity,'* Washington: The World Bank.

Dasgupta, M. 1995. 'Life Course Perspectives on Women's Autonomy and Health Outcomes,' *American Anthropologist*, 97(3): 481–91.

Dyson, T. and M. Moore. 1983. 'On Kinship Structure, Female Autonomy And Demographic Balance,' *Population and Development Review*, 9: 35–60.

George S., R. Abel, and B.D. Miller. 1992. 'Female Infanticide in Rural South India,' *Economic and Political Weekly*, 27(8): 429–31.

Ginsberg, C.A. and A.C. Swedlund. 1986. 'Sex–Specific Mortality and Economic Opportunities: Massachusetts, 1860–1899,' *Continuity and Change*, 1(3): 415–45.

Goody, J. 1990. *'The Oriental, the Ancient and the Primitive,'* Cambridge: Cambridge University Press.

Government of India. 1988. 'Child Mortality Estimates of India,' Occasional Paper No. 5 of 1988 (1981 Census), New Delhi; Office of the Registrar General, India.

—— 1989, 'Social and Cultural Tables; Part IV, A(iv), Table: C–2 (Scheduled Tribes),' New Delhi: Office of the Registrar General, India.

—— 1989, 'Social and Cultural Tables; Part IV, A(i), Table: C–2 (Scheduled Castes),' New Delhi: Office of the Registrar General, India.

—— 1991, 'Survey of the Causes of Death—Annual Report 1991,' New Delhi: Office of the Registrar General and Census Commissioner, India.

Harriss, B. 1989. 'Differential Child Mortality and Health Care in South Asia,' *Journal of Social Studies*, 44: 2–123.

International Institute for Population Sciences (IIPS). 1995. 'National Family Health Survey, India 1992–93.' Mumbai: IIPS.

Jain, A.K. and P. Visaria (eds.). 1988. *'Infant Mortality in India: Differentials and Determinants.'* New Delhi: Sage.

Johansson, S.R. 1984. 'Deferred Infanticide: Excess Female Mortality During Childhood,' in G. Hausfater and S.B. Hardy (eds.). *Infanticide*. New York: Aldine

—— 1991, 'Welfare, Mortality and Gender, Continuity and Change,' in Explanations for Male/Female Mortality Differences over Three Centuries,' *Continuity and Change* 6(2): 135–77.

—— 1996, 'Excess Female Mortality' in A. Digby, and J. Stewart (eds.), *Gender, Health and Welfare*. London: Routledge.

Kanitkar, T. 1991. 'The Sex Ratio in India: A Topic for Speculation and Research,' *Journal of Family Welfare*, 37(3): 18–22.

Kapadia K. 1994. 'Bonded by Blood: Matrilateral Kin in Tamil Kinship,' *Economic and Political Weekly*, 29(5): 855–61.

Khan M.E.. 1993. 'Cultural Determinants of Infant Mortality in India,' *The Journal of Family Welfare*, 39(2): 3–13.

Kishore, S. 1993. 'May God Give Sons to All: Gender and Child Mortality in India,' *American Sociological Review*, 58: 246–65.

Klasen, S. 1994. 'Missing Women Reconsidered,' *World Development*, 22(7): 1061–71.

Kynch, J. and Sen, A.K. 1983. 'Indian Women: Well Being and Survival,' *Cambridge Journal of Economics*, 83(7): 363–80.

Libbee, M. 1980. 'Territorial Endogamy and the Spatial Structure of Marriage,' in D.E. Sopher (ed.) *An Exploration of India*. London: Longman.

Malhotra, A., R. Vanneman and S. Kishore. 1995. 'Fertility, Dimensions of Patriarchy and Development in India,' *Population and Development Review*, 21(2): 281–305.

Miller, B.D. 1981. *The Endangered Sex*, Ithaca, N.Y.: Cornell University Press.

—— 1984, 'Daughter Neglect, Women's Work and Marriage,' *Medical Anthropology* 8(2): 109–25.

—— 1989, 'Changing Patterns of Juvenile Sex Ratios in rural India, 1961 to 1971,' *Economic and Political Weekly*, 24(22); 1229–35.

Murthi, M., A. Guio and J. Dreze. 1995. 'Mortality, Fertility and Gender Bias in India: A District level Analysis,' DERC Discussion Paper No. 61, London School of Economics.

Nath, V. 1991. 'Official Paper on 1991 Census,' *Economic and Political Weekly*, 26(19): 1229–36.

NSSO. 1994. *Sarvekshana*, April-June 1994: 1–80.

Oldenberg, P. 1992. 'Sex Ratio, Son Preference and Violence in India,' *Economic and Political Weekly*, 28(49–50): 2657–62.

Pisani, E. and P. Zaba. 1997. 'Son Preference, Sex Selection and the Marriage Market,' Forthcoming.

Rao, V. 1993. 'The Rising Price of Husbands: A Hedonic Analysis of Dowry Increases in India,' *Journal of Political Economy*, 101(4): 666–77.

Raza, M. and A. Ahmad. 1990. *An Atlas of Tribal India*. New Delhi: Concept/ICSSR.

Rosenzweig, M. and T.P. Schultz. 1982. 'Market Opportunities, Genetic Endowment and Intra-family Resource Distribution: Child Survival in Rural India,' *American Economic Review*, 72: 803–15.

Schwartzberg, J.E.(ed.) 1992. *'A Historical Atlas of South Asia.'* Oxford: Oxford University Press.

Sen, A.K. 1987. 'India and Africa: What Do we Have to Learn from Each Other?' United Nations University, Wider Discussion Paper No. 19.

Sopher, D.E. (ed.) 1980. *An Exploration of India.* London: Longman.

Spate, O.H.K. and Learmonth, A.T.A. 1967. *India and Pakistan: Land, People and Economy.'* London: Methuen & Co.

Subramaniam, R. 1996. 'Gender Bias in India: The Importance of Household Fixed Effects,' *Oxford Economics Papers,* 48(2): 280–99.

Vannemann, R. and D. Barnes. 1992. Appendix V–6, Economic Activities, *Indian Development District Database.* Centre for Population, Gender and Social Inequality, University of Maryland.

Visaria, P. 1971. *The Sex Ratio of the Population of India: Monograph No. 10, Census of India 1961.* New Delh: Office of the Registrar General, India.

Waldron, I. (1983). 'Sex Differences in Human Mortality: The Role of Genetic Factors,' *Social Science and Medicine,* 17: 321–33.