Selected Papers on the Declining Sex Ratio

Social Demography of Excess Female Mortality in India

New Directions

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Discussions of sex differentials in mortality in South Asia have suffered from a lack of theoretical depth. On what basis do we decide that a certain mortality difference must be socially rather than purely biologically derived? The answer is usually to compare the observed mortality difference to the expected difference based on western experience, but this glosses over the need to examine South Asian environments and epidemiology for their own expected effects on sex differentials. In addition, what are the expected biological sex-differential outcomes of levels of mortality that are, by international standards, extremely high? Are age-specific patterns of mortality for both sexes different from those based on western models, and why? Is the relationship between these sex-specific patterns different than it is in western experience?

In trying to answer some of these questions, the author advances two presuppositions: (1) that excess female mortality, in its socially conditioned aspect, forms a part of an overall reproductive strategy, which in most cases reflects strategic calculations of social units considerably larger than the household; (2) that class and gender relations may have primacy over many other independent variables as determinants of demographic rates. In other words, variables which operate at a more proximate level may be decisively influenced by changes in class and gender relations, and in their interrelations.

THE term 'social demography' usually connotes a primarily descriptive, and highly statistical, approach toward examining the empirical relations between socio-economic and demographic phenomena, particularly those empirical relations that *can* be examined given the kinds of data available (based on the kinds of questions asked) in surveys and censuses. Given a theoretical framework which is often rather narrow (and is, in part, often derived from an accumulation of earlier empirical examinations of similar data sets), this approach can be revealing of very broad patterns along important lines. Based on such enquiries, we surely start with the notion, for example, that female education has a powerful relationship with child mortality.

Such an approach, however, leaves us in no position to address adequately more complex and fine-grained patterns of socio-demographic interrelationships. This is not really the fault of statistical methodology, which is able to simplify very complex tables of cross-classified data using such techniques as log-linear analysis (of which hazard models are a variant); but the most powerful methods available fail to illuminate problems that are not adequately addressed theoretically. In terms of the example given regarding the relationship between female education and child mortality, we are for the most part left groping with guesses and generalities about what education actually *means* and *does* to people under different circumstances.

Finer data based on better questions are surely needed: but without theory, we do not know the right questions to ask. What we would wish for is the chance to test adequately specified hypotheses based on an adequate theory, using adequate data. I will deal with these requirements as they relate to the topic of excess female mortality in India, for the most part all too briefly, but with the hope of suggesting a more systematic consideration of them to researchers of the issue.

In reading the literature on sex differentials in mortality in the South Asian culture area, a lack of theoretical depth emerges. This sense is strongly felt from a purely demographic perspective, and gains even further momentum given a social historical perspective.

Some demographic doubts can be sketched briefly. On what basis do we decide that a certain mortality difference must be socially rather than purely biologically derived? The answer is usually to compare the observed mortality difference to the expected difference based on western experience, but this glosses over the need to examine South Asian environments and epidemiology for their own expected effects on sex differentials. In addition, what are the expected biological sex-differential outcomes of levels of mortality that are, by international standards, extremely high? Are age-specific patterns of mortality for both sexes different from those based on western models, and why? Is the relationship between these sex-specific patterns different than it is in western experience? I will shortly discuss some results of analyses that I have performed in trying to answer some of these demographic questions.

The more sociological doubts are multilayered and cannot be sketched quite so briefly. My own thinking about these from an historical perspective has resulted in two presuppositions: (1) that excess female mortality, in its socially conditioned aspect, forms a part of an overall reproductive strategy, which in most cases reflects strategic calculations of social units considerably larger than the household; and (2) that class and gender relations may have primacy over many other independent variables as determinants of demographic rates. In other words, variables which operate at a more proximate level may be decisively influenced by changes in class and gender relations, and in their interrelations.

Net Reproductivity within a Mode of Production Framework

In the first place, a theoretically rigorous conception of class ought to illuminate both gender inequality and sex differentials in mortality more satisfactorily than the mixed concept of socio-economic status, which is sometimes used. What is needed is research on the phenomenon of differential mortality as it operates within the total demographic and social framework of which it is a part.

A theoretical basis for this kind of thinking may be found, in part, in a literature which attributes differences in demographic behaviour to differences in modes of production within which households are embedded (Caldwell, 1983, Meillassoux, 1981). This literature has not been adequately critiqued and mined for hypotheses specifying demographic behavioural differences, although Caldwell's ideas are more widely paraphrased than those of any other demographic theoretician today.

One problem lies with Caldwell's somewhat rigid conception of modes of production, which apparently allows for very little of the dimension of social stratification and class formation in its application to developing countries. Caldwell sees the contrasting modes there as dichotomous: "The real reproductive divide", he states, "lies between modes of production based largely on networks of relatives and those in which the individual may sell their labour to complete strangers" (1983, p 568). My own work on historical and contemporary South Asia, however (Clark, 1979, 1983, 1984), convinces me that there is a reproductive divide between classes *within* given modes of production, and that mortality differentials are involved in differential reproductivity. (See also De Vos, Clark and Murty, 1987.) Thus there can be expected to be interrelations between demographic rates and such socio-economic phenomena as class position within a given mode of production.

Claude Meillassoux, thus far not in wide use as a theoretical reference point among demographers, identifies an interdependence between the domestic and capitalist modes in developing countries, in what might well be called the "interpenetrative mode" of production. According to this theoretical framework, within a situation of uneven development the market sphere partially depends upon various formerly autonomous domestic spheres (which originate in tribal social organisation) for the production of labour-power in the form of children (Meillassoux, 1981). Thus decisions about marriage and reproduction do not only concern the members of households. While the household participates in its own micro-level political economy, encompassing gender relations (of which marriage networks form a particularly important element), it faces constraints and incentives from within the larger political economy which affect its reproductive options. Within this context, class relations between and among households, which mirror interrelations among modes of production, play an important role as determinants of reproductivity. A similar theoretical framework has engendered important studies in European historical demography (e g, Tilly, 1978) in which class has been found to be a significant context for differential demographic behaviour.

We may start, then, from a theoretical framework which presupposes interrelationships between class and gender relations, and a set of pathways from these relations through family decision making processes to reproductivity (which incorporates child mortality). Figure 1 provides a sketch of the full theoretical model, which conceptualises a mode of production in both its productive and reproductive aspects—the reproductive aspect being more closely specified in terms of demographic measures here than in most such theoretical formulations.

The final outcome, net reproductivity, corresponds to the familiar demographic measure, the net reproduction rate. It can easily be computed for sufficiently large samples if one has either age-specific fertility and mortality rates, or estimates of the total fertility rate and female survival to the mean age at child-bearing. These measures can be straightforwardly computed for populations and groups, or estimated using logit models for much smaller units such as households, given that this is done within a large data set.

The dominant technology (cell A) serves to classify the mode itself. The health technology (cell C) is closely linked to the productive technology, and forms the nexus of proximate determinants (as called for in Mosley and Chen, 1984); but its actual uses, in the context of family decision processes, are intermediated by the social relations of production (class relations) and reproduction (gender and generational relations), as found in cells B and D. An important example of this kind of intermediation will be found in the following exposition of some of the implications of the theory.

In agrarian and tribal societies under patrilineal kinship organisation, women have long been objects of exchange along with other wealth in the forms of dowry and brideprice, originally as an outcome of the very process of social articulation (Levi-Strauss, 1969). The economic use of women as exchange objects clearly predates one in which an expected wage from their labour is calculated. Rosenzweig and Schultz (1983)

FIGURE 1: STRUCTURE AND REPRODUCTIVE OUTCOMES OF A MODE OF PRODUCTION

Panel 1
Diagram of a Mode of Production

	Forces	Social Relations
	(A)	(B)
Material Production	Technology Levels of skill and human capital	Surplus appropriation system Location of units in class system Rules governing labour supply
	(C)	(D)
Human Reproduction	Available medical and contraceptive technology Levels of nutrition and health	Family authority systems, marriage networks and gender roles Rules of distribution and inheritance

Panel 2
Reproductive Outcomes

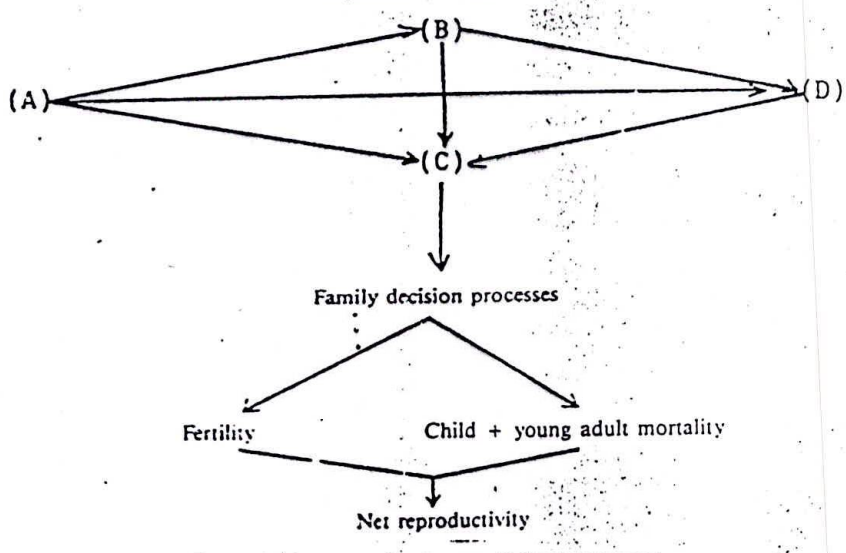
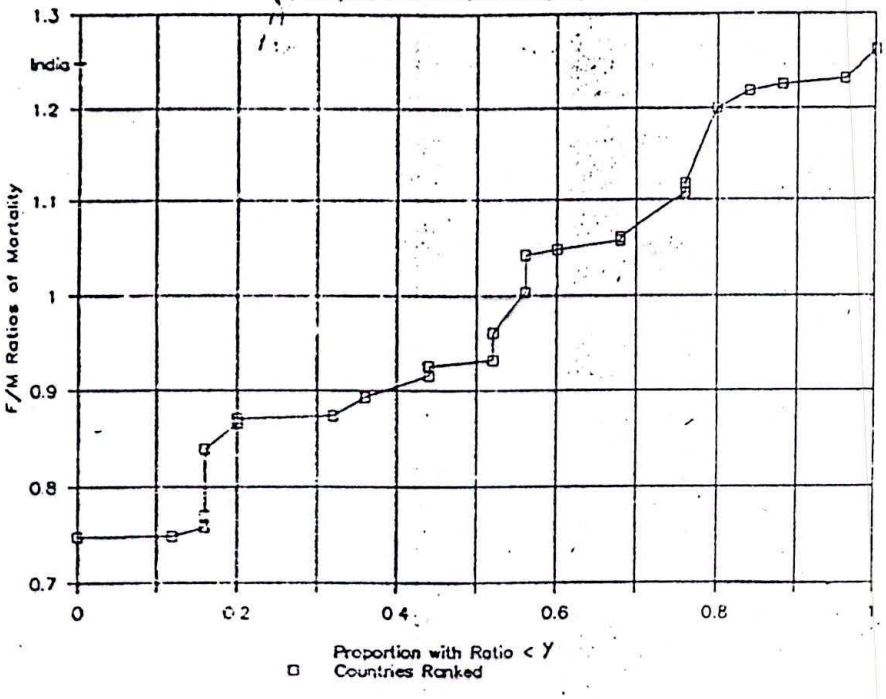


FIGURE 2: MORTALITY SEX RATIOS, 25 WFS COUNTRIES
Compared with India's (1 month-5 years)



see a value difference between the sexes, caused by lower wages for females than males; I would prefer to view the latter as but one manifestation of a more general and complex phenomenon. The value of females as objects of exchange significantly outweighs, for a time, the wages they can command when market relations become a factor. The strong positive association between low labour force participation, which reflects in part differential wages, and dowry-giving, which reflects the value of women within an exchange context, is demonstrated for India in Miller (1981). My own work has shown how the high value of women in the exchange context can be enhanced by the limitation of their numbers (Clark, 1983).

The use of women as exchange goods can continue in a market setting for sometime, especially in a situation where class formation overlaps with existing caste/tribe/ethnic segmentation (Clark, 1979, 1983). The emergence of women as subjects of their own history is a turning point whose occurrence cannot be entirely predicted.

During the initial process of class formation, the roles that women are expected to play, however, become differentiated by class. Class itself is at the outset articulated corporately, along pre-existing group lines, and not simply according to a family's individual rank on the scale of wealth and property-holding. Due to various political historical factors, formerly autonomous tribal and descent groups emerge at the upper and lower rungs of a new social and economic hierarchy within the new reality of property. During this phase (which can be long-lived), class solidarity remains to some degree linked to kinship and its wider analog, descent. In the South Asian context, class is linked to caste, with its endogamous marital limits. Different rules emerge for the proper conduct of upper and lower caste women which reflect an emergent class difference, which then in turn becomes encoded as a cultural one.

What are some of the demographic effects to be expected from the process of class formation and female role differentiation that has been sketched here? The examples suggested below are based on the analysis of social demographic phenomena in central Gujarat during the last century (as found in Clark, 1979).

One example is the following, applicable to classes with some property. Where female children, due to the structure of marriage networks (cell D) which continue to exist within given classes (cell B), are given in marriage accompanied by large dowries, some of them, because they are so expensive to invest in, may be neglected via withholding of nutrition and health care, raising their mortality. Above some benchmark level, excess female child mortality has been shown to reflect a relatively greater neglect of the nutritional and health care needs of girls than boys (D'Souza and Chen, 1981).

Constraints on female labour force participation within such classes (a product of influences from both cells B and D) can further this process. The net reproductivity of mothers would be lowered in such a case if there were no compensating rise in the level of fertility. Given overall levels of mortality that make it relatively unpredictable how many children will survive, we would expect high fertility and high child mortality to go together; and under conditions where sons are disproportionately desired and several sons are sought—that is, often, where dowries are high and male labour is predominant—we would expect both high fertility, and child mortality which is elevated by socially conditioned excess female mortality. Some female education might not appear to improve these factors, because its chief effect might simply be added to a girl's marriageability.

A second example pertains to classes with no property and no tenure rights over productive resources. We would expect family constraints on proper female behaviour here to be fewer, and dowery to be small enough to be disregarded (cell D). Women should be participating in the labour market at rates (although not necessarily wages) nearly equal to those of men (cell B). In this case, it would be desirable to have several children

FIGURE 3(a): SMOOTHED CENSUS SEX RATIOS, MADRAS
(After Migration Adjustment)

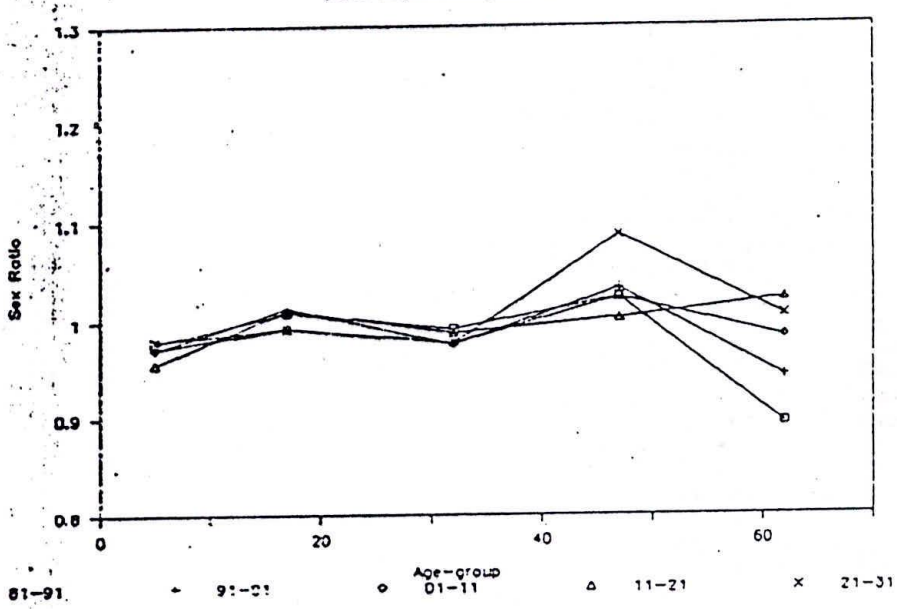
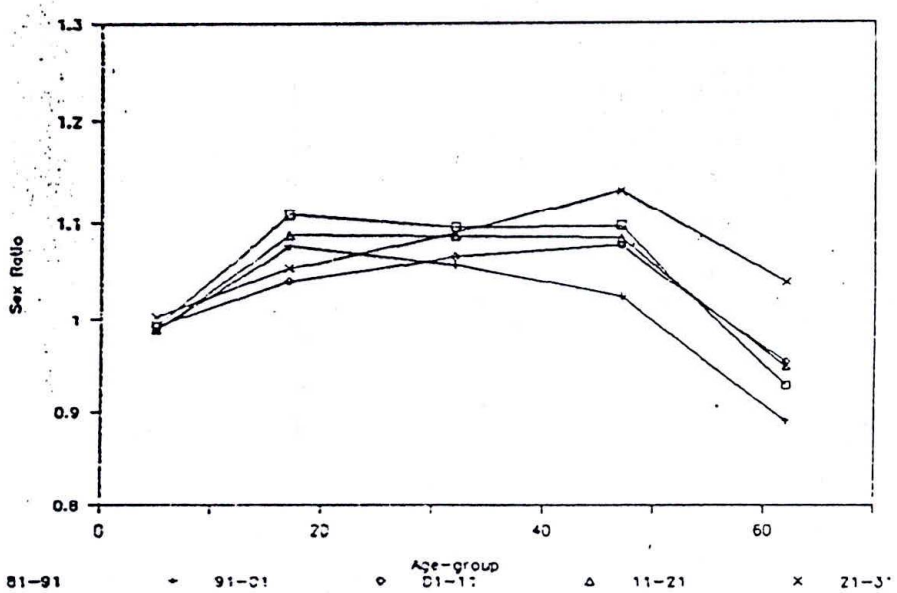


FIGURE 3(b): SMOOTHED CENSUS SEX RATIOS, BOMBAY
(After Migration Adjustment)



to help support the family, with little or no sex preference; in such a case, child mortality would be high, due to poverty, but would not be expected to be elevated by excess female child mortality. Education would be expected to have a straightforward linear effect on mortality.

The most important determinant variable in this model is then the class position of the family. (It is probably within class that gender is constructed, for the most part.) The concept of class has been recast, in much of the demographic work on developing countries (for example, that on Sri Lanka), into a statistical construct called 'socio-economic status' which is often measured by (and therefore confounded with) parents' educational level (Trussell and Preston, 1982, Meegama, 1980, Trussell and Hammerslough, 1983, Hobcraft et al, 1984, Little and Perrera, 1981).

Education is clearly crucial, but there is a need to separate more clearly its effects from those of class—that is, the level of control over productive resources enjoyed by one's group, and whether individuals within it work for others or are self-employed (control their own labour-power).

What are our expectations about education's effects, given a mode of production framework for generating hypotheses? At the individual level, first, education is itself a potentially productive resource, in its role as human capital; and second, increased education can affect both child mortality and fertility through its impact on the conditions of child-bearing, such as the mother's age, the length of birth intervals, and the practice of breast-feeding. Third, at the level of the village or region, the average number of years of schooling completed forms a global, 'ecological' variable (in the social sense). There can be threshold effects on demographic rates at both the household and the ecological levels (Tienda, 1984). Further, within the theoretical framework presented, the global educational level serves as one indicator of the dominant technology, and thus plays a part in the classification of the mode of production which is applicable.

Class in some cases can be seen as *truncating* the expected effects of additional education. A study of mine on child mortality in rural Sri Lanka (Clark, 1984) found that class—in which ownership or control of productive resources is the defining element—plays an important role in exacerbating or alleviating sex differentials in mortality in early childhood, once mother's education level is controlled. In addition, within classes which possess means of production, but at very low levels, a small amount of mother's education reduces female child mortality less than it does male. It is strongly suggested that class interest operates in some cases in the opposite direction from that of educaion. Above what threshold, then, does education add significantly to human capital, to the improvement of child-bearing conditions, or to the equalisation of gender relations and the reduction of sex preferential practices? At what point does it help transform a woman's own relationship to her assigned roles? Below this, as when its expected effects are overwhelmed by those of class, does education still have an important meaning? Trussell and Preston (1982) have stated that there is a need to understand the paths through which education operates; it may well be equally important to understand those through which it fails to operate as might be expected.

The second major variable from the model which is expected to influence mortality outcomes, in terms of both levels and sex differentials, is gender inequality. The gap between the age of the mother and her spouse, and the educational differential between them, may represent part of this factor. Gender inequality is expected to operate interactively with class—and perhaps independently as well.

Adequate data to test hypotheses generated by the theoretical framework given here would be microdata, like those of the World Fertility Survey, but ideally with many more socioeconomic and ethnographic questions.

FIGURE 4(a): MADRAS, 1901-11, SEX RATIOS
(of l(x)s of Alternative Life Tables)

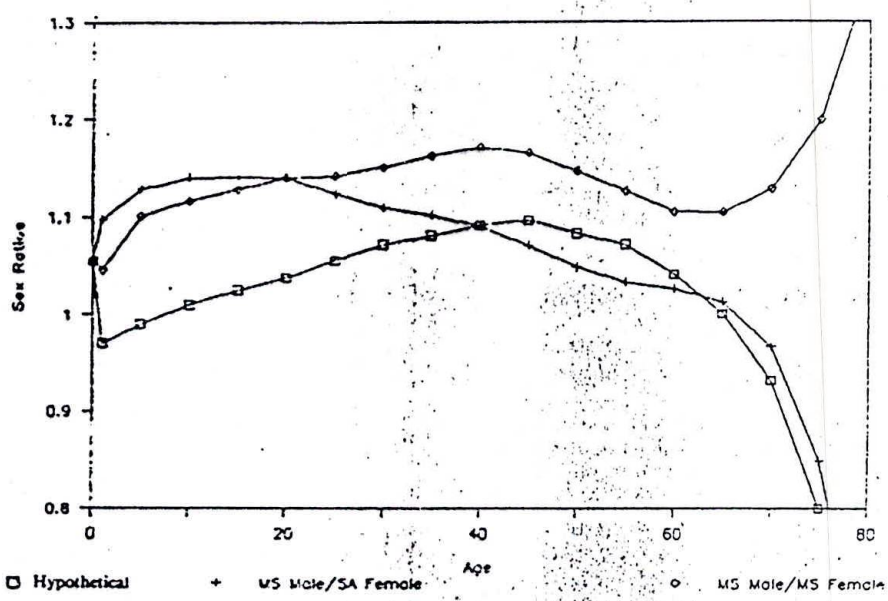
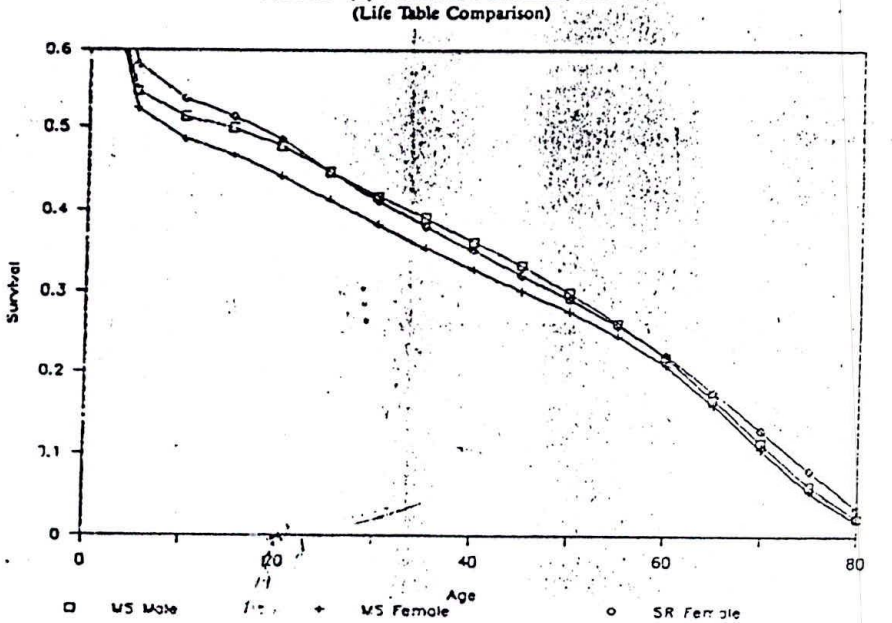


FIGURE 4(b) MADRAS FEMALES, 1901-11
(Life Table Comparison)



In particular, one would like to have questions on marriage networks and dowry levels. Family reconstitutions from parish records might also serve to provide some of the needed data, though in the case of India, where few such records exist, this point is a little academic. The data need to be on a large scale: to estimate believable age-specific mortality rates requires cell sizes no smaller than several hundred—though smaller numbers can work when mortality rates are very high. In order to use the data existing in the real world, ingenious creation of proxies is required.

Age-Specific Sex-Differential Mortality

We return now to the more purely demographic questions that need better theoretical and empirical grounding. It was necessary for me to work at this broader demograhic level in doing research on Indian sex differentials in the past, specifically 1881 to 1931, because there are no microdata to use. I used ordinary census data along with some new methodologies, and then experimented widely with alternative explanations for the results—explanations which could incorporate varying patterns of differential mortality such as appeared to fit the particular case at hand. Before presenting some of these results, I return to a demographic question raised earlier: when is a sex differential in mortality likely to have socially conditioned, rather than purely endogenous, biological causes?

An important part of the above question is contained in the following one. What ought the ratios of mortality rates to be in infancy, if there is no excess female mortality? This very normative question cannot be answered without any qualifications. In western models set at the same 'level', according to the level-setting methods of Coale and Demeny, the ratio differ both according to model and according to the level within each model. For example, Model South, Level 18 (Coale and Demeny, 1966), has a ratio of mortality from zero to age one of 0.893, female over male. But those of the other model families at the same level are lower, implying that in the South family of life tables, female over male mortality was somewhat elevated relative to what it might have been. Cultural differences between southern and western Europe are incorporated in these 'levels' as they differ among the models. This gives us little help in answering the question, since models are not culture-free.

A more conservative approach to the question is to compare India's mortality sex ratios with those of other third world countries. What really counts is the ratio of mortality between one month and five years of age. This accounts for as much as half the mortality between birth and five, and is far more likely to be free from the biological propensity of male infants to die at higher rates than female ones, a large part of which is captured in the first month of life.

The measure of an excess sex effect on child mortality is not whether male and female rates differ significantly from each other in statistical terms, but rather whether their ratio differ significantly from the expected 'normal' ratio. A normal value could be expected to be a ratio of slightly less than 1.00, female over male, due to continued biological excess male mortality during infancy above one month of age. Adopting a ratio of 1.00 would seem to set a conservative standard for the identification of excess female child mortality above it. It is important to set a conservative standard here, for it is too early in the study of this topic in general to say what the 'true' normal level is.

In calculating the cumulative distribution of sex ratios of mortality from one month to five years of age for 25 World Fertility Survey (WFS) countries, based on data given in a recent WFS report (Rutstein, 1984), we find that India's ratio (based on Padmanabha, 1982) lies above those of 95 per cent of the countries. (See figure 2. India was not, of course, one of the WFS countries.) If these ratios can be assumed to

FIGURE 5(a): BOMBAY, 1901-11, SEX RATIOS
(of l(x)s of Alternative Life Tables)

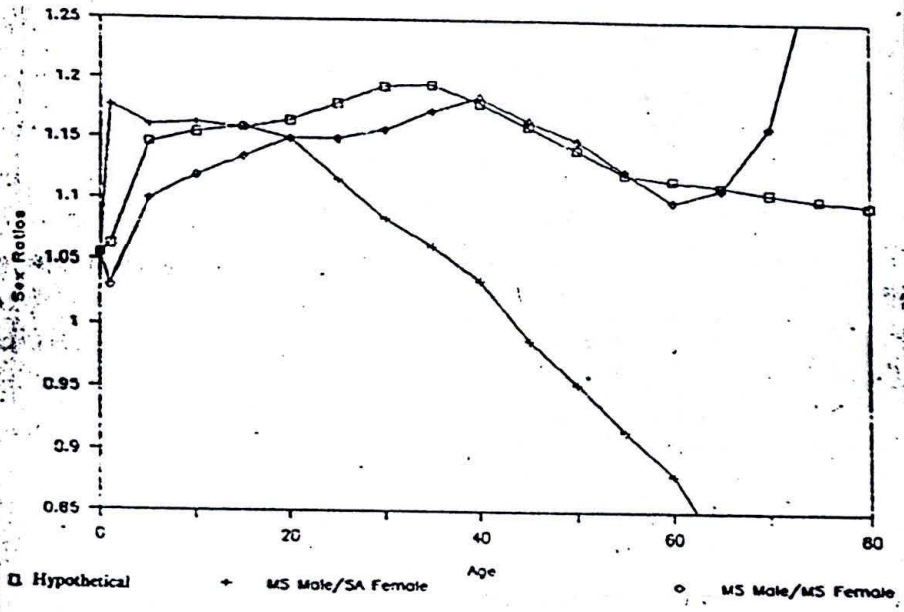
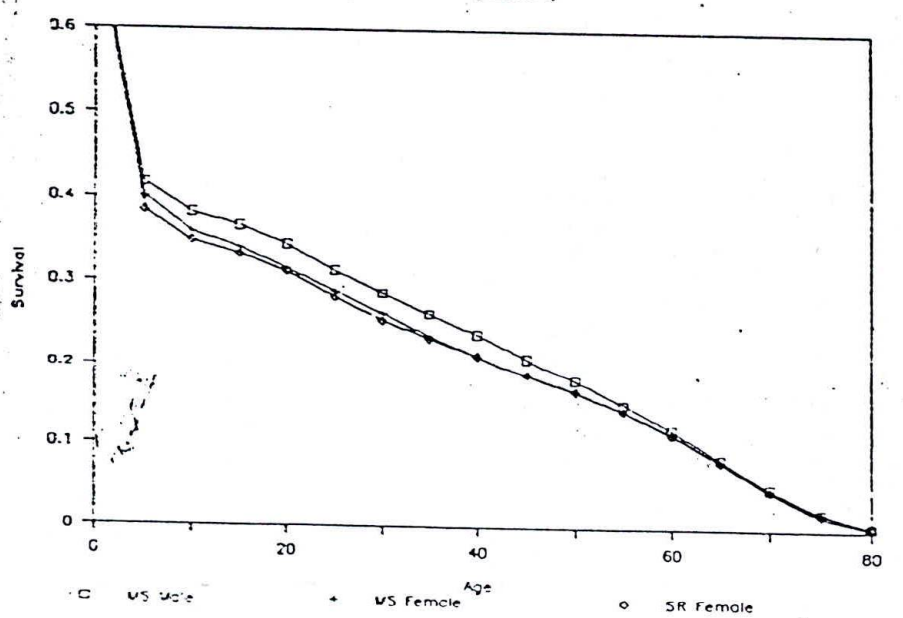


FIGURE 5(b) BOMBAY FEMALES, 1901-11
(Life Table Comparison 1)



follow approximately a normal distribution curve, then their mean and standard error could be used for significance tests of specific sex ratios of mortality in subsets of the Indian population. The mean of these 25 countries' ratios is in fact 1.004; the 95 per cent confidence limit for the maximum is 1.057. Female over male mortality ratios higher than 1.057 for the interval between one month and five years of age can therefore be said to be significantly above the normal level for less developed countries. If we use western models, the mean ratio and variance are considerably lower. Thus the WFS ratio of 1.004 can be called an appropriately conservative standard.

This presentation clearly shows the far greater than normal post-neonatal and child female over male mortality in India, and all the qualitative evidence that has been gathering over the last several years points in the direction of a greater preponderance of social rather than endogenously biological causes. This is only a first approach to the quantitative issue, however, and further work needs to be done using clinical field data. One would like to know more clearly what is the benchmark, 'normal' mortality sex ratio for each age, including 0-29 days, under various Indian conditions, from which significant deviations could be calculated.

Using data from Padmanabha (1982) these are the ratios of age-specific female to male mortality rates ($_nm_x$) in India:

<29 days	0.863	0-1 year	0.977
29 days-1 year	1.202		
1-4 years	1.303	29 days-4 years	1.262

It is abundantly clear from these ratios that excess female mortality in India does not take place only in toddlerhood, but also in the first year of life. This is obscured by the ratio for ages 0-1, because this ratio is so heavily dominated by mortality in the first month of life. In that interval, male mortality dominates in all demographic regimes except those of swift and outright female infanticide. When we see mortality sex ratios for ages 0–1 which are as high as 0.977, then, it seems clear that infant excess female mortality is involved.

I have dwelt in some detail on ratios of mortality between 0 and 5 because a very large share of mortality, particularly in high mortality regimes, takes place within that interval (which is, in turn, a combination of several important intervals). My research on historical Indian mortality requires some such baseline understanding of what one can expect of mortality differentials befor the age of five.

My data for analysing sex differentials in mortality in India are only the census age distributions, plus the adult mortality level calculations that are based on them with the help of the new methodology devised by Preston and Bennett (1983). (This research is reported in detail in 'Mortality, Fertility and the Status of Women in India, 1881-1931', which will be published in a book being edited by Tim Dyson.) It is possible, however, to explore different ways of configuring these adult levels, using different assumptions about possible life table patterns and about the ways male and female life table interrelate, based on an understanding of some of possible patterns of sex differentials in early childhood.

There are problems to address in undertaking such an attempt. The first of these is that we have no historical life tables for India that we can trust. The second is that there is no way of creating life tables for extremely low levels of life expectancy which is not artificial and mechanical. Using the Preston-Bennett method we can ascertain the adult level, but not the shape at the youngest and oldest ages of the total survival curve. We can produce an approximation to the total curve, however, if we have some model of survival rates, some modification of which we believe may be close to the mortality experience of this region. Recent demographic research on India has preferred either the Coale-Demeny (1966) Model South, or the new United Nations (1982) South Asia pattern; therefore, in the study mentioned, I produced alternate life

FIGURE 5(c): BOMBAY FEMALES, 1901-11
(Life Table Comparison 2)

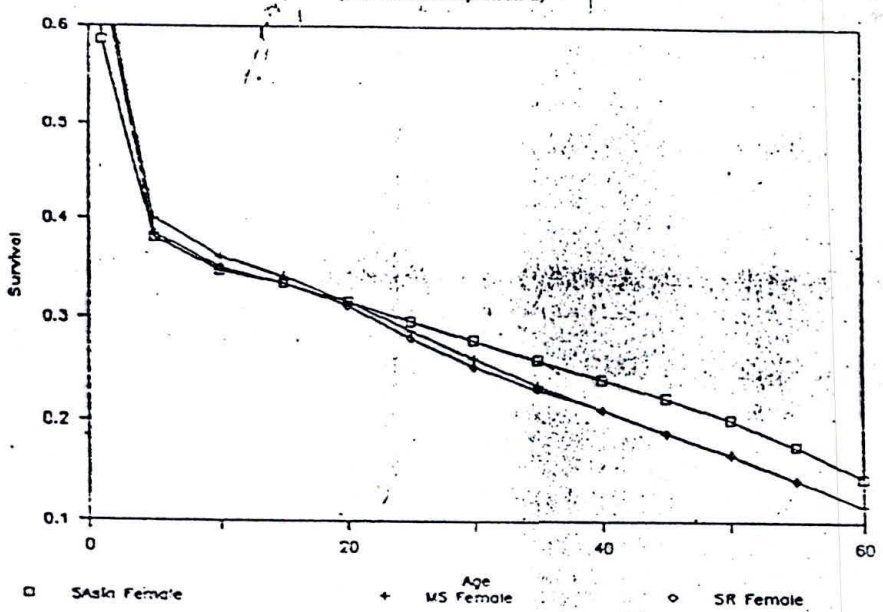
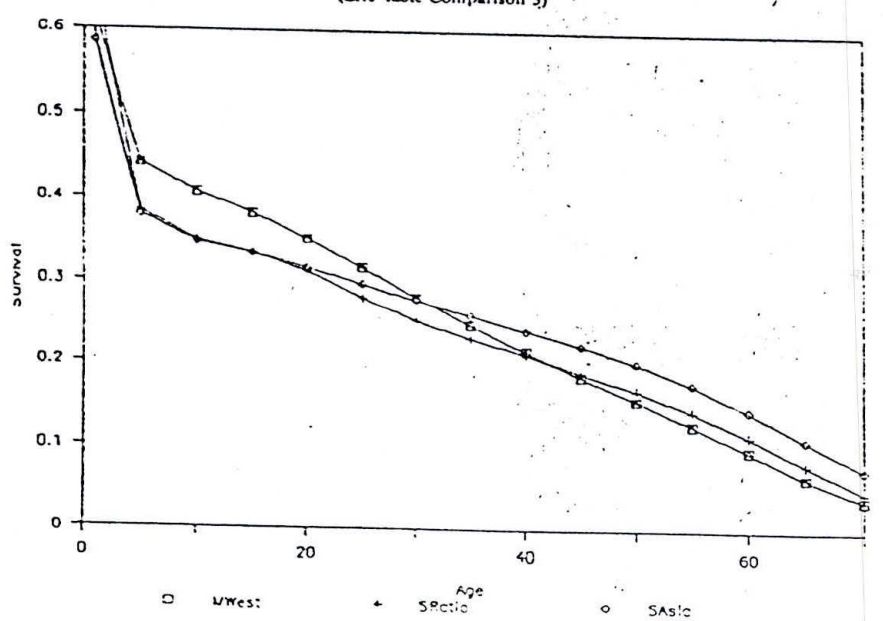


FIGURE 5(3) BOMBAY FEMALES, 1901-11.
(Life Table Comparison 3)



tables based on modifications of those models.

For the following discussion, however, I went beyond this, starting by fitting the male adult mortality levels which result from the Preston-Bennett method of life tables according to the Model South pattern, and then computing female life tables directly from the male. This has been done in such a way that the resulting female tables, first, reflect the age pattern of census sex ratios after this pattern has been highly smoothed, and second, have a good fit with the female adult mortality levels calculated via the Preston-Bennet method. This procedure was performed for Madras and Bombay Presidencies, for the decade 1901-11.

The issue is, how can we know whether we have the right life tables for females in relation to males? We can start by considering the population sex ratios, as computed from census totals. The curve of actual age-specific sex ratios at a point in time can be seen theoretically as a cumulative measure of mortality at all earlier ages. In a population with stable rates over time, the ratios of male to female age-specific survival probabilities, inflated by the sex ratio at birth, should be very close to the age-specific sex ratios of the population. This is simply because age-specific sex ratios are, clearly, ratios of survivors to each age.

There are both data problems and assumption problems in proceeding with this line of thought; in particular, rates were not in fact stable over time. However, it is clear that there are very different patterns both of overall mortality and of excess female mortality by age between the two regions. The latter is clearly suggested by an examination of the census sex ratios (even admitting that these data include underenumeration and age misreporting by sex). For Bombay the overall sex ratios are very much higher than those for Madras. (This is after adjusting for migration.)

We have considerable reason, in any case, to believe that in the west of India, many extra female deaths took place in infancy and early childhood. Bombay contained groups and areas that had been known to practice female infanticide. The custom had been outlawed in the Infanticide Act of 1872, but its incidence had also been recorded in considerable detail in the reports on the Act (see Clark 1983). We believe that the decrease in infanticide was followed by an increase in excess female mortality at early ages, due to neglect of female children (Clark 1979 and 1983, and Miller 1981).

Pursuing the examination of what different sex ratio patterns might imply about the different patterns of mortality between regions, the age-specific sex ratio curves for each presidency were smoothed out by amalgamating several age groups and pinpointing their joint ratios on central ages. This got rid of the insistent peaks and valleys characterising these data, which are notorious for their high degree of age misreporting and underenumeration. The resulting patterns, on inspection, suggest where each real curve may have had its single high point.

Graphs of the smoothed age-specific ratios for each decade are shown in figure 3. It appears from this exercise that for *most* decades, Bombay's peak may have occurred at around thirty or thirty-five, and Madras's at around age forty-five or fifty. This suggests the different age patterns of excess female mortality by region, including the strong likelihood that Bombay had some of it in childhood. (The curves for 1921-31 may have been affected in part by the smoothing of the age data of the 1931 census which was done by the census office, and in part by actual changes in the age-specific patterns of mortality. Since we do not know how much effect may have been due to each possible cause, this decade's pattern is not included in my rough estimate of the average peak age.)

Having established in this way some estimate of where the single peak of the age-specific sex ratios occurred, new female life tables were created for the decade 1901-11 for each presidency. This was done by inflating or deflating the male table's survival column (adjusted for the sex ratio at birth) by a still further smoothed series of sex ratios leading to and then descending from such a peak. Results are presented in figures 4 and 5. Figures 4 (a) and 5 (a), in addition, contrast my hypothetical, smoothed sex ratio curves with those produced by two different pairs of life tables based on adjustments of available models; the model pairs cause rather wildly anomalous patterns.

The result of the sex-ratio estimation technique for Madras is a female life table which crosses the male at two points. See the curve labelled SR Female in figure 4 (b): there it is contrasted with the male table on which it is based, and with the appropriate female table from the Model South pattern. If the sex-ratio based table is more accurate than that from Model South, it implies that excess female mortality, at ages where it is not found in matched pairs of western models of the same family, did occur in Madras. The Model South patterns for both sexes which are appropriate here, however, create the appearance of too *much* excess female mortality, because they are at different levels.

Based on the sex-ratio based table, Madras females had life expectancies close to or surpassing those of Madras males. But they still had higher age-specific mortality than Madras males, concentrated within the ages between early childhood and old age. They clearly had far better life chances than females from western India, but so did Madras males. Even in Madras, it appears that there must have been some excess female child mortality, for though the infant mortality ratio (female over male) in the newly created life table is very low, that for children one through four is 1.058. But there was relatively more excess female mortality in middle adulthood.

The Madras female life table constructed in this way turns out to have a fairly close fit to one from Model West: thus, if male mortality fits one western model, female fits another, due to unusual differences (relative to western experience) in mortality between the sexes.

The new life table for Bombay, in contrast, is quite different from any model-based ones. For this life table, I have presented three different sets of comparisons. Figure 5 (b) contrasts the new table with the male table it is based on (the Model South table that fit the male adult level found via the Preston-Bennett method), and with the female table from Model South which does likewise for females. Here we see that the Model South female table does not do justice to the full amount of excess female mortality at early ages, which the sex ratios imply.

Figure 5 (c) shows that a South Asia pattern table runs close to the sex-ratio based

TABLE : ALTERNATIVE LIFE TABLE PAIRS FOR 1901-11

	Male Base	Paired with Alternatives					
	Male Model South	Female Model South	Sex Ratios	Female South Asia	Sex Ratios	Female Sex Ratio Table	Sex Ratios
Bombay							
e(0)	18.91	17.63	1.13	18.99	1.05	17.39	1.15
e(5)	38.75	37.21		43.16		38.26	
l(5)	0.418	0.401	1.10	0.380	1.16	0.385	1.14
l(30)	0.287	0.261	1.16	0.279	1.08	0.253	1.20
GRR		3.343		3.014		3.342	
Madras							
e(0)	27.50	25.69	1.13	26.69	1.09	28.11	1.03
e(5)	44.48	43.03		46.25		42.35	
l(5)	0.546	0.523	1.10	0.510	1.13	0.581	0.99
l(30)	0.417	0.383	1.15	0.397	1.11	0.411	1.07
GRR		3.057		2.889		2.878	

Note: For details of estimation procedures, see Clark, 1987.

table at early ages, but then improves too much at later ones. The newly created life table meets the low of the South Asia table at young ages and the low of the Model South table at older ones. In other words, this procedure suggests that excess female mortality was high at most ages of life in Bombay.

Figure 5 (d) compares the sex-ratio based female table both with the South Asia table and with one from Model West which has the same life expectancy at birth; clearly the new one is very different from each.

What the sex-ratio based table postulates, going back to figure 5 (b), is that female survival was well below male until old age in Bombay; and that early excess female mortality was particularly high. The infant mortality ratio, female over male, based on this table is 1.014, and that for children one through four is 1.128. It is worth noting that the second ratio is not as high as contemporary all-India ones. Yet significantly excessive female child mortality on the international scale presented earlier is clearly implied.

Of course, these new life tables (summarised in the table) have been hypothetical creations but they make a point. The Indian data that we have suggest that we continually go wrong for major parts of India by fitting female mortality schedules to available models. The models themselves have to be questioned.

Certain additional questions have also to be asked, and asked again. Do we assume that mortality regimes are primarily a 'natural' working out of certain environmental conditions? Is the social environment continually going to be naturalised in our thinking, as if female education, for example, were an ecological variable not just in the sociologist's sense but also in the biologist's? There appears to be powerful factors strengthening the dowry system even among the educated classes in India today and dowry is one of the conditions of son preference.

While we do not yet know what constitutes a valid expectation of the endogenous, biologically-based sex differential at each age for the various regions of South Asia, the date that we do have for Indian regions suggests that socially-derived excess female mortality has created enduring demographic patterns over at least the past century. This evidence must take its place as an exemplar of the social forces shaping demographic history in a larger sense, and lead us to re-examine the modelling of mortality in general.

[Prepared for presentation to the Workshop on Differential Mortality and Health Care for Females in South Asia, held in Dhaka, Bangladesh, January 4-8, 1987, under the sponsorship of the Social Science Research Council (New York) and the Bangladesh Association for Maternal and Neo-Natal Health (Dhaka).]

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Poverty and Sex Ratio

Some Data and Speculations

N Krishnaji

This note is concerned with the question: how are mortality differentials and the imbalance between the sexes related to poverty? In other words, are the differences wider in poor families than in rich families?

Two relationships are analysed: the first, sex ratio variations across families with landholdings of different sizes and between agricultural labour and other rural households; the second, between poverty, defined by per capita consumption of families, and he sex ratio.

THE Indian population has an excess of males over females and the gap has tended to widen during this century.[1] In a pioneering study, Visaria (1961) has shown that higher female mortalities in both the child and reproductive-age groups are mainly responsible for the deficit of female in India.[2] Data on mortality differentials between the sexes available from recent surveys and censuses confirm this finding.[3] It seems reasonable to infer that while death rates in general have fallen throughout the century, rapidly after independence, the rate of decline has been larger for males than for females, at least in some age groups.

The "often overt but occasionally subtle discrimination against female children and the neglect of females even at adult ages" as factors underlying differential mortality to which Visaria[4] makes a breif reference constitute the subject matter of much recent research work. This work is mainly concerned with the discrimination against and neglect of females in respect of two crucial determinants of mortality: nutrition and health (or, more precisely, access to food and medical care). Agarwal (1986) presents a succinct review of this literature. The review shows that the available evidence, while suggesting discrimination against females, is inadequate in coverage and somewhat inconclusive. The difficulty arises from the fact that direct observation and measurement of food intakes by members within families is not at all easy[5] and the alternative, usually resorted to, of looking at anthropometric measurements such as body weights and heights in relation to certain standards or norms, leads in turn to numerous problems of interpreting data unambiguously. These difficulties are discussed in an influentiai study of some data from Bangladesh (Chen et al, 1981). On the other hand, it seems a priori that observation of health care practices and underlying sex biases may be easier but so far there have not been many studies based on such observation.

This note is not, however, concerned with the factors behind the level and the declining trend in the female-to-male ratio (FMR) in India but with a related question: How are the mortality differentials and the imbalance between the sexes related to poverty? In other words, are the differences wider in poor families than in rich families? The question has both theoretical and empirical contexts, and interesting in itself.

The regional distribution of the sex ratio within India which has remained fairly stable over time, as Visaria has shown, with very pronounced deficits of females occurring in the north-west and distinctly balanced sex ratios in the south, has led to the speculation that the ratio is governed by and hence related to women's role in agricultural work, more prominent in the poorer regions and mediated to some extent through the cropping patterns.[6] While neat correlations across regions between agricultural prosperity and crop-mix on the one hand and the sex ratio on the other are lacking, it is nevertheless true that the agriculturally rich wheat-based states of Punjab and Haryana have very low female ratios and low rates of participation of women in work whereas the poorest states in India, *viz*, Orissa, Bihar and Madhya Pradesh are more balanced with respect to numbers of females and males, and the paddy-based south has the highest sex ratio. The deficit of females in the north-west has been repeatedly noted in the early British-Indian Censuses, and indeed so were Rajput villages without female children or with only a few.[7] The census authorities discuss female infanticide in this context and attribute practices linked to what is now mildly described as discrimination mainly to landowning families of certain castes and their strong preference for male progeny ascribed to both economic and cultural factors.[8] Moreover, it has been suggested that for easily understandable reasons, apart from the role of women in work, property and asset transfers following marriage also play an important part in the determination of sex preferences. Miller (1981) argues, for example, that there is greater reciprocity between families of partners in marriage in such transfers in the south than in the north-west where it tends to be almost unilateral in favour of the bridegrooms' family.[9] All this has obvious implications for the question raised here for two reasons: first, in poor families women have to work for survival and second, the property transfer mechanism can act only in a relatively weak manner in their case because there is not much to be transferred from one poor family to another. If the suggested arguments are valid, these factors can be expected to promote higher female proportions among the poor.[10]

The question about the relationship between poverty and sex ratio is prompted also by famine mortality studies. Some studies of the recent famines in Bangladesh have, for example, shown that severe food shortages lead to a greater 'excess', i e, famine-induced, deaths among females, especially children.[11] Likewise, the data for the 1943 Bengal famine exhibit a higher excess female mortality among children.[12] The implication—for this note—could be that when food is in short supply, as it normally is in poor families, the males get a disproportionately bigger share. To digress a little for good reason, it may be pointed out that the British-Indian Census compilers looking at famine mortality have observed higher male mortalities till about the first decade of this century; they say that earlier, under famine conditions, men had to go out in search of food and were subject to higher mortality risks but later, with famine administration becoming effective, could stay at home for the arrival of relief.[13] The insights provided by the famine studies are of limited value, however, to the question of differences between the poor and the rich families for the simple reason that famine is a rare occurrence (affecting also sections of the non-poor) in contrast to the chronic deprivation among the poor.

Against this hazy background, two relationships are analysed here. The first refers to sex ratio variations across families with landholdings of different size and an embedded contrast between agricultural labour and other rural households in India with respect to the balance between the sexes. The second is concerned with poverty defined, as it usually is, by per capita consumption of families and its relationship with the sex ratio. Needless to say, this is a speculative exercise, for, in a field wherein direct observation can provide no more than useful insights, secondary information cannot be more illuminating.

LABOUR AND LANDHOLDINGS

Demographic data, especially on mortality rates by sex, relevant to the discussion here, are not available separately for agricultural labour and other poor households, so that for comparing the latter with the non-poor rural households one has to rely on indirect information on variables such as household size and sex ratio.

In rural India as a whole there were in 1971 only 950 females for every 1000 males (see table 1). For agricultural labour households covered by the rural labour enquiries the ratio was 986 in 1964-65 and 976 in 1974-75. If one takes 980 as a plausible estimate for 1971 for the labour households, since they constitute about a quarter of the rural families, it implies that the non-labour households had a sex ratio of about 940 in 1971. So it can be seen that agricultural labour households are characterised by a better balance between the sexes than other rural families consisting mainly of middle and big landowners. Significantly, labour households without land have higher proportions of females than those with some land, the sex ratio being respectively 990 and 976 in 1964-65, and 982 and 969 in 1974-75 (table 1). This suggests that if land-related variables influence the sex ratio, they perhaps do so even at the lowest end of the land scale, among the labour families.

The sex ratio varies from one age group to another and hence the overall ratio depends also on the age distribution of the males: the aggregate ratio is a weighted average of the values within the age groups, the weights being the proportion of males. It can be seen from table 2 that the female ratio in the prime-adult age group (15-49) is significantly higher among labour households than in the rural population as a whole (1,000 as against 971); the difference between the two categories of households is even more marked in respect of the 50+ age group. But the age distributions of males are not radically different, despite a higher proportion of males in the 50+ group in the population as a whole (arising possibly from lower levels of life expectation among labourers). Thus the differences in the FMR mainly arise from higher sex ratios among adults in the labour families. Indeed, if the age distribution of males for the whole rural population in 1971 is taken as 'standard', the standardised FMR for the agricultural labour households turns out to be 988 in 1964-65 and 973 in 1974-75, as against the actual values of 986 and 976 respectively, showing that age distributions do not contribute significantly to the differences being discussed here.

Sex ratios in the aggregate—and among adults in particular—are influenced by sex-selective outmigration, apart from differential mortalities. Leaving aside migration for the moment, one can discern another correlation from the data presented so far: an inverse correlation between the average household size and the FMR; the highest female proportion is observed among the landless labour households who have also the smallest average size (table 1). They have an average size of slightly over 4 with sex ratios close to 990 in contrast to all rural families with a size of about 5.5 and a sex ratio of 950.

These correlations hold in a more general sense with respect to the variations according to landholding size (table 3). First, the average household size increases steadily with the size of the landholding, rising from 2.71 in households with less than half an acre to 8.73 among families with over 50 acres; and second, in contrast, the female-male ratio among the adults declines as the landholding increases, with females outnumbering males in households with small landholdings, and big deficits of females occurring exclusively in the middle and the big land size classes. As a consequence household size is inversely associated with the sex ratio: big landholdings and big families go with a big imbalance between the sexes; small families and high female proportions are characteristics associated with tiny

TABLE 1: AVERAGE HOUSEHOLD SIZE AND SEX RATIO—AGRICULTURAL LABOUR AND ALL RURAL HOUSEHOLDS—ALL INDIA

Variable	Year	Labourers with Land	Labourers Without Land	All Labour Households	All Rural Households
Average household size	1964-65	5.00	4.16	4.53	—
	1974-75	5.15	4.38	4.76	—
	1971 Census	—	—	—	—
Female per 1000 males	1964-65	976	990	986	5.52
	1974-75	969	982	976	—
	1961 Census	—	—	—	—
	1971 Census	—	—	—	963
	1981 Census	—	—	—	949
					952

Sources: "Rural Labour Enquiry", 1963-65 and 1974-75 and "Census of India" various issues.

TABLE 2: SEX RATIO AND MALE POPULATION BY AGE GROUPS—AGRICULTURAL LABOUR AND ALL RURAL HOUSEHOLDS—ALL INDIA

Category of Household	Year	FMR by Age Group (per 1000)			Males by Age Group (Per Cent)		
		0–14	15–49	50 +	0–14	15–49	50 +
Agricultural labour	1964-65	935	1000	1125	41.9	47.3	10.8
	1974-75	925	1000	1038	43.9	45.4	10.7
All rural	1971	938	971	904	43.0	44.3	12.7

Source: Same as for Table 1.

TABLE 3: SEX RATIO AND RELATED STATISTICS BY LANDHOLDINGS, RURAL INDIA, 1961-62

Household Operational Holding (Acres)	Average Household Size	Sex Ratio (Adults)	Proportion of Children (Per Cent)
0.0 - 0.5	2.71	1077	40.2
0.5 - 1.0	4.59	1061	41.6
1.0 - 2.5	4.77	1014	41.3
2.5 - 5.0	5.27	969	40.6
5.0 - 7.5	5.85	923	41.2
7.5 - 10.0	6.13	941	41.0
10.0 - 12.5	6.54	910	41.6
12.5 - 15.0	6.70	922	41.5
15.0 - 20.0	6.91	947	41.4
20.0 - 25.0	7.40	963	42.4
25.0 - 30.0	7.24	990	42.0
30.0 - 50.0	7.84	952	42.7
Above 50.0	8.73	959	39.9

Notes: (1) The sex ratio (female to male) refers to the value among adults (15+) and the percentage of children refers to the ratio of the (0–14) age population in the total. The data are derived from the "National Sample Survey", Report No 144.

(2) The lowest class (i e, 0 to 0.5 acre) excludes "non-operating" households—presumably comprising non-agricultural and pure landlord households. The average size of household for this excluded category is 4.52.

(3) Here the classification is by operational holdings but variations are similar when ownership holdings are considered instead.

landholding.

However, the observations are based on the sex ratios in the adult populations. Fortunately, data covering persons of all ages classified by land size are available for the different states from the 1961 Census (table 4). Once again the FMR can be seen to be over 1,000 in the smallest land-size class of less than an acre in the different states of India, with only a few exceptions. It is noteworthy that even in Punjab (including Haryana) and Uttar Pradesh, where the female deficits are among the largest in the country, females outnumber males in the smallest landholding class. Equally noteworthy are the sex ratios below 900 corresponding to huge female deficits observed only in the middle and big landholding groups. Even in the south, where the FMR is generally high, it is low at the upper end of the land scale.

Migration: What do these mutual associations between no land or small landholdings—associated with poverty of an undeniable sort—small families and a balanced sex ratio convey to our understanding of mortality differentials and the underlying discrimination against females? As hinted earlier, these variations in the sex ratio are influenced to some extent by the rural to urban migration, demonstrably more prominent among males seeking work. Such a sex-selective migration tilts the balance in favour of females in the rural areas, especially among population groups with high migration propensities.

Some arithmetic will show that while this kind of migration accounts for a part of the high female ratio observed among agricultural labour and land-poor households can by no means be the whole explanation for it. The calculation can be done in a crude but quick fashion on the basis of the 1971 Census migration data (Mehrotra, 1974). Remember that for 1971 the FMR was roughly 980 and 940 for the agricultural labour and non-labour populations respectively. The 1971 Census counted, among the 438.8 million (mn) rural people, about 23.7 mn birth-place rural-to-urban migrants, i e, persons enumerated in urban areas but born in rural areas, with a FMR of 919. Assume that all these migrants were from labour households (a wholly unrealistic thing to do as will be presently seen and least favourable to the hypothesis being developed here). Migrants (23.7) then constitute about 5 per cent (23.7 mn out of (438.8 + 23.7) mn) of the redefined rural population, but 20 per cent of the labour population (labour households constituting roughly a quarter of all households). If all these migrants are thus added to the observed labour population in rural areas, the sex ratio for labour will come down from 980 to 965, but the last figure is still far higher than the FMR for the non-labour rural population (940).

A similar arithmetic can be done with respect to the landholding data. All we need to remember is that more than a half of the rural households in India have holdings below 2.5 acres, so that even under the implausible assumption that all rural-urban migration arises from these households, the differences in the sex ratio between them and the big land-owners will remain substantial.

But, more conclusive at least in a qualitative sense are the fragmentary data thrown up by small-scale studies of migration. Thus, for example, a study of four villages in east UP (Saxena, 1977) notes that out of 300 villagers migrating to Gorakhpur, only 129 (i e, 43 per cent) came from households with less than 5 acres of land back at home. It is said that even well-to-do farmers with over 50 acres migrate to towns aspiring for higher standards of living. In Saxena's sample only 39 migrants out of 300 had an agricultural labour background. Similarly, a comprehensive study of the Ludhiana district (Oberai and Singh, 1983) shows that despite the landless constituting the bulk of the outmigrants the 'propensity' to migrate is no less high among those who have large landholdings.

In this study of the agriculturally most prosperous district in India, *viz*, Ludhiana, the authors find that in the surveyed villages only about a half of the migrants to urban areas were landless or land-poor; about 9.5 per cent of the households with outmigrants had over 15 acres of land in the village (table 5). While the average migration propensity for all households (defined as the ratio of households with outmigrants to the total in the village in each landholding class)

TABLE 5: OUTMIGRANTS FROM LUDHIANA VILLAGES BY LANDHOLDING SIZE

Landholding (Acres)	Households with Outmigrants Per Cent N(=504)	All Households Per Cent N(=2124)	Relative Migration Propensity
Landless	45.8	47.6	96
Below 1	3.0	2.4	121
1 – 2.5	2.0	3.3	65
2.5 – 5	10.3	13.7	74
5 – 7.5	8.9	7.4	120
7.5 – 10	13.1	9.5	136
10 – 15	7.3	7.9	93
Above 15	9.5	8.2	114

Note: N refers to the total number.
Source: A S Oberai and H K Manmohan Singh (1983).

TABLE 4: SEX RATIO (FEMALE: MALE) AMONG CULTIVATING HOUSEHOLDS BY LANDHOLDINGS, 1961

(per 1000)

State	Landholding (Size in Acres)									
	1	1–2.5	2.5–5	5–7.5	7.5–10	10–12.5	12.5–15	15–30	30–50	50 +
Andhra Pradesh	1025	991	974	960	957	949	944	942	952	974
Assam	921	942	927	912	901	897	878	873	862	867
Bihar	1085	1041	1004	987	977	982	982	955	912	880
Gujarat	1005	969	955	951	953	947	951	949	935	934
Karnataka	1074	1027	987	959	953	939	931	930	951	915
Kerala	1026	989	962	934	934	941	946	933	897	951
Madhya Pradesh	1013	1005	984	973	968	966	966	964	978	1003
Maharashtra	1162	1070	1026	999	988	987	972	970	966	957
Orissa	1052	1033	1015	1005	994	995	986	999	1024	1027
Punjab	1005	960	936	892	875	863	847	843	847	859
Rajasthan	967	942	927	919	912	908	913	906	899	887
Tamil Nadu	1023	1000	977	965	961	961	959	955	955	937
Uttar Pradesh	1003	972	931	904	893	890	889	896	905	899
West Bengal	978	975	957	938	923	916	902	897	896	888

Source: "Census of India", 1961 (Table C1, Part II C—"Social and Cultural Tables", different issues).

was 23.72 per cent, households with over 15 acres (the biggest landholding category) had a corresponding propensity of 27.5 per cent. Some of the rural poor migrate, but so, it appears, do some of the non-poor; the migration propensities may not be very different.

The reasons for migration differ, of course, as between the landless and those who can, remaining in villages, earn high incomes from agriculture. The point, however, is that there is a marked sex-selectivity in outmigration, with males outnumbering females, and this can—and probably does—influence the balance between the sexes in not only the poor but also the non-poor rural families.

The explanation for the observed, more balanced, sex ratios among the labour and land-poor families does not, therefore, lie wholly in male emigration but possibly in relatively narrower mortality differentials between males and females. No doubt, the magnitude of the influence of migration on sex ratios in rural areas has to be worked out in a more satisfactory manner than has been possible in this note to make this more conclusive: studies of migrant backgrounds are needed for states such as Orissa and Bihar having high rates of labour migration. And, to conclude this section, it must be emphasised that mortality differentials between the sexes among the poor—as among others—need not exclusively depend on 'discrimination' (more on this later).

Per Capita Arithmetic

Poverty calculations are usually based on a classification of households by levels of per capita (income or) expenditure. It has been argued elsewhere that while the latter are good indicators of how much food and other basic necessities families can consume, to determine whether or not they are poor, they are not suited demographic analysis—of relationships between demographic and economic variables. The main reason is that such relationships are expected to depend on long-run, i e, durable, characteristics of families whereas per capita incomes are subject to wide fluctuations even in the short period, caused by vital events such as births, deaths, and migration of members within families (Krishnaji, 1984). Another reason is that per capita classifications create inhomogeneous groups in which agricultural labour families of small size may appear alongside landowning households of large size. The resulting pictures can and do cause much confusion.

But, for what they are worth, sex ratio variations according to levels of per capita expenditure are presented in table 6. These again refer to female ratios among adults only. They show that, with a few exceptions, the FMR tends to be the highest in the lowest per capita expenditure group and vice versa. The sex ratio is close to or over 1,000 in many states of India at the bottom end of per capita expenditure, while very low ratios of 800 and below (an unimaginably low 555 in Assam) are observed at the other extreme, i e, among families which can be described as the richest according to the criterion of per capita consumption.

It is tempting to conclude that these data are consistent with the observation of balanced sex ratios among the agricultural labour and land-poor households. The conclusion may be valid but there is the nuisance of two-way determination: the direction of causation runs both ways between low per capita incomes and high female proportions.

To elaborate a little: the purpose here is to see whether and how economic status determines sex proportions. However, given landholding and other resources, the size and composition of families (with respect to age and sex of members) in turn influence the family income and give rise to a two-way causation of the relationships between per capita income and demographic variables. Generally, family income increases with family size but not proportionately, so that per capita income tends to be inversely related to family size within each landholding class as it does even among agricultural labour households. As a result, in sample surveys large families get classified into the lower per capita expenditure groups. For illustrative purposes some out-dated NSS data (1955-56) are given in table 7, which show that about 15.5 per cent of big landowners with over 100 acres appear with per capita expenditures of less than Rs 12 along with 33 per cent of landless households, and 77 per cent of households possessing less than half an acre; correspondingly, as many as 4.5 per cent of households with tiny, less than half-acre holdings and about 7 per cent of those with holdings between a half and one acre are grouped, with per capita expenditures of over Rs 21, in the same category as about 24 per cent of those with over 100 acres. This shows that agricultural labour households consisting, for example, of a woman and a man, both working and earning incomes, can rub shoulders with big landowning families of big size in the NSS per capita expenditure classifications.

What is equally obvious but cannot, again, be substantiated on the basis of published information of the sort being analysed here, is the implication of the differential between the earnings of man and woman. In labour as well as cultivator families with small landholdings women generally work in contrast to those with large holdings; and these earning differentials

Table 7: Percentage Distribution of Households in Each Landholding Class by Levels of Per Capita Expenditure, Rural India 1955-56

Land Possesed (Acres)	Per Capita Expenditure Per Month (Rs)		
	0–12	13–20	21+
0	33.33	23.34	43.33
0 – 0.5	77.35	18.20	4.45
0.5 – 1.0	74.26	18.55	7.19
1.0 – 1.5	74.85	20.91	4.24
1.5 – 2.5	67.62	27.74	4.64
2.5 – 3.5	63.40	31.46	5.14
3.5 – 5.0	57.76	34.84	7.39
5.0 – 7.5	60.22	30.32	9.45
7.5 – 10	56.93	33.91	8.66
10 – 15	54.32	34.23	11.43
15 – 20	54.74	31.47	13.79
20 – 30	48.67	35.90	15.44
30 – 50	38.39	45.59	16.02
50 – 100	31.58	33.41	35.01
100 +	15.61	60.12	24.27
All Classes	62.26	29.51	8.23

Source: National Sample Survey, Report No 140.

Table 6: Sex Ratio (FMR) among Adults (15+) by Per Capita Expenditure: Rural India 1973-74

State	Per Capita Expenditure Per Month (Rs)			
	0–34	34-55	55-100	Above 100
Andhra Pradesh	1031	943	939	802
Assam	994	952	861	555
Bihar	1072	1126	1041	844
Gujarat	936	955	883	813
Haryana	834	939	942	847
Jammu and Kashmir	865	902	845	812
Kerala	1204	1048	1030	1036
Madhya Pradesh	996	981	931	841
Maharashtra	1045	1026	985	850
Karnataka	1021	964	918	920
Orissa	1080	1010	958	800
Punjab	1022	979	927	913
Rajasthan	986	992	953	988
Tamil Nadu	1080	1021	1002	854
Uttar Pradesh	997	956	942	748
West Bengal	962	975	828	788

Note: The larger number of expenditure groups available in the NSS have been collapsed into the four given above to avoid the problems created by small sample sizes in some groups.
Source: National Sample Survey, Report No 240.

imply a distinct disadvantage to families with more women than men, so that, other things remaining the same, families with higher proportions of females earn lower incomes per capita. The same reasoning applies to children. Children in labour and small peasant families work and add marginally to the household income but their contribution tends to be far less in per capita terms than that of adults. For this reason, a large proportion of children, just as a high female ratio, is an economic disadvantage to the family. It can be clearly seen then, that families with high female-male ratios and high proportions of children get classified in surveys into the relatively lower per capita expenditure groups within each landholding class. This is one reason why high female proportions and high child-adult ratios and large families are systematically observed at the lower end of the per capita consumption scale.[14]

Thus the data based on classifications according to the per capita expenditure of families are less informative about the determinants of the sex ratio than those based on landholding data. However, they reflect a different aspect of 'discrimination', that of unequal earnings, too well known and documented to be pursued any further here.

Small Families and Female Heads

According to the landholding data as well as those from the rural labour enquiries, labour and land-poor families tend to be small in size. The determinants of family size in relation to agrarian structure have been examined in detail in other studies.[15] The association between small families and high female proportions deserves further attention, however.

It has been shown by Visaria and Visaria (1983) that among cultivators with small landholdings the incidence of females as heads of household tends to be higher than in other rural families (table 8). Moreover, they note that households with female heads tend to be smaller in size and to have higher female proportions. There is some evidence to show that female headship and high sex ratios constitute a disadvantage to families in terms of per capita consumption. In a speculative vein the Visarias say: "Also females form a higher proportion of households with smaller landholdings perhaps because they are gradually forced to sell a part of their landholdings or get a smaller share relative to the brothers of the deceased spouse. Partly as a result, the female-headed households might include a high proportion of rural labour households...".

It is possible to indulge in further speculation. The Visarias find that female heads are mainly widows (or divorced or separated persons). Now there is no reason why the incidence of widowhood should be very significantly higher among those with small plots of land; it can be so however, if male mortalities in the relevant age groups are higher than female ones by margins relatively wider than in the bigger land size classes. This clearly points to the lack of one-to-one correspondence between widowhood and female headship. To the extent that female headship results from male outmigration, this is obvious. What is not obvious is that, whatever the spirit of law and custom, women fail in general to obtain rights to ownership of (or control over) land. Thus when landholdings are substantial, even if women acquire legal titles, male relations may step in quietly or otherwise, to 'manage' the property, depriving women not only of headship in a formal sense but of much else.

This is speculative but important nonetheless, for it highlights the role of the mechanisms of property transfer and control in the determination of the relationships between sex ratio and landholding characteristics.

At any rate, the smallness in family size among the land-poor arises in part from a greater incidence of widows heading the families constituted by them and their child dependents. The sex composition of such households has a priori to be in favour of females because of the absence of the male spouse. They are likely to be concentrated among the poor—howsoever defined—as a consequence of the female disadvantage in earning incomes and acquiring property.

Concluding Remarks

Factors such as male outmigration and the bunching of families headed by widows contribute to the distinctly better-balanced sex ratios among the agricultural labour and small cultivator households, but they cannot decisively explain why these ratios often tend to be over 1,000 in contrast to an average of 950 for the whole rural population, and even lower values among households with big landholdings uniformly all over India. The conclusion must be that although mortality rates in general can be expected to high—higher than in the rest of the population—in such poor households, the differential between the sexes may be relatively narrower in some age groups. The consistency with which pronounced deficits of females are observed in households with large landholdings—for example in the south, where generally the sex ratios are more evenly balanced—lends weight to this conclusion.

TABLE 8: PERCENTAGE OF HOUSEHOLDS WITH FEMALE HEADS AMONG CULTIVATORS ACCORDING TO SIZE OF LANDHOLDING, 1961

Area	Size of Landholding (in Acres)								
	Below 1	1.0–2.4	2.5-4.9	5.0–7.4	7.5–9.9	10.0–14.9	15.0–49.90	50+	All
India	14.5	9.8	6.4	5.1	4.4	4.2	3.7	3.4	7.2
Andhra Pradesh	14.5	10.8	7.9	7.1	6.5	6.3	5.9	5.7	8.8
Assam	8.0	5.0	2.7	2.0	1.6	1.5	1.3	5.5	3.5
Bihar	16.1	10.0	6.0	4.3	3.5	3.4	3.1	4.5	8.6
Gujarat	14.9	8.3	5.8	4.3	3.8	3.4	2.6	2.0	4.9
Himachal Pradesh	15.7	10.6	7.9	5.2	4.4	3.2	4.3	5.5	9.5
Jammu and Kashmir	10.9	7.3	6.0	7.4	6.9	6.4	7.5	—	7.3
Kerala	15.1	10.0	7.6	7.8	7.6	6.2	6.1	12.0	12.0
Madhya Pradesh	12.5	9.2	6.2	4.9	4.0	3.9	3.7	3.9	5.5
Maharashtra	27.1	16.4	10.9	8.4	6.9	6.1	4.5	3.3	9.5
Manipur	20.2	10.1	5.6	3.2	3.2	4.3	5.0	7.3	7.9
Meghalaya	29.2	24.8	16.1	18.0	17.8	17.1	22.1	32.8	20.4
Karnataka	20.1	14.4	11.0	9.1	8.9	7.8	6.1	4.8	10.0
Orissa	11.5	7.6	4.7	3.7	3.2	3.2	3.2	3.5	5.8
Punjab	20.6	11.4	6.3	3.2	2.1	1.7	1.5	1.5	3.9
Rajasthan	10.9	7.1	4.7	4.0	3.4	3.2	2.8	2.1	4.1
Sikkim	4.9	8.6	6.5	4.7	5.3	4.8	3.7	6.7	6.1
Tamil Nadu	14.7	11.7	8.9	7.5	6.5	6.2	5.4	6.5	10.1
Uttar Pradesh	14.3	9.3	5.6	4.0	3.4	3.0	2.9	3.3	6.9
West Bengal	8.5	5.8	3.1	2.4	2.1	2.2	2.8	5.0	4.6

Source: "Census of India", 1961, Part II C (i), "Social and Cultural Tables", table C-1, published in state volumes; cited in Visaria and Visaria (198

This indirect inference drawn from the data on sex ratio balances discussed in this note no doubt requires more direct empirical support; also, there is scope for further analysis at the regional level of even this kind of secondary information.

However, it will be hasty to conclude that there is less discrimination against females among the poor, for mortality differentials cannot be wholly attributed to 'discrimination'. For instance the higher male death rates observed in some regions among some age groups do not imply discrimination against males. But the discrimination against females in India is real and its different dimensions are well known, what even statistics reveal or do not. It is possible that discriminatory practices—especially in relation to nutrition and health care—are more effective among the landowning classes than in poor families, given the very low standard of living of the latter; the bias may be universal but it seems to be stronger among some caste groups and in some regions of the country. Theorising about this bias is not easy, however.

No doubt, the economic value of a woman, calculated (by economists who do not distinguish human beings from commodities) on a long-run basis, may turn out to be higher for a labouring or small cultivator family than for a big farmer, given the cropping patterns and the possibility of women earning incomes. But as an explanation for the observed sex ratio variation with a better balance among the labouring poor this calculation is suspect because it is difficult to believe that it is actually made in some fashion or ingrained in culture through economic consciousness and underlies sex bias or the lack of it. For the poor, work is directly related to survival from day-to-day and long-run calculations may not be relevant. It is necessary therefore, to look beyond a simple economic calculus for mapping and understanding sex ratio variations.

Notes

1 The number of females for every 1,000 males in India as a whole has declined, although not steadily, from 972 in 1901 to 935 in 1981 (Padmanabha, 1981).

2 Visaria considers other factors such as spatial mobility, under-enumeration of females and sex ratios at birth, before arriving at the importance of mortality differentials for explaining the deficit of females. During the pre-independence period, the census authorities thought that the deficits of females arose mainly from the undercounting (resulting from under reporting) of females in certain age groups. Even while recognising female infanticide, the 'neglect of female life', and 'bad treatment' of women, they refer to the 'concealment' of women belonging to certain age groups among some agricultural and other high caste communities as an important factor underlying low female proportions (Natarajan, 1972).

3 Some recent data show that upto the age of 35 years mortality tends to be higher among females (Padmanabha, 1982). Female mortalities are lower after the age of 35 years but life expectation at birth is lower for females than for males.

4 Visaria (1961), p 66. He suggests in conclusion that the discrimination "denies to many women the benefits of the normal biological superiority of their sex..." The superiority is presumably inferred from higher male mortalities generally observed in the western countries.

5 Apart from the difficulty of observing and assessing amounts consumed by individual members at a single meal, it has been suggested repeatedly that there is also the possibility of a bias introduced by the presence of an observer.

6 For a comprehensive discussion see Agarwal, op cit.

7 The 1911 Census says: In the Benares division Moore personally made most minute investigations into the facts in three hundred and eight villages; in sixty-two of these villages he found that there were no female children under the age of six years. In another part of the division, Moore found a community of Hara Rajputs regarding whom he said, "Not only are there no girls to be found in their houses now, but there never have been any, nor has such an event as the marriage of a daughter taken place for more than two hundred years...
"...the extraordinarily low female ratio of the Shekawant branch of the Kachwaha clan of Rajputs in Jaipur state, 530 females per 1,000 males, is indubitably suggestive of deliberate interference with the natural ratio, when considered with the Rajpur tradition" (quoted in Natarajan, op cit, p 4). These may be extreme cases but they illustrate the point.

8 Extracts from the different early Censuses in this respect are given in Natarajan, op cit.

9 For a discussion of Miller's work and some extrapolations, see Bardhan (1982). The author of this note has not read Miller's book.

10 Agarwal (1986) discusses this expectation in some detail and refers to some micro evidence showing the contrary: higher levels of discrimination among the landless poor households. However, such higher levels may coexist with better female proportions (aggregated over all age groups) for reasons to be clarified later in this note.

11 During baseline years female mortality consistently exceeded male mortality in all age groups except infant deaths. The age-specific sex differentials were more pronounced in children 1-4 and 5-9 years and in the childbearing years. Disaster tended to accentuate these sex differentials among children. In 1971-72 [a year of food crisis] mortality of female children 1-4 years was 57 per cent higher than mortality of males in comparison to a differential of 40 per cent in the preceding five baseline years" (Chowdhury and Chen, 1977, p 53)

12 See Greenhough (1982), p 311.

13 Referring to fewer deaths among men than women in the 1908 famine, the 1911 United Provinces Census Report says: "This is attributable chiefly to the absence of wandering. This absence of wandering was... due to the fact that the people by 1908 had learnt by experience that government was anxious and willing to assist them. In 1897... they had not yet obtained such confidence in government and took to... wandering in search of work... It is these wanderers who feel the worst effects of famine, it is chiefly they who starve. And it is amongst them that man would most severely feel his disadvantages and women would reap the fullest benefit of her advantage" (quoted in Natarajan, 1972).

14 For further discussion of such correlations see Krishnaji (1984 and 1986).

15 Ibid.

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Differentials in Mortality by Sex

Malini Karkal

The gap between the life expectancies of males and females at birth in India has shown a steady decline since 1961. Along with this has been a change in the sex ratios favouring females. While this is being generally seen as an indication of the improvement of health of women, a careful analysis of the sexwise changes in mortality patterns and of the health status of women and children belies this argument. For, although the life expectancy for females has improved, most of this gain has accrued to the older age groups. Moreover, the continuing high rates of infant mortality, especially in the perinatal period, and the large proportion of low birth weight babies with poor chances of survival is a clear indication of the poor health of women in India.

THE United Nations, "Estimates and Projections of World Population (1982)", reports, among other figures, life expectancies for populations of the world from 1950-1955. A review of these figures shows that there are only 7 countries that had life expectancies for females that were lower than that for the males. These countries were Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka and Papua New Guinea. For all the countries, excepting for Sri Lanka, the pattern of low expectancy for females continued throughout the 20th century. Sri Lanka, however, showed higher life expectancy for the females, compared to that for males, during 1960-65 and thereafter. It is interesting to note that the death rates for these countries differ and no relationship is indicated between the level of life expectancy and differentials in mortality by sex, though all the above mentioned countries are among the higher mortality group.[1]

The acceleration hypothesis postulated that the later a country enters the demographic transition, the period between the traditional pre-industrial high wastage of population replacement (high mortality and high fertility) and the modern 'economical' patterns of demographic behaviour (low mortality and low fertility), the faster it passes through the various stages. The hypothesis implies an automatic transfer of the experience of developed countries to today's developing countries without due regard to the uniqueness and peculiarities of the process of demographic change.

The medical technology hypothesis postulated that modern medical technology has broken the link between socio-economic development and levels of living on the one hand and mortality levels on the other. The advent of highly sophisticated technology, international assistance and substantial progress in the knowledge of disease prevention and cure has made a significant decline in the deaths possible without any concomitant improvements in the standard of living of the population. Initial successes in disease eradication or control, lent credibility and support to the medical technology hypothesis. However, it has now become apparent that it was premature and over-simplified to generalise. A certain 'take off' in development is prerequisite for a substantial and maintained reduction in mortality. This 'take off' is not merely in terms of economic advancement but social and cultural milieu in terms of influence on the health of the population. As the discussion hereafter will indicate, crucial role in the change is governed by the conditions affecting the health status of females.

Experience with mortality changes in different countries provides adequate evidence for the reasoning that there is a need for understanding of levels of mortality, not only as averages, but as experienced by different sections of population and the causes of morbidity and mortality among them. It is only such an analysis that will help in the planning of action programmes that will reduce morbidity and mortality including the overall level. Further, it will be observed that improved health is not only a social goal but it is a means, and indeed an indispensable component and a prerequisite of social and economic development.

It has been suggested that differentials in mortality of the two sexes reflect the differences in their biological make up. In societies such as India, higher mortality for females is a reflection of the role and status of females, both within the family and in society at large, as much as they represent the health consequences of social, economic and cultural discrimination against them. The health status of women has a two-fold

TABLE 1: MORTALITY RATES BY SEX, INDIA AND CORRESPONDING SOUTH ASIAN UN MODEL PATTERN INDIA

Age	India						South Asian Pattern					
	1970-75			1976-80			1970-75			1976-80		
	Male	Female	Difference	Male	Female	Difference	Male	Female	Difference	Male	Female	Difference
(1)	(2)	(3)	(2−3)=(4)	(5)	(6)	(5−6)=(7)	(8)	(9)	(8-9)=(10)	(11)	(12)	(11-12)=(13)
0	.12998	.13505	−.00507	.12100	.12720	−.00620	.13704	.13901	−.00197	.12656	.12584	.00072
1	.07567	.10301	−.02734	.06774	.08992	−.02218	.09063	.10845	−.01783	.07977	.09083	−.01106
5	.02266	.02613	−.00347	.01815	.02266	−.00451	.02047	.02472	−.00425	.01803	.02035	−.00232
10	.01005	.01139	−.00134	.00946	.00976	−.00030	.00871	.01058	−.00187	.00775	.00873	−.00098
15	.01119	.01706	−.00587	.01055	.01460	−.00405	.01030	.01516	−.00486	.00922	.01242	−.00320
20	.01401	.02266	−.00865	.01322	.01972	−.00650	.01215	.01839	−.00624	.01088	.01504	−.00416
25	.01546	.02266	−.00717	.01361	.02129	−.00768	.01480	.01989	−.00509	.01331	.01645	−.00314
30	.02050	.02593	−.00543	.01844	.02060	−.00216	.01834	.02339	−.00505	.01650	.01957	−.00307
35	.02886	.02852	.00034	.02471	.02354	.00117	.02480	.02713	−.00233	.02247	.02316	−.00069
40	.03854	.03260	.00594	.03830	.02871	.00959	.03532	.03295	.00237	.03234	.02879	.00355
45	.05836	.04618	.01218	.05239	.03744	.01495	.05120	.04291	.00829	.04743	.03822	.00921
50	.08418	.06918	.01500	.08165	.05865	.02300	.07714	.06481	.01233	.07238	.05855	.01383
55	.12596	.09773	.02823	.12051	.08975	.03076	.11017	.09893	.01124	.10456	.09048	.01408
60	.18434	.16139	.02295	.18317	.14687	.03630	.16409	.15139	.01270	.15720	.14014	.01706
65	.25081	.22586	.02495	.24215	.20472	.03743	.23169	.21781	.01388	.22337	.20453	.01884
70+	1	1	0	1	1	0	1	1	0	1	1	0

significance. One, women constitute almost half of the population and to that extent their condition contributes to the overall health situation and second, women's health determines the health of the future population.

The gap between life expectancies at birth of males and females in India showed a decline from 1.7 to 1.5 and to 0.4 years for the periods 1961-70, 1971-75 and 1976-80 respectively. Along with this decline has been the change in the sex ratio of the population from 941 (1961) to 930 (1971) and to 933 (1981). The reversal of the trend in the sex ratio from 930 to 933 has been welcomed by several experts. Chhabra, while reporting on the provisional results of 1981 said "the only silver lining to be noted from the census results is the marginal improvement in the sex ratio".[2] The Registrar General, commenting on the census results, opined that "the tendency of the sex ratio to deteriorate has been halted and that in fact there has been a slight improvement". He further added that "one of the conclusions that one could, at this initial stage, come to is that probably maternal and child care programmes are yielding results".[3]

In the light of overall belief that in the recent years there has been an improvement in the health of women—the sample of such belief is provided by the above mentioned comments on the trend in the sex ratio of the Indian population—it is necessary to make a careful analysis of the changes in the mortality patterns over time and in the relative changes in the two sexes.

The narrowing of the gap between the expectation of life of the two sexes does indicate that there is a convergence in the figures over time but this needs to be analysed to understand the changes in different age-groups. This is essential because averages do tend to hide large differentials in some groups when these are compensated on others. Lopez studied the relationship between male and female life expectancies at birth based on trends in population of 139 developed countries. He concluded that the relationship is highly linear ($\varrho = 0.9890$). He, therefore, presented an equation for the linear form.[4] The equation is

$$\widehat{e(m)} = 0.8788\ e_o\ (f) + 3.541$$

Applying the above equation to the data available from the Indian Sample Registration System (SRS) following results were obtained:

1970-75 for $e_o(f) = 49.0$, $\widehat{e(m)} = 46.6$

$$\widehat{e_o(m)} - e_o(m) = -3.9$$

1976-80 for $e_o(f) = 52.1$, $\widehat{e(m)} = 49.3$

$$\widehat{e_o(m)} - e_o(m) = -3.2$$

It is observed that during 1970-75 the life expectancy at birth of the Indian males was higher by 3.9 years than the one expected by the observed life expectancy of females of 49 years. Over the years this gap was reduced to 3.2 years by 1976-80 when the life expectancy of females increased to 52.1 years. Thus Indian males, relative to the females are at greater advantage in comparison to the males from the now developed countries when they passed through mortality transition. However, this advantage has shown some decline over time.

Table 1 gives a comparison between mortality rates for India and the corresponding figures for the South Asian model pattern. Table 2 gives the percentage difference in mortality rates of females compared to those of males by age-groups for India and corresponding South Asian pattern.

The figures in Table 2 show that females in both groups of populations are at a disadvantage when compared to the males in their population in the younger ages. For India this age-group is upto age-group 30-34 and for the South Asian Model it is upto age-group 35-39. Thereafter females are at an advantage.

It is worth noting that over time in the South Asian pattern the difference between the mortality rates of the two sexes has narrowed at ages when women were at a disadvantage, whereas in ages above 35 the male disadvantage has increased probably due to greater gain in mortality of females in higher ages.

In contrast to the above pattern the females in India not only have larger differences, compared to the South Asian pattern, for both the time periods, but for first year of life for the age-group 5 to 9 and for 25 to 29 the disadvantage has increased.

The disadvantage in ages 40 and above for males, for both the time periods, is not only larger in India compared to that for the South Asian pattern, but over time the disadvantage for males has increased.

In the light of the above discussion it is worthwhile looking into the change in mortality rates of the two sexes over time. Table 3 presents the gain in life expectancies between 1970-75 and 1976-80 in India.

From column 2 in Table 3 it is seen that the gain for males was 1.966 years, whereas for females it was 3.146 years. The gain in the life expectancy for females was therefore larger.

Columns 4 and 5 show that for males as well as for females the gain was larger for higher ages than for lower ages and for females the percentage gain was higher for ages 55 and above. Significantly, largest share of the gain was taken by ages 70 and above. Here again the share was 25.10 per cent of the total for males and 33.67 for females.

The figures in Table 3 therefore show that whatever gain in life expectancy that has been made by females in the period intervening between 1970-75 and 1976-80, the larger share has gone to older women in contrast to the agewise distribution of gains for males.

TABLE 3: GAIN IN LIFE EXPECTANCY IN INDIA BETWEEN 1970-75 AND 1976-80 BY AGE

Age Group	Absolute		Percentage	
	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)
Total	1.966	3.146	100.00	100.00
0	0.014	0.006	0.73	0.18
1-4	0.034	0.052	1.70	1.65
5-9	0.086	0.098	4.35	3.12
10-14	0.095	0.106	4.84	3.37
15-19	0.095	0.114	4.83	3.63
20-24	0.096	0.120	4.90	3.82
25-29	0.099	0.126	5.04	4.02
30-34	0.106	0.136	5.42	4.32
35-39	0.115	0.150	5.84	4.76
40-44	0.120	0.161	6.11	5.13
45-49	0.125	0.176	6.37	5.60
50-54	0.132	0.198	6.69	6.29
55-59	0.130	0.211	6.61	6.70
60-64	0.120	0.212	6.09	6.75
65-69	0.106	0.220	5.38	6.99
70+	0.493	1.059	25.10	33.67

Source: Computed from SRS life tables. Sample Registration System 1970-75 and Sample Registration System 1979-80.

TABLE 2: PER CENT DIFFERENCE IN MORTALITY RATES OF FEMALES COMPARED TO THOSE OF MALES BY AGES FOR INDIA AND CORRESPONDING UN SOUTH ASIAN PATTERN

Age	India		South Asian Pattern	
	1970-75	1976-80	Corresponding to 1970-75	Corresponding to 1976-80
(1)	(2)	(3)	(4)	(5)
0	− 3.90	− 5.12	− 1.44	0.57
1	−36.17	−32.74	−19.67	−13.87
5	−15.31	−24.85	−20.76	−12.86
10	−13.33	− 3.17	−21.46	−12.65
15	−52.45	−38.39	−47.18	−34.71
20	−61.74	−49.17	51.36	−38.24
25	−46.29	−56.42	−31.39	−23.59
30	−26.49	−11.71	−27.54	−18.61
35	1.18	4.73	− 9.40	− 3.07
40	15.41	25.04	6.73	10.98
45	20.87	28.53	16.19	19.41
50	17.82	28.17	15.98	19.11
55	22.41	25.52	10.20	13.47
60	12.45	19.82	7.74	10.85
65	9.95	15.48	5.99	8.43
70+	—	—	—	—

Source: Computed from data in Table 1.

Table 4 presents the differences in life expectancies of males and females by ages and for 1970-75 and for 1976-80. The difference in life expectancies of the two sexes in the earlier years was 1.544 years whereas in the later it was 0.365 years. It is interesting to note that in earlier years upto age 50-54 the percentage difference was much smaller compared to the later years and in first year of life it was the females who were at an advantage. For age group 55-59 in earlier years males had an advantage, however by 1976-80 the females were at an advantage. The difference is in favour of older females for ages 60 and above in 1970-75 and for ages 55 and above in 1976-80.

It is therefore, observed that Indian females are at a disadvantage as compared to Indian males and over time whatever gains that are made in life expectancy of females a disproportionately larger share has gone to females in older ages. This observation belies the argument that there is improvement in the health of the females in the younger ages and especially those in the reproductive ages. Support to the belief that over the years the health of younger women has improved was also provided by the SRS life expectancies at each age (Table 5). These data show that in 1970-75 as well as in 1976-80 from age 5 females have higher life expectancies compared to males for the same periods. What needs to be realised is that the life expectancies calculated for younger ages are influenced by the changes in chances of survival at older age. Hence the larger gains observed for older women and presented in discussion so far were responsible for this misleading picture.

Health Status of Younger Women

In the context of the above discussion it will be worthwhile looking at the data that gives a clue to the health status of women in younger ages and that of the children born to them.

Birth weight is strongly conditioned by the health and the status of the mother, her early diet and maternal malnutrition. Ill-health and other deprivations are the most common causes of low birth weight and retarded fetal growth.[5] Countries with lower life expectancies for females, mentioned earlier, report higher incidence of low birth weight babies. These countries also report higher incidence of perinatal mortality and a larger share of infant mortality during first four weeks of life. Indian data show that the perinatal mortality is around 60 per 1,000 births and around 50 to 60 per cent of the infant deaths take place during first 4 weeks of life. This pattern of deaths, and with the reported higher incidence of low birth weight babies, are clear indications of poor maternal health.

Ruzicka and Chowdhury point out that in Bangladesh and Pakistan and in parts of India, the disadvantage of girls begins during the post neonatal period.[6] Gopalan supports this observation and says that "the relative neglect of the female child is evident from the fact of greater prevalence of growth retardation even in infancy among girls than in boys. It is such nutritional 'insult' commencing right from infancy and continued through all stages of development that eventually results in maternal health/nutritional status which harms not just the women but the succeeding generation as well."[7]

International standards for satisfactory performance at delivery of women indicate that women with weights of 38 kg or less during pregnancy and 42 kg or less during the last month of pregnancy, and those with heights less than 145 cm are to be considered as being at risk during pregnancy. Such women experience complications during pregnancy or at delivery and have babies of low birth weight whose growth and development are unsatisfactory. The data from different states in India clearly indicate a distressingly high proportion of women with 'pregnancy risks'.

In keeping with the above observations about the health of the women in developing countries is the finding that an estimated 22 million low birth weight babies are born annually in the world and 21 million of them are born in the developing countries. The importance of this condition can be well understood when it is pointed out that there are strong indications that these babies contribute to a large proportion of deaths and child morbidity, the risk of mortality being upto 20 times higher for these babies than for other babies, both in neonatal period and later. Further it needs to be mentioned that two-thirds of all babies of low birth weight born in developed countries are estimated to be pre-term (i e, less than 37 weeks of gestation). In developing countries on the other hand, three-fourths of all babies of low birth weight are full term, but significantly, are undernourished and small for gestational age. This is a clear indication that the babies born of the malnourished and infested mothers in the developing countries are poor in health. The data, therefore, show that late neonatal and post-neonatal deaths are now uncommon in developed countries. In many of the developing countries however, they account for about two-thirds of all infant mortality. The inter-American investigation of mortality in childhood points out that malnutrition is an underlying cause for 57 per cent of the infant deaths in some of the countries.[8]

'Special care' or 'premature' units with well-equipped set-ups for these low births weight babies do show survival rates comparable to those found in some of the developed countries. However, a follow-up of these babies showed that 70 per cent of the infants discharged from the premature nursery were dead within three months.[9]

The effect of malnourishment as an

Table 5: Life Expectancy at Different Ages by Sex—India

Age	1970-75		1976-80	
	Male	Female	Male	Female
0	50.5	49.0	52.5	52.1
1	57.0	55.6	58.6	58.6
5	57.5	57.7	58.8	60.2
10	53.8	54.2	54.8	56.6
15	49.3	49.8	50.3	52.1
20	44.8	45.6	45.8	47.8
25	40.4	41.6	41.4	43.7
30	36.0	37.5	36.9	39.6
35	31.7	33.4	32.6	35.4
40	27.6	29.3	28.3	31.2
45	23.5	25.2	24.3	27.0
50	19.8	21.3	20.5	23.0
55	16.4	17.7	17.1	19.3
60	13.4	14.3	14.1	15.9
65	10.9	11.6	11.7	13.2
70+	8.6	9.2	9.6	10.9

Source: Sample Registration System, 1970-75 and 1976-78.

Table 4: Differences in Life Expectancy of Males and Females by Age

Age Group	Difference in Life Expectancy			
	Absolute		Percentage	
	1970-75	1976-80	1970-75	1976-80
(1)	(2)	(3)	(4)	(5)
Total	1.544	0.365	100.00	100.00
0	−0.004	0.005	−0.27	1.23
1	0.080	0.061	5.18	16.83
5	0.146	0.134	9.48	36.69
10	0.151	0.140	9.78	38.46
15	0.168	0.149	10.85	40.73
20	0.190	0.166	12.27	45.47
25	0.216	0.189	13.37	51.71
30	0.235	0.206	15.23	56.45
35	0.238	0.203	15.43	55.72
40	0.221	0.180	14.28	49.18
45	0.181	0.130	11.71	35.66
50	0.126	0.060	8.17	16.39
55	0.050	−0.030	3.26	−8.30
60	−0.030	−0.123	−1.95	−33.68
65	−0.078	−0.192	−5.03	−52.61
70+	−0.346	−0.911	−22.37	−249.95

Source: Computed from S R S Life Tables.
Sample Registration System 1970-75 and Sample Registration System 1979-80.

underlying cause becomes much more significant in the case of female babies, since as pointed out earlier in Table 6, there is evidence that in countries such as India, female babies get less nourishment and show greater malnourishment. Further it is now conclusively proved that the life-long undernutrition of the mother, extended into her pregnancy, is more serious for the baby than an acute nutritional disturbance during pregnancy in a previously well-nourished mother. The long-term effect on the child are more severe and may be devastating when intrauterine malnutrition is followed by malnutrition in the first months of life.[10] There is now evidence that undernourished mothers when breast-feeding, do not meet the nutritional requirements of their babies. It is also found that the infant born to the mother aged 30 and over is likely to receive too little milk of low fat content, and therefore obtains too few calories and later develops marasmus.[11] Continuation of fertility among women at higher ages can therefore affect the health of their children in their early ages as well as adults.

Weaning in developing countries takes place by the second year of the baby. Poor post intra-uterine conditions influence the low birth weight babies and such babies when undernourished show higher susceptibility to diseases of childhood, such as measles, pertussis and pneumonia. These in combination with continued malnourishment have higher fatality rate. For the babies who manage to survive through these conditions there may be serious chronic damage. Some of this is already apparent in childhood such as blindness and paralysis, while other sequelea become manifest later in life such as lower resistance to infections, chronic heart disease, and mental retardation. Thus the neglect and under-nourishment of girls sets a vicious cycle of deteriorating health of population, stagnation of death rates and continuing high mortality among infants and children.

A medical check-up of the individuals showed that women receive lesser share of food compared to the men in their families. In populations such as those in Maharashtra, that seem to have made the transition to relatively lower mortality for females, females when compared with males, show lower incidence of morbidity for several diseases however, the incidence of anaemia is higher among them,[12] thus supporting the belief that it is not the poverty alone that is responsible for the poor health of females, but their social neglect.

Dyson argues that excess male mortality

TABLE 9: COMPARISON OF SURVIVALS BY BIRTH WEIGHT BETWEEN BIRMINGHAM (20) AND IMESI, NIGERIA

Birth Weight (g)	Stillbirths/1,000 Total Births		Neonatal Deaths/1,000 Total Births		Mortality 1-12 months/ 1,000 Total Births	
	Birmingham	Imesi	Birmingham	Imesi	Birmingham	Imesi
−1,000	448	429	931	750	118	1,000
1,000−	436	—	612	200	64	444
1,500−	192	95	224	211	37	286
2,000−	87	47	77	49	18	103
2,250−	46	14	36	13.7	19	111
2,500+	10.6	22.9	6.8	15.2	8	38
All weight	22.1	27.2	15.8	24.9	9	54

Source: David Morley (1973), "Paediatric Priorities in the Developing World", Post-graduate Paediatrics Series, Butterworth and Co Ltd, London, pp 79-80, p 93.

TABLE 6: MALNUTRITION ON THE GOMEZ'S SCALE IN MALE AND FEMALE INFANTS

Centre	Male							Female						
	Retardation Grade							Retardation Grade						
	Excellent	Normal	I	II	III	NR	N	Excellent	Normal	I	II	III	NR	N
Bombay	12.5	21.9	42.5	18.3	2.8	2.0	958	8.2	17.4	43.2	25.4	4.5	1.3	862
Calcutta	5.4	14.2	42.7	25.0	8.2	4.5	667	5.5	14.8	36.9	27.5	10.6	4.7	710
Madras	10.2	19.9	41.7	23.0	3.1	2.1	846	5.6	14.8	43.8	28.3	5.7	1.8	883

Notes: N = Total Numbers of Sample. NR = No response.
Source: From C Gopalan's article, ref 5.

TABLE 7: PERCENTAGE OF FEMALE WITH WEIGHT LESS THAN 38 KG CALCULATED* FROM NNMB DATA 1974-79

Age Group	Kerala	Tamil Nadu	Karnataka	Andhra Pradesh	Maha-rashtra	Gujarat	Madhya Pradesh	Orissa	West Bengal	Uttar Pradesh
20-24	20	20	23	22	24	15	17	16	29	17
25-29	21	22	21	24	25	20	15	24	32	20
30-34	23	23	22	27	30	21	16	22	35	24
35-39	27	22	26	25	29	24	18	28	42	25
40-44	34	24	28	28	32	25	19	29	43	26

Note: * Calculated on the basis of values given for means and standard deviations assuming normal distribution.
Source: Report for the year 1979 NNMB, NIN, Hyderabad, 1980, quoted from Gopalan's article, ref 5.

TABLE 8: PERCENTAGE OF WOMEN WITH HEIGHT LESS THAN 145 CM CALCULATED* FROM NNMB DATA 1974-79

Age Group	Kerala (1781)	Tamil Nadu (1827)	Karnataka (2573)	Andhra Pradesh (2131)	Maha-rashtra (1995)	Gujarat (2376)	Madhya Pradesh (1128)	Orissa (608)	West Bengal (1641)	Uttar Pradesh (1577)
20-24	20	14	16	16	15	12	16	23	21	22
25-29	20	14	12	15	17	13	17	25	22	15
30-34	22	14	12	17	21	13	16	22	25	22
35-39	24	14	14	16	24	14	17	27	29	25
40-44	30	+	18	18	24	16	18	22	29	26

Note * The percentages have been calculated on the basis of mean and standard deviation values using normal probability tables.
+ The value given for standard deviation is not reliable and the percentage figure is not calculated.
Source: NNMB Report for the year 1979, NIN, ICMR, Hyderabad. Figures in bracket indicate total sample size. Quoted from Gopalan's article, ref 5.

TABLE 10: SEX RATIOS (F/M × 100) OF DEATHS—URBAN MAHARASHTRA, 1982

Cause of Death Group	Age Group													
	1	1-4	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+	Total
1	86	94	90	75	71	89	72	61	53	45	37	32	29	41	56
2	—	—	—	—	70	56	54	51	55	50	90	69	63	62	64
3	96	112	104	82	103	93	127	127	124	91	86	72	66	71	84
6	73	97	85	65	65	71	81	79	81	57	73	57	54	55	70
7	—	—	—	—	88	67	87	83	78	55	51	49	48	56	55
8	83	100	91	66	75	96	88	91	88	81	60	53	49	73	76
9	77	83	80	63	69	71	85	71	47	30	25	22	26	33	39
15	75	—	—	—	—	—	—	—	—	—	—	—	—	—	75
16	91	61	76	63	98	119	72	68	64	90	49	53	48	99	88
17	97	79	88	83	54	90	77	66	49	53	45	35	33	54	60
All	78	94	86	72	72	93	87	77	64	56	48	44	43	61	66
Population 1981 Maharashtra	—	—	96	95	91	82	78	83	78	78	73	79	76	92	85

Causes of deaths: Group 1: Infectious and parasitic disease; Group 2: Neoplasm; Group 3: Endocrine, nutritional and metabolic disease; Group 6: Diseases of nervous system; Group 7: Diseases of circulatory system; Group 8: Diseases of respiratory system; Group 9: Diseases of digestive system; Group 15: Perinatal causes; Group 16: Ill defined conditions; Group 17: Injury and poisoning.

observed in Indian populations may be due to higher incidence of tuberculosis.[13] Discussing the incidence of tuberculosis among children Morley points out that association between protein energy malnutrition and vitamin A deficiency in childhood tuberculosis is not simple. Tuberculosis may present as kwashiorkor or marasmus following a slow deterioration of the child's nutrition over many months. Morley says that adult physicians and those concerned with community health place childhood tuberculosis low in their priority, because it is non-infectious and goes largely unrecognised. In developing countries there is a tendency for infection at an early age, the nutrition of the child is poor and there is a high probability of an intercurrent infection, particularly measles and whooping cough. Low tuberculin sensitivity is frequent and caseation [degeneration of tissue typical of tubercular lesions] either in the primary lesion or in the associated lymph glands is more common. The majority of primary infections in children over 5 years of age, undergo a benign course with no detectable clinicial illness.[14] Severety of TB among girls may be accentuated by their undernourishment and through pregnancies, contributing to higher female mortality in younger ages, whereas for males it takes toll in later adult life.

The etiology of malnutrition, which is a major health problem for the majority of the world's population, is not only interwoven with many facets of poverty and underdevelopment but in many of the developing countries it is accentuated by the discriminations against women. It is, therefore, imperative that the nutritional problems in their solutions have basically to depend not only on economic development but have to assure equitable distribution to both sexes, as much as to all the sections of the population.

It must be mentioned here that in parts of the developing world available data show that mortality transition is underway and females have higher life expectancies as compared to the males in these population. However, there is reason to believe that this change from the earlier pattern is not because of any reversal in the attitude of the society to the position of women and treatment meted out to them, but due to the benefits of some of the public health programmes and more significantly due to effects of family planning programmes that have influenced maternal mortality as well as strains on the health of women, resulting in gains in older ages rather than younger.

Data from urban Maharashtra for medically certified causes of deaths show that even when the overall death rates for females are better, the sex ratio of deaths for ages 15 to 19 and 20 to 24 are higher than those for the population in those age groups. Also the sex ratios for deaths were higher than those for the population for almost all age groups from 0 to 4 to 40 to 44, excepting age group 5 to 9 (and which showed a marginal difference) for causes endocrine, nutritional and metabolic diseases. The ratios were also higher for diseases of respiratory system for age groups from 15 to 39 (Table 10). These data may be indicative of the effects of maternity on the already weak females. Since much of the female mortality takes place in younger ages, at higher ages males show relatively poor mortality situation.

Notes

[Paper prepared for the Workshop on Differential Female Health Care and Mortality, jointly sponsored by the Bangladesh Association for Maternal and Neonatal Health, and the Social Science Research Council, New York, at Dhaka in January 1987.]

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3 P Padmanabha (1981), 'The Decisive Decade: A Note on the Provisional Results of the 1981 Census of India', *Yojana*, Vol XXV, No 9, p 6.

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5 Nearly three quarters of the world's LBW infants are born in Asia, two-thirds of them in middle south Asia, one of the most populous area of the world. India, Pakistan and Bangladesh together account for some 10 million LBW infants. 'The Incidence of Low Birth Weight, A Critical Review of Available Information', *World Health Statistics Quarterly*, Vol 33, 1980, p 202, World Health Organisation, Division of Family Health.

6 L T Ruzicka and A K M A Choudhury (1978), "Demogrphic Surveillance System in Matlab, Vital Events and Migration 1974" (Sec C), Cholera Research Laboratory Science, Report No 11, Dhaka. A review of detailed investigations by medical specialities enquiring into perinatal deaths show that in all the cases of perinatal deaths the mothers were anaemic, received inadequate antenatal care and quite often had several health problems.
See Malini Karkal, 'Health of Mother and Child Survival' in "Dynamics of Population and Family Welfare" (1985) ed, K Srinivasan and S Mukherji, Himalaya Publishing House, pp 358-374.

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Female Infanticide in Rural South India

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Infanticide has been practised in all continents, but little dependable primary data exists on this subject. Presented here are findings on female infanticide for a rural south Indian population. These data were collected as part of a major four-year field study on child growth and survival in a 13,000 population and have been confirmed directly with the families concerned. Female infanticide is practised in only 6 of the 12 study villages affecting about 10 per cent of new-born girls. Reported here are the demographic consequences and social factors associated with this are considered. Seventy-two per cent of all female deaths were due to femicide and misclassification of these deaths would grossly distort the significant child survival achieved by this population.

AMONG humans, infanticide is a longstanding and widespread practice.[1] The study of infanticide among humans—its motivations, methods, and determinants—has a long history extending from commentaries of early travellers to contemporary fieldwork-based studies. Long-term scholarly interest in the subject of infanticide, however, and decades of intensive anthropological fieldwork on the related topics of household formation, birth practices, and child care yield surprisingly little dependable information on infanticide, especially direct infanticide. It is difficult to obtain firsthand, carefully confirmed data on infanticide cases and the social variables related to infanticide, in sufficient quantity to allow theory testing.

Absence of information on direct or indirect infanticide in a given study does not necessarily mean that such practices are in fact non-existent. The researchers simply may have overlooked them, intentionally or unintentionally. Several reasons explain scholarly inattention to infanticide. Most important, there is the problem of gathering enough data on direct or indirect infanticide through a brief field trip. Even in a large study population (of over a thousand, for instance), the number of infanticides that might occur is small. For example, Sargent, who has written an insightful study of witchcraft and infanticide in a west African population, learned of five cases of infanticide during her field trip of 1976-77.[2] In addition to the problem of small numbers of cases, the subject of infanticide bears a certain amount of stigma for both the population concerned and the anthropologist who studies it.

Therefore, most anthropological studies of deliberate and direct infanticide, in particular, rely on inferential evidence, largely secondhand reports from informants who inform the anthropologist of infanticides they have heard about.[3] In such local studies of direct infanticide, numbers of reported cases are still quite small, thus limiting theory testing and analysis. For instance, in their study of the Tarahumara of Mexico, Mull and Mull interviewed 20 women about their knowledge of infanticide.[4] They found that 95 per cent of the women knew of at least one case of infanticide when the mother had no husband or had 'too many children, 55 per cent knew of at least one case of infanticide of a 'damaged' child, and 10 per cent knew of at least one case in which a sickly infant had been killed. All the women questioned knew of at least one such circumstance. Due to limitations of their data, Mull and Mull can provide little insight beyond this basic information on people's knowledge of various instances of infanticide, the methods used, and some anecdotes. Bugos and McCarthy's study of infanticide among the Ayoreo, a tribal population of south-western Bolivia, involves a more quantitative approach.[5] Their fieldwork, conducted from January 1980 to March 1981, provides information on many more cases of infanticide than they discuss since they limit their study to "well-documented cases in which the mother was a party to the decision to kill the child. . . .and to only those cases in which the sex of the infanticide victim is known."[6] They are concerned mainly with the reasons for infanticide, and their analysis reveals two general patterns: infanticides due to the condition of the mother or infant, and infanticides due to uncertain social or physical factors (such as being resettled on a reservation). Analysis of the marital histories of the mothers involved reveals the overarching importance of marital instability.

Larger state-level populations can be studied through archival data, such as parish records or early censuses.[7] But this strategy is constrained by the necessity of having to infer infanticide from the data and the lack of firsthand observational insights on related aspects of the society under consideration.[8]

A contemporary analysis of official statistics on infanticide cases in Canada, alternatively, provides direct and confirmed evidence in 148 cases for 1961-1979.[9] But like the historical/census-based studies, this one is limited in its ability to provide understanding of social context and motivations. The authors are removed from the people who committed the infanticide; they cannot interview them and must instead infer motivations on the basis of the social/cultural data available, such as age and sex of the victim, age and sex of the person who killed the infant and relationship to the infant.

In an extensive informant-based study of infanticide, Nutini examines 250 cases of infanticide in an area of rural Mexico which are definite and confirmed on the basis of detailed interviews.[10] Many of the cases in the study occurred while Nutini was in the field, but others are included on the basis of recall and are thus not as reliable in their details as the others. His detailed research on infanticide is possible because of his long-term residence in the area (every summer over the past 30 years), widespread social networks, and rapport with the people of several villages. The data reveal a complex pattern of witchcraft beliefs as ideological justification for the infant deaths, and social patterning of the victims whereby high parity children are killed and girls more frequently than boys in recent times.

Study Area and Population

The larger study, of which the infanticide data constitute one part, was conducted in a rural area in the South Indian state of Tamil Nadu. The research was carried out in 12 villages of K V Kuppam block, North Arcot Ambedkar district, Tamil Nadu state, South India, for four years beginning in September 1986.[11]

The 12 study villages are noncontiguous, scattered in the peripheral areas of K V Kuppam block. Most villagers are Hindus, and a small proportion are Christian converts. While villages in the study area differ slightly from each other in their caste composition, the average distribution is 56 per cent gounders, 31 per cent harijans, 11 per cent other backward castes, and 2 per cent forward castes.[12] Sixty per cent of the mothers in the study are illiterate.

Socio-culturally, the study area is Dravidian, a term which implies, in addition to language, distinct features of marriage, intrahousehold dynamics, female status, and other practices, in comparison to non-Dravidian north India.[13] Most notably, characterisations of Dravidian sociocultural dynamics emphasise consanguineous marriages, sometimes between uncle and niece, first cousins or more extended kin relations within the same village or micro-region,[14] relatively equal treatment of sons and daughters in terms of food and medical care, and relatively high status of adult women within the household *vis-a-vis* males in the same household. Literacy rates of women are higher in the south than the north, and cur-

rently all new teachers in government primary schools in Tamil Nadu must be women. Fertility rates tend to be lower in the south than the north.[15] The Tamil Nadu state government has instituted special monetary incentives for weddings of girls above the age of 18 years who have completed the 8th standard. Sex ratios (both for the juvenile and total populations) in recent decades have been near equality at the district level.[16]

None of this, however, should be taken to imply that gender equality prevails in South India. Instead, one should realise that gender inequality exists, but is less extreme than in India's north-west. Furthermore, it should be remembered that this typification is, drawn in very general comparison to the more patriarchal north-west and should not be assumed to apply to all contexts in the south where considerable variation from the general pattern can be found within a region, village, or even family.

The data on female infanticide were gathered as a part of a prospective study carried out during April 1, 1987 to September 30, 1989. All pregnancies in the 13,000 population during this period were followed. The study includes a total of 773 birth outcomes involving 772 married women and one unmarried woman. There were 766 singletons and seven sets of twins. Total live births were 759 of which 378 were male and 381 female. The observed sex ratio at birth is not significantly different (at $p = 0.05$) from the standard sex ratio at birth of 105 males to 100 females, observed in large populations worldwide. Of the 21 stillbirths, eight were male and 13 female.

Each village had an assigned village level worker whose primary function was to provide education about child care to village mothers. The worker in all cases was a local resident of the village and had been trained at RUHSA (Rural Unit for Health and Social Affairs, headquartered in Kavanur village). The village worker's normal duties included keeping track of reproductive events among the entire village population, a task which was accomplished through visiting each home every 10 to 12 days. Every house in which an infant is born is visited within two days of the birth. Such regular home visiting generates high quality household demographic data since no pregnancy and its birth outcome can be overlooked by the health workers.

The fact that an infanticide has been committed is widely discussed among the village women. To the outsider, however, the cause of death is misreported. The village worker, though, is from the same village and is aware of the possibility of infanticide. This is confirmed with the mother and immediate relatives. After about five months following the establishment of excellent rapport with the study families, the field team had knowledge of the intent of infanticide even before the birth occurred in many cases. The father or other family members would tell the village worker that if the current pregnancy resulted in the birth of a female, it would be killed.

The infanticide data on which this paper is based, therefore, are unusually dependable. The reported number of cases is a conservative estimate. At least three other female infant deaths during the period are likely to have been infanticides, and unconfirmed female infanticide may account for the disproportionate number of females (13 out of 21) reported as stillbirths (infanticide at birth may be misreported as 'sevappu'—blue baby syndrome—or as a stillbirth). These deaths are probable, but not certain infanticides, and thus they are not included in this study as infanticides. Also not included are female infanticides that occurred before the reference period or subsequently.[17]

Other information gathered concerns the village in which the infanticide occurred; caste of the household in which the infanticide occurred; age, sex and birth order of the reference infant; twinship status of the reference infant; and marital status of the mother. The following discussion reports on the analysis of these variables in relation to the cases of female infanticide.

Patterns of Infanticide

In the study population of 13,000 there were a total of 773 birth outcomes recorded, involving 759 live births of which 378 were male and 381 female. Among the cohort of live born infants, 56 died in the period of two and a half years (from April 1, 1987 to September 30, 1989), and of these there were 23 males and 33 females. Thus the male to female mortality ratio was about 3:4, a very low ratio compared to worldwide statistics for societies where gender bias toward infants is not significant which indicate slightly higher male mortality in infancy and early childhood due to the biological higher vulnerability of boys.

Of these deaths, 19 were confirmed infanticides. In other words, of the total 56 deaths more than one-third were confirmed infanticides. Of the 23 male deaths, there was no infanticide. Among the 33 female deaths, there were 19 infanticides. Thus more than half the female deaths in the 12 study villages were due to direct infanticide; in the six villages in which all the infanticides occurred, infanticides constitute 72 per cent of female deaths (excluding the only case of the female infanticide to the unwed mother). Thus, the 'natural' death rate in this area for female infants is substantially increased through the practice of direct infanticide.[18] Using the infant deaths of the two one-year cohorts (obtained by following each year's cohort prospectively for one year) an infant mortality rate (IMR, deaths per 1,000 live births) of 69 was obtained for the whole study population; if we subtract out the deaths due to female infanticide, the IMR drops to 46. Put another way, in the six villages where female infanticide is practised, female infanticides constitute 9.7 per cent of all female births.

Only female infanticide occurred during the study period. However one case of male infanticide had occurred just before the beginning of the study period (February 1987), where the mother lost her husband and killed the male child soon after birth, after which the mother remarried. In the case of the unwed mother, she tried to abort the pregnancy, which was unsuccessful and committed female infanticide when it was born. Maternal motivations for infanticide may be said, therefore, to vary on the basis of marital status (the mother's motivations, in turn, are likely to be influenced by her natal family and their concerns for loss of status). It is likely that, no matter what the infant's gender, an unmarried or a newly married mother who becomes widowed may be impelled to commit infanticide. Unwed motherhood as a motivation for infanticide has been documented for historic periods in Europe[19] and contemporary Canada.[20] Another case of male infanticide occurred after the study period, where the child had a severe congenital anomaly. Despite utilisation of the necessary corrective surgery and post operative care (free of cost) for over two months, infanticide was committed the day the child was taken home.

The prevalence of female infanticide in the study villages corresponds with a report of gender-specific infanticide in a nearby population, the Kallars of Madurai district.[21] The Kallars discussed are smallholding farmers and landless agricultural labourers who sometimes resort to poisoning second-born, and subsequent, daughters. According to local hospital staff estimates reported in the article, a very high percentage of female infants are victims of infanticide:

> The statistics are shocking. Nearly 600 female births in the Kallar group are recorded in the Usilampatti government hospital every year, and out of these an estimated 570 babies vanish with their mothers... Hospital sources estimate that nearly 80 per cent of these vanishing babies—more than 450—become victims of infanticide.[22]

This assertion implies that, within the subgroup discussed, about 70 per cent (450 out of 570 infants) of infant girls are infanticide cases. Such a high percentage merits careful local investigations for confirmation, but is not out of the realm of possibility given historic data on similarly high rates in north-west India during the 19th century[23] and the pattern reported for a region of contemporary Rajasthan in which very few girls are kept alive.[24]

In terms of the possible historic roots of female infanticide (direct or indirect) in South India, we can only speculate concerning the Kallar practice,[25] or what the present study shows for K V Kuppam block, though the PR's field conversations revealed a pattern of at least several generations. Adding some confirmation to the possibility that the practice is of longstanding are some references to female infanticide in South India in the 1800s among the Kallars, Khonds, and Todas.[26] It is possible, therefore, that the contemporary situation has antecedents far back in time, but attempts at more detailed historical reconstruction have yet to be made.

One of the most interesting and perplexing results of this analysis is the clearly demarcated village clustering of female infanticide cases. All 19 cases of female infanticide occurred in six of the study villages which are in the same part of the block; in the other six villages there were no cases. Overall (all ages combined) sex ratios confirm the pervasiveness of this pattern and its effects on village demographics. In the 12-village study population, the overall sex ratio (females per males) at the time of the study was 977.5. In the villages where female infanticide was practised, the sex ratio was 939.8, while in the other villages it was 1018.6. Sex ratios in the under-five age group reflect this different distribution as well, with a surplus of boys in the former villages and a surplus of girls in the latter at all times during four years. Also, the PR observed instances of deliberate female neglect more frequently in the former than the latter.

The villages in which female infanticide occurs tend to be even more remote and have less educated populations than the villages with no cases of female infanticide. They are located in a hilly and more isolated part of the block, cut off from outside influences more notably than the non-infanticidal villages. Out of the six infanticidal villages, only two have bus service, while in the six non-infanticidal villages, all but one have bus service.

The caste composition of the villages with the female infanticide cases differs from the other villages in that they are predominantly gounder, with lower proportions of the other caste groups. Of the 18 cases of female infanticide (of married mothers), 17 were among the gounders. The remaining one case occurred among the arunthatis (cobblers), a scheduled caste.[27] These arunthatis, like the gounders, are a highly consanguineous group. No cases occurred among the harijans. Consanguineous marriages are common in this area. Most frequent are marriages between uncle and niece, and first and second cousins. In the six villages where female infanticide occurs, rates of consanguinity are much higher (almost 65 per cent of the families) than in the non-infanticide villages (about 40 per cent of the families). Specifically, in reference to uncle-niece marriages, 6 per cent of marriages are of this form in the non-infanticide villages, while 11.2 per cent are in the infanticide villages. This correlation's significance has yet to be explained, since it involves a very different kinship dynamic than in India's north-west where female infanticide is clearly associated with hypergamy and extensive exogamy.

Another distinguishing feature of the villages where female infanticide occurred is that they also are the villages in which all the twins were born; over the entire study period of two and a half years no twins were born in the other villages.[28] As in many other cultural contexts, the chances of a female twin dying through direct or indirect infanticide, in either a male-female or female-female set, are very high.[29] In this study area none of the twins died as a result of direct infanticide, but the senior author is aware that a female twin may be more subject to neglect than a male twin, and a female infant born after a set of twins is very likely to be killed.

The age at which death occurred is predominantly very young. Seventeen of the 19 female infanticides occurred within seven days of birth, one on the ninth day after birth, and the remaining one on the 16th day. In the entire study population, there were a total of 18 female infant deaths during the first seven days after birth, and 17 of these were confirmed infanticides (the single non-infanticide death was due to prematurity of the infant). Thus, the first week of life is extremely risky for female infants, but not because of 'natural' causes.

Notably, only one female infanticide (by a married mother) involved a first-born daughter. All the other victims had birth orders greater than one, and each of these families had at least one surviving female child at the time, and usually they had two. This pattern corresponds to the well known parity-specific practice of female child neglect in north-west India which seems to protect and preserve first-born daughters but discriminate against higher parity daughters.[30] Discrimination in child treatment based on the child's gender interacting with birth order has also been documented in Tokugawa Japan.[31]

Although the gounders involved in female infanticide live in remote villages, they are the upper social stratum of their villages. In fact, gounders own a significant proportion of the land in North and South Arcot districts. To assert that, relatively speaking, the gounders are well-off does not mean that they do not feel economic pressures when it comes to raising daughters. As in north-west India, it is precisely the costs of raising daughters according to upper-class rules that create severe constraints on household finances.

Excess Female Mortality

The data on 12 South Indian villages discussed here show unequivocally that female infanticide greatly increases the area's female infant mortality level. Indeed, if one were seeking to explain high rates of infant mortality in this region, ignoring the role of direct female infanticide would entail overlooking the cause for the majority of female infant deaths.

The results of this study present a challenge to concepts about the benefits of rural socio-economic development and biomedically-oriented health care programmes. First, this research suggests that the villages in which female infanticides occurred are less 'developed' in terms of urban linkages, services, and education than the non-infanticide villages. Although one cannot assume simply that bringing 'development' to the more remote and less 'developed' villages would necessarily bring about an immediate reduction in female infanticide, this is a possibility that should be held open for further investigation. It is unlikely, however, that 'development' in itself would be sufficient in the short run, since it has been found that, with increased resources, people who disfavour daughters and favour sons follow a pattern of diverting even more resources to sons than daughters. Second, a simple biomedical approach to improved infant mortality rates in the area would have only a small effect in changing the 'unwanted' status of certain daughters. A holistic approach is required for changing such a complex system of values about girls and women, and extensive study of the underlying social dynamics in this micro-region (such as marriage payments, marriage links among villages, women's economic opportunities, etc) would be helpful in constructing needed policies to reduce female infanticide.

In terms of public health involvement, the intensive home visitation system has been shown to be effective elsewhere in India,[32] in co-ordination with carefully maintained household-by-household records on births, in reducing deaths of unwanted daughters and promoting pregnancy planning to prevent future unwanted births. Also related, and on the positive side, is the recent decline in fertility rates in the area,[33] a possible indication that fewer unwanted daughters are being born and thus fewer becoming victims of infanticide. The option of sterilisation by women who have obtained the desired number and gender composition in their offspring may significantly reduce the number of unwanted female births. Other government policies related to raising the status of women may also have a beneficial impact: scholarships for women students, special emphasis on women in poverty alleviation programmes, reservations (reserved slots) in local community organisations for women, and special care for widows. One recent indication of Tamil women's relatively high status and position, even in the public domain, is their use of voting power to have prohibition reinstated.

This study of a south Indian population is a positive step forward in that it provides information that can be useful to planners in many different fields of effort. As a recent note drawn from the newsletter *Safe Motherhood* comments, "Such measures can only be successful if better data—separate information about girls' and boys' mortality rates, for instance—are available to planners of health and education. Girls are the future of all nations, so it is high time the scales were balanced."[34]

Notes

[The study on growth of pre-school children of which this was an incidental part was funded by UNICEF and Thrasher. We would like to thank D V Mavalankar, P Visaria and L Visaria for their suggestions.]

1 See reviews in Mildred Dickemann, 'Demographic Consequences of Infanticide in Man', *Annual Review of Ecology and Systematics*, Vol 6, 1975, pp 107-37; Barbara D Miller, *The Endangered Sex: Neglect of Female Children in Rural North India* (Ithaca, NY, Cornell University Press, 1981.

Ch 2); Susan C M Scrimshaw, 'Infanticide in Human Populations: Societal and Individual Concerns' in Glenn Hausfater and Sarah Blaffer Hrdy (eds), *Infanticide: Comparative and Evolutionary Approaches* (Aldine Publishing Company, Hawthorne, NY, 1984, pp 439-62); and Sheila Johansson, 'Delayed Infanticide' in Glenn Hausfater and Sarah Blaffer Hrdy (eds), *Infanticide: Comparative and Evolutionary Approaches*, (Aldine Publishing Company, Hawthorne, NY, 1984, pp 463-85).

2 Carolyn Sargent, 'Born to Die. Witchcraft and Infanticide in Bariba Culture', *Ethnology*, Vol 27, 1988, pp 79-95.

3 The literature on indirect infanticide (which results mainly from lack of food, medical care, and other kinds of life-supporting attention to an infant) is relatively abundant and based more on firsthand evidence of intrahousehold discrimination. For example, on north India: B D Miller (cited in note 1); on Bangladesh: Stan D'Souza and Lincoln C Chen, 'Sex Differentials in Mortality in Bangladesh', *Population and Development Review*, Vol 6, 1980, pp 257-70; Lincoln C Chen, Emdadul Huq, and Stan D'Souza, 'Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh', *Population and Development Reivew*, Vol 7, 1981 pp 55-70; on pre-20th century Europe: Johansson (cited in note 1); and on 19th century America: E A Hammel, Sheila R Johansson, and Caren A Ginsburg, 'The Value of Children during Industrialisation: Sex Ratios in Childhood in Nineteenth-Century America', *Journal of Family History*, Vol 8, 1983, pp 346-66.

4 Dorothy S Mull and J Dennis Mull, 'Infanticide among the Tarahumara of the Mexican Sierra Madre' in Nancy Scheper-Hughes (ed), *Child Survival: Anthropological Perspectives on the Treatment and Maltreatment of Children* (Boston, D Reidel, 1987, pp 113-32).

5 Paul E Bugos, Jr, and Lorraine M McCarthy, 'Ayoreo Infanticide: A Case Study' in Glenn Hausfater and Sarah Blaffer Hrdy (eds), *Infanticide: Comparative and Evolutionary Approaches*.

6 Ibid, p 519.

7 See, for example, G William Skinner, 'Infanticide as Family Planning in Tokugawa Japan', paper prepared for the Stanford-Berkeley Colloquium in Historical Demography, San Franscisco, 1984, and 'Conjugal Power in Tokugawa Families: A Matter of Life and Death' in Barbara D Miller (ed), *Sex and Gender Hierarchies*, New York, Cambridge University Press, forthcoming; R Sauer, 'Infanticide and Abortion in Nineteenth-Century Britain', *Population Studies*, Vol 32, 1978, pp 81-93; R Trexler, 'Infanticide in Florence: New Sources and First Results', *History of Childhood Quarterly*, Vol 1, 1973, pp 98-116; Josiah Cox Russell, *The Control of Late Ancient and Medieval Population*, The American Philosophical Society, Philadelphia, 1985; Regina Schulte, 'Infanticide in Rural Bavaria in the Nineteenth Century in Hans Medick and David Warren Sabean (eds), *Interest and Emotion: Essays on the Study of Family and Kinship*, Cambridge University Press, New York, 1988, pp 77-102; and Linda Gail Arrigo, 'Female Infanticide and Social Stratification in Republican China: New Perspectives from the Buck Survey of Farm Families', paper presented at the Western Conference on the Association for Asian Studies, California State University, Long Beach, 1985.

8 Anthropologist G W Skinner is an exception since he has undertaken fieldwork in contemporary Japan to complement his analyses of archival data on the Tokugawa period.

9 Martin Daly and Margo Wilson, 'A Sociobiological Analysis of Human Infanticide' in Glenn Hausfater and Sarah Blaffer Hrdy (eds), *Infanticide: Comparative and Evolutionary Perspectives*.

10 Hugo G Nutini, 'Traditional and Contemporary Configuration of Infanticide in the Tlaxcala-Pueblan Valley, Mexico' in Hector Correa (ed), *A Comparative View of the Ethical, Social and Technological Aspects of Unwanted Pregnancies and Their Outcomes*, Praeger, forthcoming.

11 Sabu George gathered the data on female infanticide as an incidental part of his study of infant and child growth and survival patterns. During his first six months in the field, he noticed several cases of female infanticide and therefore felt the need to study this subject. The data reported here, therefore, are dated from April 1987 rather than from September 1986 when he first arrived. It should be remembered that, while his initial purpose was not to study infanticide, it was necessary to do so because these deaths were not amenable to prevention by the usual health and nutrition education strategies and thus present a special challenge to child survival programmes.

12 For information on the meaning of the terms Other Backward Castes and Forward Castes, see Marc Galanter, *Competing Equalities: Law and the Backward Classes in India*, University of California Press, Berkeley, 1984.

13 See the classic work by Irawati Karve, *Kinship Organisation in India*, Asia Publishing House, New York, 1968) and more recent studies: David E Sopher, 'The Geographic Patterning of Culture in India' in David E Sopher (ed), *An Exploration of India: Geographical Perspectives on Society and Culture* (Cornell University Press, Ithaca, NY, 1980, pp 289-326); Miller (cited in note 1); Tim Dyson and Mick Moore, 'On Kinship Structure, Female Autonomy, and Demographic Behaviour in India', *Population and Development Review*, Vol 9, 1983, pp 35-60.

14 See, for example, P S S Rao, 'Inbreeding in Various Religious and Social Groups in South India', *Human Genetics and Adaptation*, Vol 1, 1982, pp 15-31.

15 Dyson and Moore (cited in note 14).

16 Barbara D Miller, 'Changing Patterns of Juvenile Sex Ratios in Rural India, 1961-1971', *Economic and Political Weekly*, June 3, 1989, pp 1229-36.

17 Some mothers whose children were victims of female infanticide during the reference period were known to have had their next female child, born after September 30, 1989, also die from infanticide.

18 The reader should recall that, in addition to the cases of confirmed direct infanticide, other female infant deaths may have been direct infanticides (not confirmed) or indirect infanticides brought about through nutritional or medical neglect.

19 Maria W Piers, *Infanticide* (W W Norton and Company, New York, 1978).

20 Daly and Wilson (cited in note 9).

21 *India Today*, 'Born to Die', June 15, 1986, pp 10-17.

22 Ibid, p 13.

23 Kanti Pakrasi, 'Effect of Infanticide on Sex-Ratio in an Indian Population', *Zeitschrift fur Morphologie und Anthropologie*, Vol 62, 1970, pp 214-30; K B Pakrasi and B Sasmal, 'Infanticide and Variation of Sex-Ratio in a Caste Population of India', *Acta Medica Auxologica* [Italy], Vol 3, 1971, pp 217-28; Mildred Dickemann, 'Female Infanticide, Reproductive Strategies, and Social Stratification' in N A Chagnon and W Irons (eds), *Evolutionary Biology and Human Social Behaviour: An Anthropological Perspective*, Duxbury Press, North Scituate, Massachusetts, 1979, pp 321-367; Miller (cited in note 1, ch 3), and Alice Clark, 'Limitations on Female Life Chances in Rural Central Gujarat', *The Indian Economic and Social History Review*, Vol 20, 1983, pp 1-25.

24 *India Today*, 'Rajasthan: A Murderous Tradition', Vol 13, 1988, pp 22-24.

25 See *India Today* (cited in note 22).

26 Edgar Thurston, *Ethnographic Notes in Southern India*, Delhi, Cosmo Publications, 1975 [1907].

27 The mother involved in this case is known to have done away with her subsequent female infant born after September 30, 1989.

28 The villages where the twins were born are known throughout the area for having a high rate of twinship. For related research, see A H Bittles, A Radha Rama Devi, and N Appaji Rao, 'Consanguinity, Twinning and Secondary Sex Ratio in the Population of Karnataka, South India', *Annals of Human Biology*, Vol 15, 1988, pp 455-60.

29 See Gary Granzberg, 'Twin Infanticide: A Cross-Cultural Test of a Materialist Hypothesis', *Ethos*, Vol 4, 1973, pp 405-512; and Susan McGeorge, 'Twinning in Tlaxcala, Mexico', unpublished PhD dissertation, Department of Anthropology, University of Pittsburgh, 1991.

30 Miller (cited in note 1, pp 104-05); Betty Cowan and Jasbir Dhanoa, 'The Prevention of Toddler Malnutrition by Home-Based Nutrition Education' in D S McLaren (ed), *Nutrition in the Community: A Critical Look at Nutrition Policy, Planning, and Programmes* (John Wiley and Sons, New York, 1983, pp 339-56); and Monica Das Gupta, 'Selective Discrimination against Female Children in India', *Population and Development Review*, Vol 13, 1987, pp 77-100.

31 Skinner (cited in note 7).

32 For a discussion of Ludhiana CMC's approach see, Barbara D Miller, 'Female Infanticide and Female Child Neglect in Rural North India' in Nancy Scheper-Hughes (ed), *Child Survival: Anthropological Perspectives on the Treatment and Maltreatment of Children*, D Reidel, Boston, 1987, pp 95-112.

33 Shireen J Jejeebhoy, 'Women's Status and Fertility: Successive Cross-Sectional Evidence from Tamil Nadu, India', *Studies in Family Planning*, Vol 22, 1991, pp 217-30.

34 *The Lancet*, 'Girls Matter, Too', 1991, 2, p 813.

Sex Ratio, Son Preference and Violence in India

A Research Note

Philip Oldenburg

Explanations for the different comparative values of sons and daughters have focused on economic and cultural factors including the type of agriculture, kinship systems, customs concerning the linkages between parents and offspring after marriage and socio-economic activity. Are differences in these factors sufficient to explain the 'Bermuda Triangle for girls' of west-central UP and the surrounding districts as revealed by the sex ratio map of the 1991 Census?

This article examines the hypothesis that families in west-central UP want (or need) more sons than families elsewhere because additional sons enhance their capacity to literally defend themselves or to exercise their power by investigating the correlation of sex ratio with violence in the state.

I

THE map of sex ratios published in the report of the provisional figures of the 1991 Census [Nanda, 1991: 53] vividly shows that "barring Jaisalmer in Rajasthan and Jind in Haryana, all the other districts of Haryana, Uttar Pradesh, Madhya Pradesh and Rajasthan with a low sex ratio below 850 form a continuous belt" [Nanda, 1991: 58]. Twenty-two of the 30 districts in this belt are in UP. These include Delhi and Kanpur (urban). Aside from the other major city districts there are 11 other below 850 sex ratio districts, largely scattered. Most of the districts in the next lowest category (850-899 females per 1,000 males) form a ring around these very low sex-ratio districts, extending into Bihar, with an 'island' of higher sex ratio districts in eastern UP. And the further south the eye travels the more favourable-to-females districts one finds, with Kerala having the best picture by far. The data aggregated to the state level is consistent with this picture. It is perhaps not too fanciful to see this map as showing a pit with sloping sides, a pit whose lower depths represent a very large number of 'missing' women (Figure 1). With the exception of Kerala, where the sex ratio continues to rise, the other large states are converging on a continuously declining all-India mean, which has now reached 929 females per 1,000 males.[1]

The pattern of the sex ratio map is virtually the same as that of the map of "excess female mortality over male mortality by age 5" [UNICEF, 1991: 25]: the largest differences, of 20 per cent or more, are to be found in western UP and in north Bihar. Raju and Premi [1992: 911], citing the argument of Coale [1991], seem to agree that "it is the sex differences in mortality rates which affect the balance of the sexes", but do not provide an estimate of how much effect that has. There is no doubt that the sex ratio picture reflects deliberate choices by parents, ranging from the rare murder of female infants to the "fatal neglect of female children" [Miller, 1989: 193] to the adoption of standard family planning methods once an 'ideal' family (skewed in favour of sons) has been reached.[2] With this ideal family, a family planning strategy that says "stop having children after two sons have been born and 'neglect unto death' fourth-born daughters" would mean that a normal sex ratio is not reached until 40 per cent of the families have had five children, with three of them daughters (Table 1).

This 'strategy' and this model obviously do not accurately represent the actual situation: on the one hand, many families plan their families to stop at two or three, no matter what the sex of the children; on the other hand, there are families who apply 'death by neglect' before the fourth-born daughter [Das Gupta, 1990].

Planning a family does not require adoption of infanticide or modern family planning measures; all it needs is the conscious or quasi-conscious differential treatment of girl infants, who are, on average, given a lesser share of food and less medical care than their brothers. The data are overwhelming and the techniques are well-studied, even if the parental responsibility is sometimes glossed over.[3] Obviously, it is not necessary for every family to practise this strategy to account for low sex ratios, and many, many parents love and cherish their infant daughters. But this is not a question of 'backward' or 'ignorant' people: Monica Das Gupta [1987: 95] has evidence that excess mortality among later birth order daughters increases with the education of the mother, and "through a better ability to manipulate both their fertility and their children's mortality, educated women are better equipped than others to achieve the family size and sex composition that they desire". Paradoxically, worsening sex ratios may be in part the consequence of a successful family planning programme which encourages parents to have 'two or three' children but which cannot control the techniques by which they achieve that result and satisfy their preference for sons.

There has also been a great deal of study on the question of why Indian parents want more sons than daughters, and, overall, there is now some agreement on the major explanatory factors, which, though intertwined, can be put under the two broad headings of economic and cultural [see Miller, 1989:

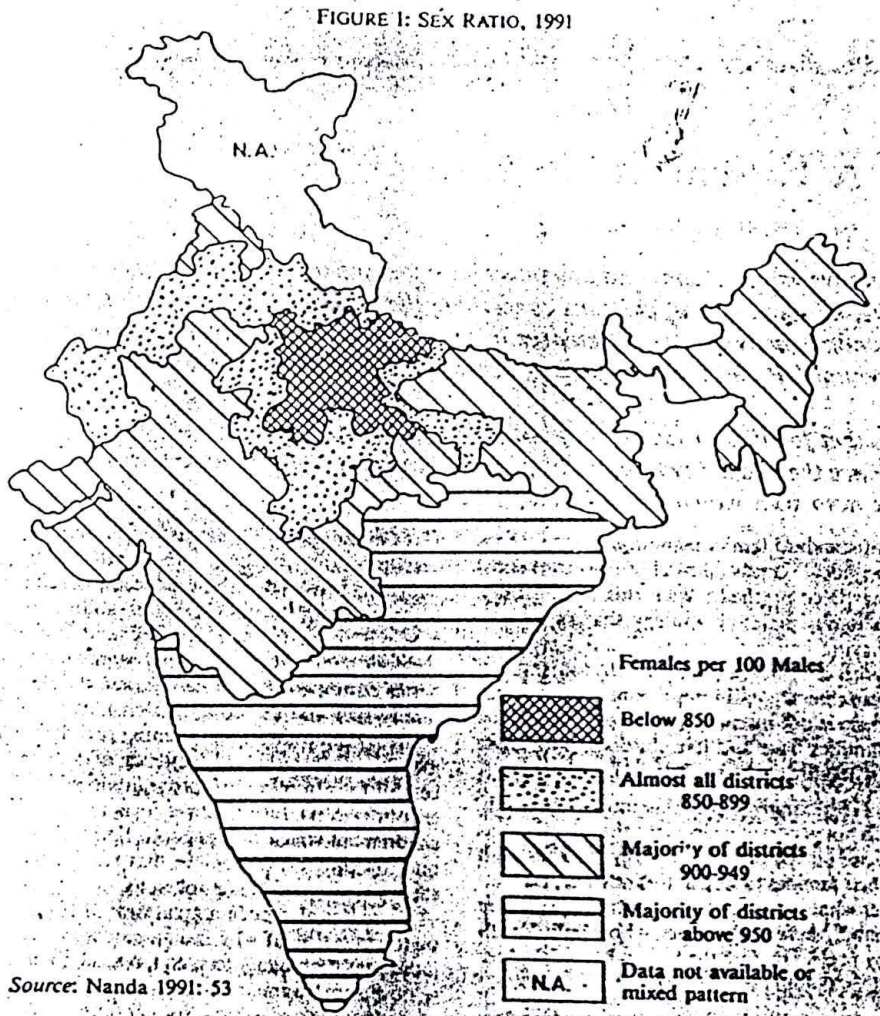
TABLE 2: VARIATION IN LIVE BIRTHS PER FAMILY, BY FACTOR OF NEED FOR SONS 'FOR PHYSICAL FORCE TO DOMINATE IN FAMILY AND VILLAGE'

	Sons are Important	Sons are Unimportant
Uttar Pradesh	4.4	4.2
Andhra Pradesh	3.7	3.4
Kerala	3.1	2.5

TABLE 1: PROJECTIONS OF FAMILY SIZE AND SEX RATIO
(1st child, 2nd child, 3rd child, 4th child, 5th child (cumulative))

Parents	Son	Son				5 Females
Parents	Son	Daughter	Son			Per 9 Males
Parents	Daughter	Son	Son			= 556
Parents	Son	Daughter	Daughter	Son		14 females per
Parents	Daughter	Son	Daughter	Son		18 males
Parents	Daughter	Daughter	Son	Son		= 778
Parents	Son	Daughter	Daughter	Daughter	Son	30 females
Parents	Daughter	Son	Daughter	Daughter	Son	per 30
Parents	Daughter	Daughter	Son	Daughter	Son	males
Parents	Daughter	Daughter	Daughter	Son	Son	= 1000

FIGURE I: SEX RATIO, 1991



Source: Nanda 1991: 53

192-93 for a representative listing]. The economic factors include the value of women in agricultural work; the expectations of financial support, not just in old age; and the burden of providing a dowry. The cultural factors include the need for sons to carry on the lineage; the need for children in religious rituals; and the difference in age between brides and grooms (which allow boys to find brides even in a low sex ratio locale). There is also at least one major 'personal' factor: the literal physical and emotional support that comes from co-residing with children. These do not by any means exhaust the factors that come into play nor does it suggest a ranking in importance, though an emerging consensus may be captured by Monica Das Gupta's assertion that "for India as a whole, the evidence suggests that son preference is primarily culturally determined, and scarcity of resources may at most accentuate the effects of sex bias" [1987; as quoted with approval, in Vlassoff, 1990: 19].

Explanations for the different comparative values of sons and daughters along these dimensions include the type of agriculture, kinship systems, customs concerning the linkages between parents and offspring after marriage, and socio-economic capacity. Miller [1981] argues strongly that a 'northern model' is based on low demand for female labour, and a 'southern model' on high demand for female labour (in turn based on the difference between dry field plough agriculture and wet rice cultivation),[5] but Das Gupta [1987: 96] seems sceptical of that explanation.

Are differences in these factors sufficient to explain the 'Bermuda Triangle for girls' of west central UP and the surrounding 'downward sloping' districts revealed by the sex ratio map of the 1991 Census? Various factors have been proposed and also rejected: underenumeration of females in the census, and differences in sex ratio at birth [Miller, 1981: 68-69; but see Basu, 1991: 16-17]. Kundu and Sahu [1991] discount the former factor, but argue for the latter as explaining some of the most recent decline, adding "the relative decline in sex ratio at birth in recent years could be due to amniocentesis" [ibid: 2342].[6] It is hard to believe that the west-central districts of UP differ from others in access to amniocentesis facilities.

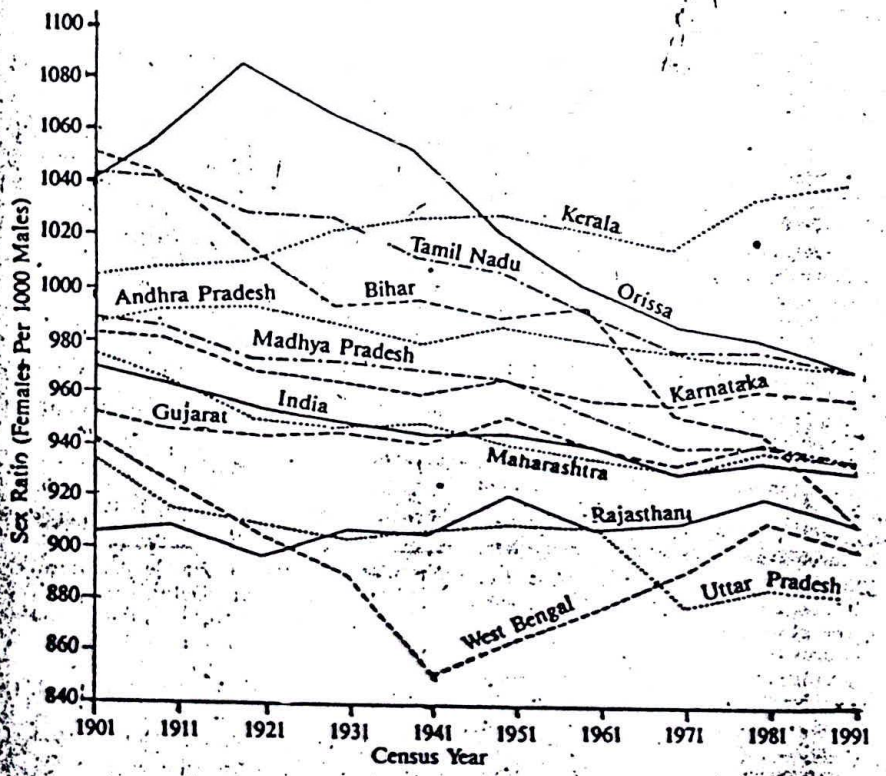
Migration patterns are a genuine factor: outmigration of males clearly increases the sex ratio in the Konkan districts of Maharashtra and in the hill districts of UP, and in-migration of males may well 'lift' the Punjab sex ratio, for example. Kundu and Sahu [1991: 2342] argue that "at the state or district level, migration is the single most important factor explaining the temporal and cross-sectional variation in the sex ratio". The slowing down of male outmigration from Bihar and eastern UP, possibly due to the danger of working in terrorist-torn Punjab, would explain at least some of the declining sex ratio, and the marginal improvement in sex ratio in the central-west districts might be due to increased male outmigration.[7] However, it seems unlikely that even if all east UP migrants were to return home, that sex ratio would decline to the level of west-central UP.[8]

While one might be prepared to agree with Kundu and Sahu [1991: 2341] that "increased discrimination against women, resulting in their higher mortality, also stands discounted" as an explanation of India's sex ratio decline, discrimination against girls clearly is the best explanation for the absolute level of sex ratio, and therefore should be taken more seriously as an explanation for inter-state and inter-district variation. That is, do places vary in the which families plan the degree of (im)balance of boys and girls?[9]

We must return then to social, economic, cultural, and, I would add, political factors. These are likely to be—for our case of west-central UP—of considerable longevity: it was a significant part of the erstwhile north-west provinces, the area "with the very highest juvenile [male to female] sex ratios reported in the 1872 Census" [Miller, 1981: 61]. Is there something special about the caste composition, religiosity, economy, or politics of the region which distinguish it from others? I leave it to others to explore—preferably with survey research and complementary micro-studies—the social, cultural, and economic reasoning that makes parents of this 'tract' (to adopt a useful colonialism) want sons so much that they kill daughters by neglect (or worse) in greater numbers than parents elsewhere in India.[10] I would like to propose as one factor among many, but one that has not been often cited, the perception of a need for sons to uphold, with violence, a family's power *vis-a-vis* neighbours (not infrequently including kinsfolk).

In a preliminary search, I have found only two studies in which this factor is even noted. Miller [1989: 192-93] remarks that "sons play important roles in local power struggles over land boundaries and rights to irrigation water". Mahadevan and Jayashree [1989: 128], surveying 6,500 respondents in UP, Andhra Pradesh, and Kerala, report that parents who thought sons were important "for physical force to dominate in the family and village" had more children born than those who thought it unimportant. Only 41.2 per cent of the respondents in UP (compared to 48.4 in Andhra and 68.6 in Kerala) said

FIGURE 2: TRENDS IN SEX RATIO, 1901-91
(India/states having population 25 millions and above)



that sons were 'of value' for this purpose; other reasons for having sons were mentioned by far higher percentages of respondents.[11] These results were not broken down by district or region within states, so there is no way of knowing how the physical force factor varied within UP's 2,000 respondents.

II

As a partial, purely indicative test of my hypothesis that families in west central UP want (or need) more sons than families elsewhere[12] *because additional sons enhance their capacity literally to defend themselves or to exercise their power*, I have begun to investigate the correlation of sex ratio with murder case rate in UP. Murder case rate (the statistic used is murder cases registered per million population as calculated from data in the *Crime in India* series) has been chosen as an indicator of the degree of violence in a district.[13] *Ceteris paribus*, it is more likely that people will be murdered when and where political power and inter-personal disputes are literally fought out with fists, knives, and guns rather than with law suits, shouting matches, or slander, and other less violent means.

We have tended to overlook, I think, the degree of variation in chronic violent behaviour. Marguerite Robinson's book *Local Politics: The Law of the Fishes* [Robinson, 1986], a study of a village in Medak district of Andhra Pradesh, is a very important exception. In one chilling section, she describes the endemic violence of that environment in the early 1970s:

> A significant component of the political process in Narsapur taluk [of Medak] is the use and threat of physical force... The beating of inferiors by superiors was an everyday occurrence. Fathers beat their sons, husbands their wives, mothers-in-law their daughters-in-law, teachers their pupils; village elders beat any offending youth of the same or lower caste. Usually a wooden rod was used, although any nearby object could serve the purpose. Beatings tended to be severe, but usually there were understood limits. For example, the watchman of [a village] was beaten by the village revenue officer (*mali patel*). When onlookers determined that the watchman's wrist was broken, the beating was stopped... With the exception of the harijans [who were employed by the village elders to administer polluting beatings]... a poor villager who displeased his employer or one of the village heads was likely to be beaten by him (usually privately, sometimes publicly)... Only the patels were considered to have the right to administer beatings to other adults [Robinson, 1988: 40-42].

One wonders how much of this sort of violence exists elsewhere, and how the situation varies from village to village, district to district, and state to state. With the vast differences in history, caste structure, and structures of economic and political control, it would be strange if 'naked' physical force was not used to greatly differing degrees. This is not to deny the importance—probably the far greater importance in India overall—of other 'currencies' of power that exist: economic leverage (landlord-tenant, lender-borrower, etc); socio-cultural control (exclusion from religious or community affairs, e g); influence with the political establishment; and the ability of some to get their way by persuasion or by calling into play the respect others have for them.

Still, in some places, the strong arms of adult sons and other male relatives, in particular, are needed for the exercise of day-to-day power. To be sure, they are needed for the protection of the family as much as for forcing compliance on others. Patrons also would value as many males as possible in their dependent clients. This perhaps gives an image of occasions of pitched battles (which do occur), but violence as the currency of power exchange is also a feature of day-to-day intimidation, in which the show of force (with the display of large or vicious followers), the reputation for the use of violence, and the well-timed slap or hard shove play an important role.

There is no systematic data on this, as far as I am aware.[14] I therefore have chosen to use the murder case rate as a fairly crude proxy variable for the incidence of violent behaviour that would tend to enhance the value of dependent males, especially sons. The assumption is, obviously, that the more severe and widespread this sort of violence is, the more likely it is to end in murder.

The number of murders varies considerably from year to year in a given district, so I have calculated the mean murder case rate in 1980, 1981 and 1982 in the districts of UP.[15] These data have been plotted against sex-ratio data [the most convenient source is Bose, 1991] and is summarised in Table 3. There is an impressive number of 21 districts in both the high sex ratio/low murder case rate districts and the low sex ratio/high murder case rate districts, but what is more impressive is how the districts that appear in each quadrant largely are clearly defined by region, all but one (Bahraich) of the east and centre-east districts in the upper left quadrant and all but three (Unnao, Bulandshahar, Bijnor) of the west and centre-west districts in the lower right quadrant. Three of the districts in the lower left quadrant are contiguous, as are five of the districts in the upper right quadrant. The correlation coefficient (Pearson's r) is equal to -0.72.[16]

This is clearly a result that cries out for more detailed testing. Since crime data are collected by 'thana' and since sex ratio could easily be calculated for the same unit, the number of cases could be easily expanded, and we might discover sub-district patterns, and test for the influence of other variables of likely relevance, such as caste composition. Change over time—the relationship, if any, between the deteriorating law and order situation, reflected in an increase in the murder case rate in the data up to 1989, and

the declining sex ratio—need to be investigated. We need to study whether in these areas of violence daughters are seen as an even greater burden than elsewhere because of the greater risk of rape and abduction.[17] A careful micro-study of the hypothesised linkage between son preference and violence as the currency of power has to be made before we come to any firm conclusions on this topic.

More important, we will need to explore why there is this variation in UP. These districts are indeed notorious for the use of physical force, because, in one explanation, they are areas, unlike the ex-zamindari areas of east UP, where the economic leverage 'big men' exercise is comparatively weak, and resort to force is 'traditional'.[18] Another suggestion is that the Ganges-Jamuna doab was an area where pastoralists had to adopt settled agriculture where the ecology was unfavourable, thus making the struggle for land more intense than in areas where more intensive agriculture was possible.[19] It is also just possible—I note with trepidation—that castes or communities that predominate in certain places have cultural traditions that valorise violence (i e, a 'macho' or 'martial' peoples explanation). All this requires further research.

I cannot resist, however, speculating on the relevance of the UP data, such as they are, for the larger picture of the variation of sex ratio and murder case rate in India as a whole (Table 4).

We can see regional patterns here as well, which might well require the addition of 'endemic violence' to other north-south difference explanations, and other social, economic, and cultural variables. The decline in sex ratio over time might also be illuminated by this factor (compare Figure 2). Although the murder case rate in the 12 largest cities is in fact exactly that of the country as a whole (33 per million), it may be that as the country has become more urbanised, and as old systems of social and economic control have broken down, increasing violence might help explain the decline in sex ratio. Might the precipitous decline in the Bihar sex ratio, for example, be in an indicator of a deteriorating law and order situation in that state? But this limb of speculation will not, I fear, bear any more weight. Low and declining sex ratios in India are the results of the preference for a family with more sons than daughters in it, and they will not improve until that preference is altered. Although a less violent and confrontational social system may contribute to that change, I suspect that the impact would be minor, and more fundamental economic and social changes that enhance the autonomy and power of women are necessary.

Notes

[I wish to express my gratitude to those who read this note in draft, and to absolve them from blame for the errors that remain: Rana Behal, Meera Chatterjee, Govind Kelkar, Ritu Menon, and Veena Talwar Oldenburg (who is also responsible in large measure for sensitising me to issues of gender and from whose descriptions of her own work I may well have been pointed in the direction of this note). Some of the data and ideas herein are connected to research I am presently engaged in under a grant from the American Institute of Indian Studies.]

1 The trend line of a combined Punjab and Haryana moves steadily upward from a very low level to meet, roughly, the line of Uttar Pradesh, descending, in 1991. Kerala's increased male outmigration to the Middle East may account for the recent increase in its sex ratio.

2 The 'ideal family' in Thane district consists of two sons and 1.3 daughters (with women's and men's views virtually the same) [Jeejeebhoy and Kulkarni, 1989: 109]; Khan and Rao [1989:147] report: *"Irrespective of economic class a minimum of two sons still seems to be the prevailing norm of rural Bihar"* [their emphasis] with a 'two sons one daughter' family, the modal preference. Even in south India (in this case in Karnataka): "Most families want a minimum of two sons, largely because of the danger of losing one, but also because two are believed to be the minimum size of a male team within the family...There are also strong emotions about having a daughter" [Caldwell, Reddy and Caldwell, 1988:77]. According to Srinivasan and Kanitkar [1989:39] "The second all India survey on family planning practices in India conducted in 1980-81 indicates that for a large percentage of couples the best combination of children was two sons and one daughter".

3 Eg, UNICEF 1991: 64-70, which presents copious data, but carefully uses the passive tense and thus helps hide the fact of parental responsibility. Monica Das Gupta makes the agency very clear, but even she softens

TABLE 4: SEX RATIO AND MURDER CASE RATE, LARGER STATES OF INDIA, 1981

	Below Median Murder Case Rate	Above Median Murder Case Rate
Above median sex ratio	Kerala Orissa Andhra Pradesh Karnataka Tamil Nadu	Bihar Gujarat
Below median sex ratio	West Bengal Rajasthan	Madhya Pradesh Maharashtra Uttar Pradesh North-west states[a] North-east states[b]

Notes: a North-west states = (weighted) combination of Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, and Punjab.
b North-east states = (weighted) combination of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura.
1981 Murder case rate = mean of 1980-82 murder case rates.
Sources: As in Table 2.

TABLE 3: SEX RATIO AND MURDER CASE RATE IN 1981, UP DISTRICTS

	Below the Median Murder Case Rate (Range 3-46)		Above the Median Murder Case Rate (Range 47-109)	
Above the Median sex ratio (860-1092)	Hill Districts Uttarkashi Chamoli Tehri Garhwal Garhwal Pitoragarh Almora Central Faizabad Rae Bareli Gonda Sultanpur/ Pratapgarh	East Azamgarh Jaunpur Ballia Ghazipur Deoria Gorakhpur Basti Varanasi Mirzapur Bijnor	Bulandshahar	Unnao Fatehpur Banda Allahabad Hamirpur
Below the Median sex ratio (801-858)	Naini Tal Dehra Dun Saharanpur Mazaffarnagar	Bahraich Jhansi	West Meerut Moradabad Budaun Aligarh Etah Mathura Agra Mainpuri Etawah Kanpur Jalaun	Centre-west Rampur Bareilly Pilibhit Shahjahanpur Farukhabad Kheri Sitapur Hardoi Lucknow Barabanki

Note: Murder case rate is the mean annual number of murder cases, 1980-1982, per million population; sex ratio is females per 1000 males.

the language in her concluding statement: "All these considerations result in strong and mutually reinforcing incentives for parents to successfully rear sons rather than daughters" [1987:96]. Cassen [1979:114] notes that excess female mortality is "due fundamentally...to worse malnutrition among young females than males and the risks of maternity" without assigning blame for the former cause. For the clearest presentation of the early research and a powerful argument on the topic, see Miller, 1981; in her later study [1989:193] she says "[There is today] the practice of indirect female infanticide through the fatal neglect of female children." In Punjab, "being female significantly increases the probability of dying at all stages of childhood after the first month of life, i e, at the ages when behavioural and environmental factors play a larger role in child survival" [Das Gupta, 1990:499]. Most of these studies focus on questions within this broad picture: e g, what effect birth-order has, or level of education, or socio-economic status, or mothers' economic and social autonomy, etc.

4 See, e g, Mahadevan and Jayashree, 1989; Jeejeebhoy and Kulkarni, 1989; Vlassoff, 1990; Das Gupta, 1987.

5 It must be noted that "what is 'northern' applies mainly to the propertied groups of the north just as the 'southern' model fits most accurately the propertied groups in the south.. Unpropertied groups in both the north and south have a characteristic sex ratio pattern more like one another's than like the propertied groups of their respective regions" [Miller, 1981:27].

6 Miller [1981: 168-69] anticipates that possibility. However, Alaka Malwade Basu [1991:17] argues: "If one assumed (somewhat generously) that a quarter of the [abortions performed in 1984-85] followed sex-determination tests, they would account for about 0.75 million of the estimated 31 million female shortfall in the country."

7 Kundu and Sahu [1991:2324] note that there seems to be a connection of decline in sex ratio to 'backwardness'—that "sex ratio has declined in districts that are poor in terms of their urban, industrial, agricultural development", but what the causal connection might be remains unsaid and is not obvious. Rajan, Mishra, and Navaneetham [1991] sharply criticise Kundu and Sahu and propose that out-migrant males are often double-counted. Raju and Premi [1992], in turn, support Kundu and Sahu [1992] and provide a critique of Rajan, Mishra, and Navaneetham.

8 Najma Khan [1981:492] finds that in the 12 villages of six east UP districts the rate of male out-migration is only 7.1 per cent (with a high of 16.7 per cent in two villages of Azamgarh district). Calculating the magnitude of (temporary and permanent) male outmigration from census data is difficult, and I have found no studies that provide a simple answer to the question of the precise impact on sex ratio of more men than women migrating out from particular districts of UP. See Premi [1989] for a discussion of the problem.

9 Das Gupta [1987] and Miller [1989: 196-204] outline the way it is done in rural Punjab, but there might be other methods elsewhere; they both have excellent discussions of the various arguments for the *reasons* for doing so, to which we now turn.

10 See Hasan [1989] for a very thorough summary of the historical (including post-independence politics) and land-relation factors that distinguish western from eastern UP, and regions within that broad division.

11 Mahadevan and Jayashree [1989:126]; other 'dimensions' scored as follows: 'economic support during old age' (98.5 per cent of respondents), 'salvation to the parents by doing ritual formalities' (92.3 per cent), 'provide traditional links (lineage)' (94.5 per cent), 'meeting family obligations' (91.1 per cent), 'inherit family property' (90.3 per cent), 'becoming adult member and getting status' (100 per cent), and 'physical support and staying with parents' (99.3 per cent). There were other factors that were expressed by less than 50 per cent of respondents, including 'receiving dowry', given by only 13.4 per cent in UP (44.4 per cent) in Andhra and 8.3 per cent in Kerala). The factor which most significantly differentiated UP from the other two states was 'inherit family property' (UP: 90.3 per cent; Andhra: 42.7 per cent; Kerala: 23.4 per cent).

12 Coupled with the oft-noted disincentives to have more than one daughter (with the result that "a sizeable proportion of young women [in the Punjab area studied] did not want to have even one daughter", and almost none wanted a second daughter' [Das Gupta, 1987:94], this would generate comparatively low sex ratios. Again, I make no guesses as to the contribution of 'son-benefit' versus 'daughter-liability'.

13 This is true of UP, according to one senior UP police official (interview, New Delhi, December 1991), though probably not of every Indian state. Murder cases are more reliably reported than other crimes (interview with a senior police official who has dealt with the statistics, New Delhi, December 1991; see also Saksena, 1986:151). 'Murder cases' do not equal 'murders': if more than one person is murdered in a single incident, only one case is registered; I have therefore used the awkward but more accurate term 'murder case rate'. According to N S Saksena, one of the most knowledgeable analysts of police matters, this factor plus under-reporting of murders, yields an estimate of more than three murders for every murder case registered [Saksena, 1992]; i e, the murder rate is three times the murder case rate. It is probable, however, that this ratio does not vary much from district to district, nor has it changed that much over time (interview with senior police officer, New Delhi, February 1992). Murder is also overwhelmingly a crime of males against males: in 1981 only 2 per cent of the persons arrested for murder were women (*Crime in India, 1981*). Computing an index of 'violent crime' requires access to a level of data that is unpublished: e g, brawls in which less than five persons are involved are not registered as a 'riot' but under another section of the Indian Penal Code, which is not separately listed in the *Crime In India* data.

14 There may be some indicative evidence in works of literature, or in the work of anthropologists other than Robinson. In my own fieldwork in Meerut district, as in a number of incidents I myself have experienced, this aspect of on-the-ground politics has certainly been evident.

15 While the data is from 1981, the 54 districts are those of 1972, which was chosen because I tried to discover whether the rate of increase of murder case rate displayed the same pattern that the single-point comparison showed. The difference is that I treat Meerut and Ghaziabad districts as one (Meerut), and Kanpur Rural and Kanpur City as one (Kanpur). I have also disregarded the murder cases registered with the railway police in UP.

16 I would like to thank Nandita Aras for calculating the statistics for me, and Harpreet Mahajan for helping me understand them.

17 I am grateful to Meera Chatterjee for making this point.

18 Interview with a senior UP police officer, December 1991, New Delhi.

19 Interview with Ashok Thapar, December 1991, Delhi.

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Sex Ratio and Violence

Spurious Results

Arup Mitra

THE grand debate on gender ratio in the Indian context gains momentum further as Philip Oldenburg (1992) in his recent piece attaches a new dimension to the issue. To explain the 'Bermuda Triangle for Girls' of west-central UP and the surrounding 'downward sloping' districts he proposes to include the factor, namely, the "perception of a need for sons to uphold, with violence, a family's power vis-a-vis neighbours". In favour of his basic hypothesis (i e, "families in west-central UP want (or need) more sons than families elsewhere because additional sons enhance their capacity literally to defend themselves or to exercise their power"), the empirical evidence he cites is the negative correlation (-0.72) between the district specific sex ratio and the rate of murders.

But such a correlation between the variables mentioned above can also emerge if the districts with low murder rates, and thus less disputes and violence as the author would have us believe, report outmigration of males larger than that in the districts with high-murder rates. The outmigration of males in the districts with less violence would turn the sex ratio in favour of the women. But such a possibility has been ruled out in Oldenburg's discusslon as he writes, "it seems unlikely that even if all east UP migrants were to return home, the sex ratio would decline to the level of west-central UP". But if women for reasons such as marriage have outmigrated to a greater extent from the central-west UP as compared to elsewhere in the state, that can also be a reason of low sex-ratio in central-west UP.

Oldenburg also discounts the view of Kundu and Sahu (1991) which relates the decline in sex ratio at birth to rising amniocentesis. In his words, "It is hard o believe that the west-central districts of UP differ from others in access to amniocentesis facilities." He would rather explain the inter-regional differences in sex ratio in terms of "discrimination against girls"—the discrimination that stems from the want (or need) for more sons in the face of violence. But protection from violence such as disputes with neighbours (leading to murders) is just one single component of the huge spectrum of social security the parents expect to derive from having more sons. Particularly in the urban areas the concept of social security associated with 'son preference' would vary substantially from such a connotation given to the term. It would, therefore, be quite misleading to suggest that "as the country has become more urbanised, and as old systems of social and economic control have broken down, increasing violence might help explain the decline in sex ratio". Moreover, it would be a wild guess to treat all the murders across regions as being of uniform type. Organised violence and the murders committed by the mafia groups functioning in the cities are phenomenal. In that case, can one associate the 'son preference' with crimes? If Maharashtra falls into the category of low sex-ratio and high murder case rate (Table 4, Oldenburg) it would be due to the fact that three of the 12 million plus cities (as per the 1981 census) are located in this state and as the author himself has noted, the murder rates in these large cities are considerably high. In fact, if regions with low sex ratio have high crime rates and vice versa it would not be difficult to perceive both crimes and sex ratio as the outcome of some endemic problem of the socio-economic conditions.

In addition to more male outmigration in eastern UP and more female outmigration in western UP for reasons such as marriage, other factors which may be suggested in explaining the inter-district variations in sex ratio in UP are to be perceived in terms of the practice of dowry and problems associated with it (including post-marriage harassment of the daughter-in-law and her parents). In the context of the rapid spread of consumerism and rising inflation of the 80s, the problem of dowry has aggravated further, and its subsequent impact on parent's sex bias cannot be ignored. In the face of rising cost of living the average family size tends to decline but in that case the small family norm, given the sex bias of the parents, tends to get implemented at the cost of female foetus [Mitra: 1991]. Given the level of social backwardness the problem of dowry is more severe among those belonging to the middle and higher income brackets than their counterparts in the bottom size classes. Similarly it would be erroneous to ignore the positive association between affluency and crimes (like murders). If the average level of living in the central-west UP can be found to be higher than that in other parts of the state, given the level of social backwardness, the discrimination against girls, can, indeed, be related to the problems of dowry.

On the whole, the argument of violence leading to discrimination against girls is not only highly inadequate in explaining the differences in sex ratio across regions or over time, but reflects a narrow understanding of social violence in India, particularly in urban areas.

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On the Demography of the 1991 Census

Tim Dyson

India's true population size is very much larger than is indicated by the census – and the post-enumeration check results are a poor indicator of the true level of underenumeration. While there has probably been considerable fertility and mortality decline in India during the 1980s, it is much less certain that the last decade has witnessed any reduction in the rate of population growth. A picture of constant rate of population growth between 1971-81 and 1981-91 is far more convincing – coupled with a higher rate of all-India growth during the 1961-71 decade.

> Faced with the choice between changing one's mind and proving that there is no need to do so, almost everyone gets busy on the proof.
>
> – John Kenneth Galbraith

PUBLICATION of the provisional results of the 1991 Census of India [Nanda 1991] has occasioned the usual very considerable degree of interest and debate. Two key indications have received particular attention – first, the fact that the rate of population growth seems to have declined, and second, the indicated increase in population masculinity compared to the Census of 1981, which has been widely taken to reflect a worsening of the relative survival chances of females during the last decade [Mazumdar 1991].

In this context the present paper approaches the provisional 1991 Census results from something of an historical perspective. Drawing on the same basic views which conditioned our interpretation of the 1981 provisional results [Dyson 1981], we argue both that it is unlikely that India's rate of population growth has materially declined and that there has probably not been any deterioration in the relative mortality experienced by females.

The paper is divided into three sections. First the all-India statistics are considered, followed by those of the main states. Then, in the final section, we briefly summarise our principal conclusions.

All-India Results

Table 1 summarises the main results from the last five censuses, including the provisional figures for 1991. As can be seen, the average annual rate of population growth appears to have fallen slightly from around 2.2 per cent during both 1961-71 and 1971-81; to about 2.1 per cent during 1981-91. Also the population sex ratio (m/f) in 1991 has risen to its highest ever recorded figure of 1.077.

Apropos the provisional 1981 Census count, we have argued previously that the Indian census probably underenumerates the real population size by several (e g, 4 or 5) percentage points [Dyson 1981]. And certainly in our view, the undercount is much larger than is suggested by the post-enumeration check surveys. In view of the increased mobility, size, and residential complexity of the country's population – plus its probable heightened detachment and scepticism towards the whole census exercise – there seems little reason to change our assessment in this respect for 1991 [see also Bose 1991: 42]. In our estimation, therefore, the true population as of March 1991 could well have been higher than 875 million. And its current size (allowing for under-enumeration and subsequent growth) could well be very close to 900 million. For example, if the enumeration was just 4 per cent deficient and the population has subsequently grown at 2.11 per cent, then its size as of March 1992 would be 896 million (896.0 = 843.9 x 1.04 x 1.021).

Table 2 summarises the assumptions – themselves drawn up with close reference to SRS estimates – behind the most recent all-India population projections made by the Expert Committee on Population Projections. As the Registrar General has pointed out [Nanda 1991: 40], the enumerated census total in 1991 of 843.9 million is extremely close to the projected figure. While, clearly, this could partly be fortuitous, it nevertheless does constitute strong support for the continuation of fertility and mortality decline during the 1980s. A brief summary of SRS vital rates is provided in Table 3. In broad terms it thus seems reasonable to conclude (drawing on Tables 1-3) that the birth rate is currently around 31-32 per thousand and that the death rate is probably about 10-11. The corresponding level of life expectation is around 60 years and the level of total fertility is a shade above four live births per woman. In other words, in general terms the coincidence of the enumerated and projected population figures almost certainly does signify continued significant mortality and fertility decline during the 1980s.

The statements of the previous paragraph are probably reasonably uncontentious. For example, today there is fairly general agreement that fertility decline is definitely occurring and that it is probably happening in virtually all the main states [see, for example, Srinivasan 1988]. However, it is as well to remember the recency of this realisation. Thus the provisional 1981 Census results were scrutinised primarily apropos the issue of whether or not there was a fertility decline underway. However, the single most important issue arising from Table 1 does not pertain to reductions in fertility. Rather, the key issue which arises from the 1991 provisional census results is whether there has been any decline in the rate of population growth.

This issue is best explored at the state level. But before we do this, some preliminary remarks are appropriate regarding some of the other statistics in Table 1. Still, some 20 years later, the question of the level of enumeration in the 1971 Census remains extremely germane. It was Visaria [1971] who first suggested, from a comparison of houselisting and census population estimates, that the 1971 Census had been a relatively poor enumeration in terms of its coverage. If this was the case – and there is certainly indirect evidence in support – then clearly the all-India intercensal growth rate for 1971-81 in Table 1 may have to be amended in such a way that it modifies the indicated growth rate reduction during the intercensal decade 1981-91 (see below).

The issue of possible changes in census coverage completeness is also very relevant to the question of changes in the population sex ratio. Thus it has been argued that when census coverage completeness deteriorates in India, it does so particularly for females [Dyson 1981]. In this context Figure 1 plots the population sex ratio for the censuses of 1921-91 inclusive. Note that both previous censuses for which suspicions of a particular deterioration in the level of enumeration apply – namely, 1941 and 1971 – produced surprisingly masculine population sex ratios. Also, in the subsequent censuses of 1951 and 1981 it may be significant that the population sex ratio fell; indeed, these are the only censuses this century when the sex ratio has declined compared to the previous census (Figure 1).

Viewed in this light the very high population sex ratio of 1991 is certainly disturbing. For if the relative level of census coverage did deteriorate further in 1991 then, of course, a decline in the intercensal population growth rate becomes still less plausible. With this as background we now examine the state-level results.

State-Level Results

Table 4 presents the 1991 state-level population totals and related intercensal growth rates. As can be seen, seven states now have populations over 50 million: that of Uttar Pradesh is around 140 million. Also striking is the persistence of especially high rates of population growth in the large poor

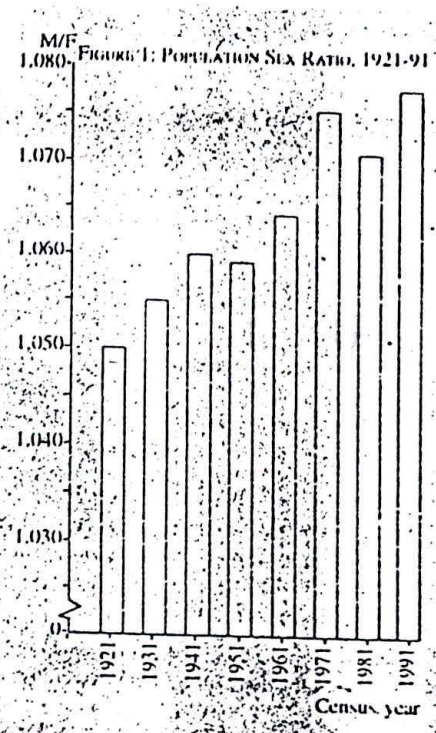


FIGURE 1: POPULATION SEX RATIO, 1921-91

northern states of Uttar Pradesh, Madhya Pradesh, and Rajasthan. For purposes of comparison, Table 5 summarises state-level CBRs, CDRs and corresponding rates of natural increase from the SRS, averages for three year periods in the middle of each intercensal decade are taken as representative of the decade as a whole. Several points emerge from Tables 4 and 5.

First, the consistency and quality of state-level demographic data available for the 1980s seems to be better than that available for the 1970s. In this context Figure 2 compares state-level Crude Rates of Natural Increase (CRNI) from the SRS with corresponding intercensal rates of population growth, for both the 1971-81 and 1981-91 decades. It is clear that the relationship has become much tighter – the simple correlation coefficients for the 1970s and 1980s are respectively 0.53 and 0.90. Moreover, regarding the 1981-91 comparison it is clear that some of the differences in Figure 2 are explicable in terms of migration. For example, Maharashtra and West Bengal tend to be net receivers of people, while Kerala is a net exporter. This improved state-level correspondence between the SRS and census measures of population growth probably partly reflects the better operation of the SRS during the 1980s compared to the 1970s. But also the 1981-91 intercensal growth rates may have been less affected by changes in census coverage level than those for 1971-81 (which, of course, may be biased by the probable poor census count of 1971).

Second, for all states except Maharashtra, West Bengal and, a little more surprisingly, Andhra Pradesh, the intercensal rates of growth for 1981-91 are marginally lower than the mid-decadal CRNI's indicated by the SRS. The differences are particularly great in Bihar, Gujarat, Haryana, Karnataka, Kerala and Punjab. Perhaps the most puzzling discrepancies are for Gujarat, Haryana and Karnataka, states which tend to be net receivers of migrants. However, the main point we are making is that whereas in the 1970s state intercensal growth rates were generally higher than the rates of natural increase indicated by the SRS, the 1991 Census results have produced precisely the reverse effect. Again there is a hint (no more) that there may have been some further slight deterioration in census coverage in 1991.

Third, and relatedly, comparing Tables 4 and 5 there is a much weaker relationship ($r = 0.45$) between the indicated change in intercensal growth rates according to the census and the SRS. Indeed, for all states, the census growth rate either indicates a greater percentage decline in growth rate between the 1970s and 1980s compared with the SRS, or less of a percentage rise. In other words, the SRS is generally much less supportive of a declining rate of population growth (see also Table 3).

Table 6 summarises the position at the state-level. Both the SRS and census are in agreement that the rate of population growth is declining in Kerala, Punjab, Tamil Nadu and (a shade less certainly) Gujarat. Note that according to Table 4, with the exception of Punjab, these four states also experienced intercensal growth rate declines between 1961-71 and 1971-81. We can thus be fairly sure that their growth rates are indeed declining – in some, quite sharply. Conversely, the states of Andhra Pradesh, Madhya Pradesh, Maharashtra and West Bengal each experienced a slightly higher rate of intercensal population growth during 1981-91 than during 1971-81, and a higher rate of natural increase in the 1980s compared to the 1970s according to the SRS (Table 6). Thus the available evidence certainly does not support any decline in the rate of growth of these four states – although it is certainly possible that improvements in SRS coverage account for some of the suggested increases in CRNI (perhaps especially apropos Maharashtra) and that increased migration has also occurred during the 1980s to both Maharashtra and West Bengal.

This leaves us with six major states which according to the 1991 provisional census results have each experienced a decline in the rate of intercensal population growth, yet according to the SRS have each experienced a rise in the rate of natural increase. In brief the issue is: how are we to apportion Bihar, Haryana, Karnataka, Orissa, Rajasthan and Uttar Pradesh between the cells in Table 6?

Clearly, there are several possible resolutions for the indicated differences in the case of these six states. They encompass changes in migration, census coverage level and the performance of the SRS, over the period 1971-91. However, three explanations seem particularly relevant. First, improve-

TABLE 1: ALL-INDIA CENSUS STATISTICS, 1951-91

Census Year	Total Population (000s)	Average Annual Rate of Population Growth (per cent)	Males (000s)	Females (000s)	Population Sex Ratio (m/f)
1951	361,088	1.25	185,547	175,541	1.057
1961	439,235	1.96	326,324	212,911	1.063
1971	548,160	2.20	283,987	264,173	1.075
1981	683,329	2.22	353,257	330,072	1.070
1991	843,931	2.11	437,598	406,333	1.077

Notes: (i) The 1981 census total given above is based on the recently revised estimate for Assam, which was not enumerated in the 1981 census.
(ii) The average annual rates of population growth given above for 1961-71 and 1971-81 have been adjusted to allow for the fact that the reference date for the 1971 census was April 1, rather than March 1. The first growth rate given relates to the decade 1941-51.
Principal Source: Nanda (1991).

TABLE 2: SUMMARY OF ASSUMPTIONS AND STATISTICS FROM REVISED (1989) ALL-INDIA POPULATION PROJECTIONS OF EXPERT COMMITTEE ON POPULATION PROJECTIONS

Indices	Date/Period			
	1981	1986-91	1991	1991-96
Life expectation-male	54.1	58.1	–	60.6
(years) - female	54.7	59.1	–	61.7
Crude death rate (CDR0	–	10.8	–	9.4
Crude birth rate (CBR)	–	30.9	–	27.5
General fertility rate (GFR)	–	140.9	–	122.7
Crude rate of natural increase (CRNI)	–	20.1	–	18.1
Population (000s)	685,185	–	843,596	–

Notes: (i) The 1981 population figure given above is that taken to be the final figure for the 1981 census.
(ii) The life expectations given for 1981 are actually the SRS rates for 1980.
Principal Source: Nanda (1991).

FIGURE 2: COMPARISON OF INTERCENSAL GROWTH RATES AND SRS CRUDE RATES OF NATURAL INCREASE, MAJOR STATES

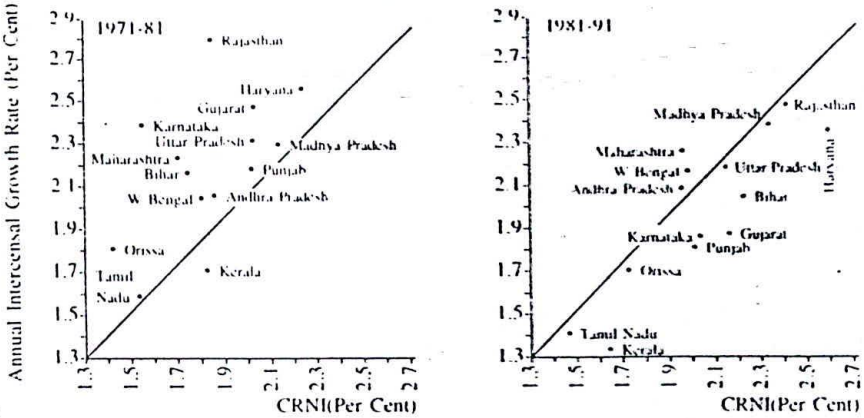
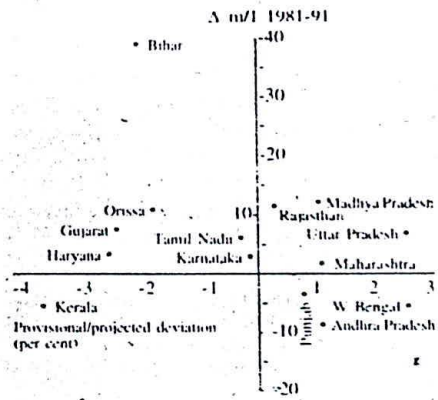


FIGURE 3: CHANGES IN SEX RATIO 1981-91 PLOTTED AGAINST DEVIATION FROM PROJECTED 1991 POPULATION TOTALS, MAJOR STATES



ments in SRS coverage over the period may have produced a spurious rise in the CRNI between the 1970s and 1980s. Looking at the SRS CBRs in Table 5 this explanation seems partly applicable in the cases of Bihar (especially) and perhaps Karnataka, Orissa and Rajasthan. Second, a particularly poor level of census enumeration in 1971 may have biased in an upwards direction the 1971-81 intercensal growth rate and hence produced a spurious growth rate decline compared with 1981-91. Third, the relative level of census coverage in 1991 may have deteriorated to produce the same effect. Obviously, these explanations are not mutually exclusive: they could all be relevant in the case of some states.

This said, it seems unlikely that the rate of intercensal population growth has actually declined in Uttar Pradesh, Rajasthan and Bihar. Analysis of both the 1971 and 1981 Census results strongly suggested that the 1971 Census enumeration level was particularly deficient in all three states [Visaria 1971, Dyson 1981]. Note too from Table 4 that Uttar Pradesh, Rajasthan and Bihar together experienced the greatest proportional rises in rates of intercensal growth between 1961-71 and 1971-81. Moreover the indicated intercensal growth rate percentage declines between 1971-81 and 1981-91 for UP and Bihar are extremely small and it would not need much to overturn them (Table 4). In the case of Bihar in particular, it may well be that improvements in SRS coverage explain part of the indicated rise in CRNI (Table 5). But, on the other hand, the 1991 Census results for Bihar produce an intercensal growth rate that is particularly low compared with the CRNI from the SRS; again, this could also be thought of as indicative of a relatively poor census enumeration level in Bihar in 1991.

Returning to Table 6, in the cases of Haryana, Karnataka and Orissa it seems more likely – though not certain – that the indicated growth rate declines from the 1991 provisional census results are real (in direction if not in magnitude). Perhaps the evidence is most persuasive for Haryana which also experienced an intercensal growth rate decline between 1961-71 and 1971-81 (Table 4), and for which the indicated increase in CRNI between the 1970s and 1980s from the SRS is comparatively modest (Table 5). Also, levels of contraceptive use in Haryana are comparatively high [Government of India 1987]. Note too from Table 4 that Orissa also experienced a decline in its intercensal growth rate between 1961-71, 1971-81 and 1981-91. And we have already remarked that improvements in SRS coverage may help to explain some of the indicated rise in CRNI in Orissa. Accordingly, it seems very probable that Orissa's rate of growth is also declining.

To sum up, then, it seems fairly certain that rates of population growth have declined in Kerala, Tamil Nadu, Punjab and Gujarat. And the same conclusion seems likely for Haryana, Orissa and (perhaps a little less clearly) Karnataka. On the other hand, the generally more populous states of Andhra Pradesh, Madhya Pradesh, Maharashtra and West Bengal have probably experienced some minor increase in growth rate. And to these states – almost certainly in our view – must be added Bihar, Rajasthan and UP.

Some simple calculations can illustrate the implications of such an analysis for conclusions regarding trends in the all-India intercensal rate of population growth. First, for the six states in Table 6 for which the census indicates a decrease in growth rate while the SRS indicates an increase, assume that the true growth rate during 1971-81 was the average of the CRNI from the SRS (too low) and the indicated intercensal growth rate (too high). Second, back-project the 1981 populations for these six states to 1971 on the basis of these average growth rates. This exercise alone suggests that the 1971 Census total should be raised by just over five million. The implied 1961-71 all-India intercensal growth rate is raised to 2.29 per cent per annum and the rate for 1971-81 falls to 2.13 per cent. The latter figure is virtually the same as the implied growth rate of 2.11 per cent per annum for 1981-91 (Table 1). Obviously, these are rough and ready assumptions and calculations. But they suggest that the decade 1981-91 may not have witnessed any reduction in the rate of population growth. This conclusion will be strengthened if (as is to be expected) the final 1991 Census total is a few million higher than the provisional total and if any evidence arises of a further deterioration in census coverage level in 1991.

The question of a possible deterioration in census coverage level in 1991 redirects our attention to the indicated increase in the population's masculinity. In this context Table 7 shows that the increase in masculinity in 1991, compared with 1981, was widespread (as indeed it was in 1971 compared to 1961). The sex ratio (m/f) rose in Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu and Uttar Pradesh. The increase in 1991 was especially pronounced in Bihar. Indeed, Table 7 shows that if we simply exclude this one state then the all-India rise in masculinity between 1981 and 1991 is reduced from seven to three points. Further, if we exclude Bihar from the last four censuses then the all-India sex ratios are notably more consistent and any upward trend is much less marked. It may also be highly significant that the presumed deterioration in census coverage level in 1971 was also accompanied by an especially great increase in population masculinity in Bihar (Table 7). Coupled with the previously

TABLE 3: ESTIMATED CRUDE BIRTH, DEATH AND NATURAL INCREASE RATES FROM SAMPLE REGISTRATION SYSTEM (SRS), ALL-INDIA, 1971-89

	Period/Year			
	1971-80	1981-89	1988	1989
CBR	34.59	32.78	31.5	30.5
CDR	14.72	11.54	11.0	10.2
CRNI	19.87	21.24	20.5	20.3

Notes: (i) Figures given for periods are mean values of corresponding annual rates
(ii) Rates for 1989 are provisional.

Principal Source: Registrar General, India (1990)

noted shortfall in Bihar's 1981-91 intercensal population growth rate compared with the CRNI of the SRS, this casts further doubt on the level of census enumeration in 1991 in this state.

Another way to get tentative insights into the possible influence of census coverage chaages in 1991 may be to examine state-level differences between the provisional and projected population totals. Figure 3 plots these differences against changes in the sex ratio between 1981 and 1991. As can be seen, Kerala's enumerated population both declined in masculinity and fell well short of its projected total (both changes probably reflecting outmigration). But excluding Kerala, all states which fell short of their projected population totals also registered a rise in masculinity. Figure 3 provides a very tentative indication that at the state level a relatively poor census coverage may have been associated with increased masculinity. Moreover, Bihar is clearly an outlier. The suggestion is that some additional factors may have been operating there.

The increase in masculinity in Bihar has therefore been examined at the district-level, where necessary recombining 1991 Census data for districts (available in Premi 1991) so that they can be compared with the 31 districts of Bihar which existed at the time of the 1981 census. Three points emerge from this exercise. First, virtually every district in Bihar experienced an increase in masculinity between 1981 and 1991; the sole exception was Dhanbad – the state's most masculine district at both enumerations – which experienced a slight decline in sex ratio from 1.229 to 1.200 in 1991. Second, the greatest increases in population masculinity appear to have occurred in districts located in north-central Bihar (e.g. Nawada, Sitamarhi, Muzaffarpur, Vaishali, and Darbhanga). Third, at the district-level, there is a fairly strong and highly significant positive relationship between the increase in the sex ratio between 1981 and 1991 and the intercensal rate of male population growth between those years; ($r = 0.40$, $p < 2.5$ per cent (excluding Darbhanga, $r = 0.53$, $p < 1$ per cent)). This last finding can be interpreted as suggesting that a lower rate of male outmigration from Bihar, perhaps coupled with an element of return male migration during the 1980s, has contributed to the sudden increase in masculinity in the state. However, one has to ask why any such migration effect has been so pronounced in Bihar compared with UP.

Discussion and Conclusions

It is difficult to be other than tentative in interpreting the provisional 1991 Census results. Here we have approached them in a similar vein as we previously approached the 1981 results. And it might be objected that this essentially constitutes an example of getting 'busy on the proof'.

This said, our principal views and conclusions are as follows. India's true population size is very much larger than is indicated by the census – and the post-enumeration check results are a poor indicator of the true level of underenumeration. While there has probably been considerable fertility and mortality decline in India during the 1980s (life expectation is now about 60 years and total fertility around 4 live births), it is much less certain that the last decade has witnessed any reduction in the rate of population growth. We believe the evidence supports fairly sizeable growth rate reductions in Kerala,

Table 4: 1991 Census Results and Intercensal Growth Rates, Major States

	Total Population 1991 (000s)	Average Annual Rate of Population Growth (Per Cent)			Per cent Change in Growth Rate	
		1961-71	1971-81	1981-91	61-71 to 71-81	71-81 to 81-91
State						
Andhra Pradesh	66,305	1.90	2.10	2.14	+11	+2
Assam	22,295	2.98	2.12	2.12	-	-
Bihar	86,339	1.93	2.17	2.11	+12	-3
Gujarat	41,174	2.58	2.46	1.89	-5	-23
Haryana	16,318	2.79	2.55	2.33	-9	-9
Karnataka	44,817	2.17	2.39	1.88	+10	-21
Kerala	29,011	2.33	1.77	1.31	-24	-26
Madhya Pradesh	66,136	2.52	2.27	2.37	-10	+4
Maharashtra	78,707	2.43	2.21	2.26	-9	+2
Orissa	31,513	2.23	1.85	1.78	-17	-4
Punjab	20,191	1.96	2.16	1.85	+10	-14
Rajasthan	43,881	2.46	2.87	2.47	+17	-14
Tamil Nadu	55,638	2.01	1.63	1.39	-19	-15
Uttar Pradesh	138,760	1.80	2.29	2.24	+27	-2
West Bengal	67,983	2.38	2.10	2.20	-12	+5
All India	843,931	2.20	2.22	2.11	+1	-5

Principal Sources: Registrar General, India (1990); Dyson (1981).

Table 5: Estimated Crude Birth, Death and Natural Increase Rates from Sample Registration System (SRS), Major States, 1975-77 and 1985-87

State	1975-77			1985-87			Per Cent Change		
	CBR	CDR	CRNI	CBR	CDR	CRNI	CBR	CDR	CRNI
Andhra Pradesh	33.6	14.7	18.9	30.6	10.0	20.6	-9	-32	+9
Assam	33.1	14.9	18.2	34.4	12.4	22.0	+4	-17	+21
Bihar	29.7	12.3	17.4	36.9	13.9	23.0	+24	+13	+32
Gujarat	36.8	15.2	21.6	32.0	10.4	21.6	-13	-32	0
Haryana	36.3	13.0	23.3	35.2	8.9	26.3	-3	-32	+13
Karnataka	27.8	11.3	16.5	29.2	8.7	20.5	+5	-23	+24
Kerala	27.2	7.9	19.3	22.5	6.2	16.3	-17	-22	-16
Madhya Pradesh	39.5	17.6	21.9	37.7	13.7	24.0	-5	-22	+10
Maharashtra	28.4	11.8	16.6	29.3	8.4	20.9	+3	-29	+26
Orissa	30.1	15.3	14.8	31.4	13.4	18.0	+4	-22	+22
Punjab	31.5	10.9	20.6	28.6	8.4	20.2	-9	-23	-2
Rajasthan	34.7	15.1	19.6	37.1	12.2	24.9	+7	-19	+27
Tamil Nadu	30.4	14.4	16.0	24.1	9.5	14.5	-21	-33	-9
Uttar Pradesh	41.2	20.7	20.5	37.7	15.0	22.7	-8	-28	+11
West Bengal	30.9	12.2	18.7	29.9	9.1	20.8	-3	-25	+11
All-India	34.2	15.2	19.0	32.6	11.3	21.3	-5	-26	+12

Principal Source: Registrar General, India [1990].

Table 6: State-level Changes in Population Growth between 1970s and 1980s

	Census			
	Decrease in Intercensal Growth Rate		Increase in Intercensal Growth Rate	
	(C)	(SRS)		
Decrease in CRNI				
Gujarat	(-23)	(0)		
Kerala	(-26)	(-16)		
Punjab	(-14)	(-2)		
Tamil Nadu	(-15)	(-9)		
Increase in CRNI				(C) (SRS)
Bihar	(-3)	(+32)	Andhra Pradesh	(+2) (+9)
Haryana	(-9)	(+13)	Madhya Pradesh	(+4) (+10)
Karnataka	(-21)	(+24)	Maharashtra	(+2) (+26)
Orissa	(-4)	(+22)	West Bengal	(+5) (+11)
Rajasthan	(-14)	(+27)		
Uttar Pradesh	(-2)	(+11)		

Note: (C) denotes percentage decline in intercensal growth rate.
(SRS) denotes percentage decline in SRS CRNI between the 1970s and 1980s.

Tamil Nadu, Punjab and Gujarat, with perhaps lesser declines in Haryana, Orissa and Karnataka. But growth rates may well have increased in Andhra Pradesh, Madhya Pradesh, Maharashtra, West Bengal, Bihar, Rajasthan and Uttar Pradesh. Overall we consider that a picture of a constant rate of population growth between 1971-81 and 1981-91 is far more convincing – coupled with a higher rate of all-India growth during the 1961-71 decade. Probably a significant factor behind the greater CDR than CBR decline during the 1980s has been age-structural change; specifically, increases in the proportion of the population in the principal reproductive years.

Despite the fact that the quality of India's demographic data base seems to be improving (as in Figure 2) the 1991 Census results certainly can be interpreted in such a way as to suggest some deterioration in the overall level of enumeration compared with 1981. We do not see the indicated increase in population masculinity in 1991 as indicative of worsening relative female survival chances. Rather the SRS-based assumptions of the Expert Committee that females now outlive males seem more plausible (Table 2 and Dyson 1988). In this context it is perhaps worth remarking that the state-level pattern of sex ratio change in Table 7 comparing 1971/1961 with 1991/81 is similar ($r = 0.63$, $p < 1$ per cent). Perhaps this suggests some resemblance to the way in which the enumeration level may have deteriorated in 1971, though again other factors may also be contributing to the similarity (and the relationship is very much weaker [$r = 0.28$] if Bihar is excluded). Also it is likely that compositional changes in India's population are contributing slightly to the increased masculinity (for example, the combined population of states with sex ratios of 1.090 or above in 1991 constituted 44.25 per cent of the national population, compared with 43.50 per cent for the same states in 1971).

Finally a word is in order regarding the performance of the family welfare programme between the major states – firmly bearing in mind that many factors other than programme performance influence a state's indicated rate of population growth.

After the 1981 Census there was a fairly strong negative relationship ($r = 0.69$) between a state's level of family welfare protection (per cent of couples effectively protected) and the indicated change (1971-81 compared to 1961-71) in its rate of inter-censal population growth [Dyson 1981]. This relationship seems much weaker after the 1991 Census. Thus comparing levels of protection for 1986 [Government of India 1987] with the change in growth rate between 1981-91 and 1971-81 (Table 4) produces a coefficient of just -0.33.

However this should not be taken as indicative of any reduction in the influence of the family planning programme on population growth. For one thing the relationship found after the 1981 census was partly spurious because the 1971-81 population growth rates for Bihar, Rajasthan and Uttar Pradesh were inflated and these states also performed poorly in terms of family welfare provision (indeed, excluding them from the 1981 calculations the r value falls to just -0.21). For another, there clearly is a real, if weak, relationship between family welfare performance and reductions in population growth rates after the 1991 Census. Thus the all-India level of family welfare protection in 1986 was 34.9 per cent and most of the states we have identified as probably experiencing a reduction in the rate of growth did comparatively well on this measure: Kerala (41.1), Tamil Nadu (41.1), Punjab (53.5), Gujarat (48.2), Haryana (52.1), Karnataka (36.3) and Orissa (34.7). Moreover – again with the possible exception of Orissa – these states have all increased their family welfare provision levels faster than the all-India increase between the 1970s and 1980s. Perhaps Maharashtra is the most difficult state to account for from this perspective, since 53.1 per cent of its eligible couples were estimated to be protected against conception in 1986 [Government of India 1987], yet there is scant evidence of a reduction in the state's rate of population growth.

To conclude, it seems difficult to maintain that the 1980s have seen a slower rate of population growth than did the 1970s, although the last decade has certainly witnessed much progress in terms of both fertility and mortality decline. But the 1990s will almost certainly see reductions in the all-India rate of growth and indeed the SRS annual rates imply that this process may already be underway.

[This paper is to appear in Monica Das Gupta, T N Krishnan and Lincoln C Chen (eds), *Health and Development in India* (forthcoming).]

TABLE 7: POPULATION SEX RATIOS (M/F), MAJOR STATES, 1961-91

State	Census				Ratios of Sex Ratios	
	1961	1971	1981	1991	1971\1961	1991\1981
Andhra Pradesh	1.019	1.023	1.038	1.029	1.004	0.991
Assam	1.151	1.115	—	1.081	—	—
Bihar	1.006	1.049	1.056	1.096	1.043	1.038
Gujarat	1.064	1.070	1.061	1.069	1.006	1.008
Haryana	1.152	1.154	1.140	1.144	1.002	1.004
Karnataka	1.043	1.045	1.038	1.041	1.002	1.003
Kerala	0.978	0.984	0.967	0.961	1.006	0.994
Madhya Pradesh	1.049	1.062	1.063	1.073	1.012	1.009
Maharashtra	1.068	1.075	1.065	1.068	1.007	1.003
Orissa	0.999	1.013	1.018	1.029	1.014	1.011
Punjab	1.171	1.156	1.129	1.126	0.987	0.997
Rajasthan	1.101	1.080	1.085	1.095	0.981	1.009
Tamil Nadu	1.008	1.022	1.022	1.029	1.014	1.007
Uttar Pradesh	1.100	1.138	1.129	1.134	1.035	1.004
West Bengal	1.139	1.123	1.097	1.090	0.986	0.994
All-India	1.063	1.075	1.070	1.077	1.011	1.007
All-India (excluding Bihar)	1.070	1.079	1.072	1.075	1.008	1.003

Principal Sources: Nanda [1991]; Visaria and Visaria [1981]; Bose [1991].

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Sex Ratios: What They Hide and What They Reveal

K Srinivasan

The widespread large decline in the sex ratios in the country in the last decade in the context of an increasing trend in female life expectancy and such other factors raises the question of whether there was large scale under-enumeration of females in the 1991 Census.

INDIA shares a distinctive feature of the south Asian and Chinese populations with regard to the sex ratio – the centuries old deficit of females to males – the opposite of non-Asian countries. In India the deficit is largely attributed to woman's lower status in society which has contributed to their higher mortality in all ages up to 45. Of more serious concern to the country and vocalised by women's groups in recent years is that the sex ratio, defined as the number of females per 1,000 males (which is the opposite of the internationally used definition as males per 1,000 females), has been declining almost consistently over the decades, except for a small improvement in 1981. The sex ratio for the country as a whole, computed to be 972 in the 1901 Census, declined steadily to 930 by 1971, rose marginally to 934 by 1981, but declined subsequently to 927 in the 1991 Census. The table gives the sex ratio figures for the years 1901, 51, 71, 81 and 1991 for the states and union territories of the country.

The secular trends and the inter-state differentials revealed by the figures in Table 1 are perplexing and hard to explain. Over the decades when the sex ratios declined from 972 in 1901 to 927 in 1991, the expectation of life of females increased from 23.3 years during 1901-1910 to 40.6 years during 1951-60, 44.7 years during 1971-80 and to 59.1 years during the quinquennium 1986-91. For males, the expectation of life during the corresponding years was 22.6, 41.9, 46.4 and 58.1 years respectively. The increase in the expectation of life during the five decades, 1905-55, for females was 17.3 years compared to 19.3 years for males, lower by two years, partially justifying the decline in the sex ratios during this period. In the next 33 years, 1955 to 1988, female expectancy increased by 18.5 years compared to 17.8 years for the males, higher by 0.7 years. But even during this period, according to the censuses of 1951 and 1991, the sex ratios have declined, a phenomenon not consistent with the relatively larger increase in the life expectancy of females compared to males. From demographic theory we can easily show that in a period when the life expectancy of females increases by a greater length than for the males, it is impossible for the sex ratio to decline except in the case of large scale surplus emigration of females over males (in millions), or a very sudden drop in the percentage of female births to male births (increase in the sex ratio at birth, defined in this case as male births to 100 female births) again in millions, both implying events of such colossal magnitude that they could not have gone unnoticed in a democratic society such as India. This phenomenon, observed in India as a whole, is also noticed in most of the states, but the thorny question of interstate migration, especially the differential migration of males and females, compounds the issue. All the estimates of interstate migration (out and in migrants) during any intercensal period are based on the data from the censuses and using them to prove the point of inconsistency between the increase in life expectancy of females (relative to males) and the population sex ratio at the state level, adjusting for the migration figures, would amount to begging the question for an answer. At the national level the arguments are not affected by the magnitude of interstate migration, nor by the mortality estimates after 1966 that are based on the system of sample registration, which is independent of the census.

In many states, especially the large Hindi-speaking areas, the sex ratios have been quite low over time and still there have been further declines between 1981 and 1991. For example, in Bihar, it fell from 946 to 911, and in Uttar Pradesh from an already quite low figure of 885 in 1981 to 879 in the next 10 years. Surprisingly, even Maharashtra, considered to be one of the most progressive states in the country with a better status for

TABLE 1: TRENDS IN SEX RATIOS IN THE STATES AND INDIA

States	Sex Ratio (No of Females per 1000 males)				
	1901	1951	1971	1981	1991
Andhra Pradesh	985	986	977	975	972
Arunachal Pradesh	NA	NA	861	862	859
Assam	919	868	896	910	923
Bihar	1054	990	954	946	911
Goa	1091	1128	981	975	967
Gujarat	954	952	934	942	934
Haryana	867	871	867	870	865
Himachal Pradesh	884	912	958	973	976
Jammu and Kashmir*	882	873	878	892	923
Karnataka	983	966	957	963	960
Kerala	1004	1028	1016	1038	1036
Madhya Pradesh	990	967	941	941	931
Maharashtra	978	941	930	937	934
Manipur	1037	1036	980	971	958
Meghalaya	1036	949	942	954	955
Mizoram	1113	1041	946	919	921
Nagaland	973	999	871	863	886
Orissa	1037	1022	988	981	971
Punjab	832	844	865	879	882
Rajasthan	905	921	911	919	910
Sikkim	916	907	863	835	878
Tamil Nadu	1044	1007	978	977	974
Uttar Pradesh	937	910	879	885	879
West Bengal	945	865	891	911	917
Union Territories					
Andaman and Nicobar Islands	318	625	634	760	818
Chandigarh	771	781	749	769	790
Dadra and Nagar Haveli	980	946	1007	974	952
Daman and Diu	995	1125	1099	1062	969
Delhi	862	768	801	808	827
Lakshadweep	1063	1043	978	975	943
Pondicherry	NA	1030	989	985	979
All India	972	946	930	934	927

Note: * The 1991 Census was not conducted in Jammu and Kashmir. Hence, the population projected by the Standing Committee has been used.

Source: Registrar General [1992: 86-87, 102-05].

women, recorded a sex ratio of 934 in 1991 compared to 937 in 1981. Only in Kerala has the population favoured females throughout this century, with 1036 females per 1000 males in 1991, followed by Himachal Pradesh with 976. In 15 out of 23 states in which the census was conducted both in 1981 and 1991, the sex ratio was lower in the later census. (In 1991 the census was not conducted in Jammu and Kashmir, and in 1981 it was not conducted in Assam.) In all these 15 states, the female life expectancy has increased more than for males during this period, as revealed by the SRS data. It is surprising that in this context the sex ratio has declined between 1981 and 1991 in all these states. Except in Kerala there is a deficit of females to males in all other censuses since 1951. This widespread large decline in the sex ratios in the country in last decade in the context of an increasing trend in female life expectancy (rising faster than for the males), and similar phenomena in a number of states, raises the possibility of large-scale under-enumeration of females in the 1991 Census.

The extremely volatile political and social climate that prevailed in many parts of the country because of the issue of reservations (Mandal Commission recommendations supporting reservations of jobs and seats in colleges on the basis of caste) and the 'ratha yatras', or massive processions organised by the Hindu fundamentalist groups over the Ayodhya temple issue, during the six-month period prior to the census, might have contributed to the under-reporting of females by households. To check on this point on an empirical basis, the sex ratios were computed separately for two groups of districts, i e, those more disturbed than the others, defined as those through which the 'ratha yatra' procession passed between September and October 1990, in the most affected states, viz, Bihar, Gujarat, Madhya Pradesh, Maharashtra, and Uttar Pradesh. It was found that the more disturbed districts had a consistently lower sex-ratio than the others: 909 versus 919 in Bihar, 924 versus 950 in Gujarat, 915 versus 925 in Madhya Pradesh, 908 versus 978 in Maharashtra, and 874 versus 892 in Uttar Pradesh [Srinivasan 1991]. Similarly, the projections of population with 1981 as base, and taking the observed levels of fertility and mortality between 1981 and 1991 under different assumptions of sex ratios at birth, revealed that the 1991 Census is likely to have missed about 3.7 million more females than males in the count [Parasuraman and Roy 1991]. Thus the possibility of increasing under-enumeration of females in India in the more recent censuses needs further investigation.

There is no doubt that women's lower status in Indian society has contributed, historically, to low age at marriage for girls, lower literacy and educational attainment, and higher fertility and mortality levels during the reproductive ages. However, since independence, consistent efforts have been made to improve their status through legislation and social action by various women's groups, and though women might not yet have achieved a status equal to men in all walks of life, it is certain that their position has not deteriorated over time such as to imply a higher mortality level for females compared to males. The possibility of relatively larger under-enumeration of females in the recent census, which can also be taken as an index of the continuing poor status of women, has to be investigated in greater detail.

Another factor that has been advanced by women's groups and others for the decline in the sex ratio is the increasing incidence of female foeticide in the country through the use of the modern techniques of ultrasonography and amniocentesis that help to identify the sex of the baby at very early stages of pregnancy. When these procedures determine at an early stage of pregnancy that a foetus is female, it is more likely to be aborted. However, these procedures have found favourable response in the late 80s and early 90s only in the large metropolitan cities of Bombay, Calcutta, Madras and Delhi where the facilities for such techniques were available. Even to increase the sex ratio at birth in the Indian society by one point, for example, from 106 to 107, about 70,000 female foetuses have to be aborted. Projection exercises reveal that even if we assume that the sex ratio between 1981 and 1991 had increased by 4 points, i e, from 106 to 110 male births to 100 female births, even then the population sex ratio in the 1991 Census could not have been lower than the 1981 level given the increase in life expectancy of females after birth compared to males. In recent years many state governments, led by the government of Maharashtra, are bringing in legislation to ban the use of any technique to determine the sex of the child during pregnancy and even if done for clinical or genetic reasons, to prevent divulging of the information to the mothers. Female foeticide cannot be advanced as a major contributory factor behind the decline in the sex ratio of the Indian population between 1981 and 1991 [Irudaya Rajan et al 1991, 1992].

Last, we can suggest one possible reason why historically the status of women has been relatively lower in the older civilisations such as China, the Middle East and south Asia, including India. The differential treatment meted out to the girl child might be due to their understanding of the differential survival capabilities of the two sexes. From centuries of observation of the mortality of male versus female in their societies, these civilisations might have realised that given equal nutrition and care at every age from conception onward, the male is the biologically weaker sex and needs relatively better treatment and attention for equalising the chances of survival. One expects this to happen at the family level where the relatively weaker child gets better nutrition and attention than the others. To have a balanced sex ratio in the population, similar over-protective mechanisms seem to have operated at the societal level with regard to male children. However, over the centuries the additional care required for the male child became institutionalised as his having intrinsic social and religious value not possessed by the female child, and preferential nutrition practices might have become strong gender biases that became institutionalised. Without such an explanation it is difficult to understand how the sex ratio in many of these countries has been unfavourable to females for centuries in the past.

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Missing Females: A Disaggregated Analysis

S B Agnihotri

The problem of sex ratio imbalance in India needs a disaggregated analysis. The absence of such analysis masks the seriousness of the problem among certain groups and in certain areas. This paper presents data on the female/male ratio for scheduled castes, scheduled tribes and the rest of the population. While further disaggregation among various subgroups is necessary, the data presented here help to identify some major problem areas.

THE adverse female-to-male sex ratios in South Asia has attracted considerable academic and policy concern in the recent years. Among different regions of the world, South Asia stands out both for low sex ratios and lower life expectancy at birth for females [Sen 1987 T-1]. The indian subcontinent represents extreme manifestation of this pattern.

Census reports in India have voiced concern over the declining trends in the sex ratios [Nath 1991]. This decline has taken place steadily since the turn of the century [Bose 1991]. The seeming reversal in this trend in the 1981 Census had given rise to much optimism. This has turned out to be short-lived with the 1991 Census figures indicating a decline in this ratio to 927 females per thousand males. Available data reveal that increased urbanisation or improved economic prosperity has not necessarily resulted in correcting these adverse trends [Kynch and Sen 1983; Krishnaji 1987]. As to the understanding of the phenomenon, the official position is that it is "... difficult to pinpoint any particular reason for the declining sex ratios which require a detailed analysis ..." [Nath op cit].

The available literature on this subject is dominated by two themes and an omission – that will be the subject matter of some detailed analysis below. The 'omission' refers to the absence of an analysis of the sex ratio patterns among three distinct categories of the Indian population – the tribals, the scheduled castes (once considered untouchables) and the others – normally referred to as the 'general' category. The analyses currently done do look at different categories – urban and rural, different regions or different occupational groups like cultivators, agricultural labourers and the non-agricultural workers. The analysis in terms of the scheduled tribes, the scheduled castes and the general or the non-scheduled components of the total population is absent.

Miller (1981) in her otherwise authoritative analysis of the juvenile sex ratios in India has explicitly opted out of this line of analysis and has instead taken up individual castewise analysis.[1] Two of the most recent and detailed reviews on this issue, viz, Chatterjee (1990) and Bennet et al (1991) do not cover this aspect either. A literature search between 1981 and 1991 also indicates that this line of analysis has not been pursued.

This omission is surprising because anyone familiar with the tribal Indian society cannot miss out its similarities with Boserup's 'female farming system'. These are high female labour participation, prevalence of shifting cultivation, late entry or even absence of plough and low level of monetisation of the economy. Boserup (1976) has herself pointed this out. She has also mentioned the scheduled castes as being major suppliers of casual labour and being 'unpropertied' class in Miller's terms [Miler 1981]. The supply of casual labour covers both agricultural and non-agricultural sectors. These are important respects in terms of which the ST and the SC populations differ from the 'general' population.

One would prima facie expect, therefore, a difference in the sex ratio pattern among these three groups. An analysis of the census date of three decades 1961 to 1991 indicates this to be indeed the case (Table 2). The female-male ratio (fmr) values expressed as number of females per thousand male population, are significantly higher for the tribal population and closer to the African ratios. This is followed by fmr values for the Scheduled Caste population, while the fmr values for the non-SC/ST population have been the lowest until recently. The difference between fmr values for SC and non-SC/ST or 'general' population has narrowed down during the last two decades.

The fmr pattern presented in Table 2, is both interesting and worrying. It also brings out the merit in disaggregation of the data in more than one ways. It allows one to compare the fmr data across the three socioeconomic groups, across different states and over the four decades, viz, 1961 to 1991.

The first feature to be noticed is that the problem of declining fmrs is more serious than envisaged so far for the 'general' category in a number of states and for the Scheduled Castes as a whole. For the scheduled castes the overall fmr declined further by three points during 1971-1981 when the overall fmr for the total population went up, even if temporarily. This decline is seen in almost all states including Tamil Nadu and Andhra. Only Himachal Pradesh and Punjab in the north, Kerala in the south, West Bengal, Assam and Sikkim in the east were significant exceptions. The decline was pronounced in the cowbelt Bihar, UP, MP and Haryana. It was also pronounced in Orissa as well. During 1981-1991 decade, the decline in fmr has been significant for ST population as well – from 983 in 1981 to 972 in 1991.

It needs to be stressed that the absence of such disaggregation had masked some of the drastic reductions in fmr that took place in the past. During 1961-1971 the declines in fmr values among some of the groups were as sharp as 50 females per 1000 males in Bihar, 32 females per 1000 males in MP, 23 females per thousand males in Orissa and 45 females per thousand males in UP. Hardly any attention has been focused on these sharp declines. Similar sharp declines have taken place during 1981-1991 also. Interestingly, wherever the fmr values for SC population have gone up, the 'general' category fmr values have gone up. But the converse is not necessarily true.

TABLE 1: SEX RATIO AND LIFE EXPECTANCY RATIO (Female/Male)

Region	Sex Ratio (1980)	Life Expectancy Ratio (1980-85)
World	0.990	1.047
Western Europe	1.064	1.104
Eastern Europe	1.056	1.098
United States	1.054	1.106
Latin America	0.999	1.047
Asia	0.953	1.022
India	0.931	0.993
Pakistan	0.929	0.961
Bangladesh	0.939	0.979
Western Asia	0.940	1.052
Eastern and south-eastern Asia	1.008	1.065
China	0.941	1.404
Africa	1.015	1.065
Northern Africa	0.986	1.060
Non-Northern Africa	1.024	1.021

Source: Sen, A K (1987b): 'Africa and India – What Do We Have to Learn from Each Other?' WIDER Discussion Paper No 19.

Missing Females

Another interesting way of looking at the same information is to calculate the number of missing females. If we take, say, the 1961 fmr (941) as the base fmr, then the number of missing females in, say, 1991 would be the number of women required to be added to the 1991 female population, so as to have the same fmr as in 1961. This number can be expressed as:

$$dw = [\text{fmr}(61) - \text{fmr}(91)] * M(91) \quad ...3.1$$

where M(91) is the male population of 1991 Census.

This is straightforward, as,

fmr (91) = W(91) / M(91), and,

$$\text{fmr}(61) - \text{fmr}(91) = [W(91) + dW] / M(91) - W(91)/M(91) \quad ...3.2$$

Readjusting this we get the expression 3.1 above.

An exercise on above lines for 1981 shows the number of total missing females to be 31.24 lakh. The ST population accounts for only 3 per cent of this number. STs form about 7 per cent of the population. Similalry SCs account for 29 per cent of the missing females although they make 14.6 per cent of the population as their share. The two figures for general category are 68 per cent and 78.5 per cent respectively.

The choice of an adhoc base, however, creates a problem in further disaggregation of the data. This is because the total fmr:

$$F = W/M = \Sigma W(i)/M = \Sigma\{W(i)/M(i)\} * \{M(i)/M\} \quad ...3.3$$

$$\text{or, } F = \Sigma p(i) * f(i) \quad ...3.4$$

Table 2: FMR Table
(No of women per thousand men)

State/Union Territories	Year	Total FMR	SC FMR	ST FMR	Non SC-ST FMR
India	1961	941	957	987	934
	1971	930	935	982	924
	1981	934	932	983	930
	1991	927	922	972	923
Andhra Pradesh	1961	981	980	976	982
	1971	977	973	973	977
	1981	975	971	962	977
	1991	972	969	960	974
Arunachal Pradesh	1961	894		1,013	299
	1971	861	904	1,007	460
	1981	862	592	1,005	599
	1991	859	627	998	658
Assam	1961	869	883	918	862
	1971	896	917	960	886
	1981	901			901
	1991	923	919	967	916
Bihar	1961	994	1,031	1,014	985
	1971	954	981	1,003	943
	1981	946	966	993	937
	1991	911	914	971	905
Goa	1961	1,066			1,066
	1971	981	936	742	982
	1981	975	956	845	976
	1991	967	967	889	967
Gujarat	1961	940	972	970	933
	1971	934	950	968	927
	1981	942	942	976	936
	1991	934	925	967	929
Haryana	1961	868	894	–	863
	1971	867	871	–	866
	1981	870	864	–	872
	1991	865	860	–	866
Himachal Pradesh	1961	938	934	983	937
	1971	958	950	1,000	959
	1981	973	959	978	977
	1991	976	967	981	978
Jammu and Kashmir	1961	878	890	–	876
	1971	878	924	–	874
	1981	892	922	–	889
	1991	–	–	–	
Karnataka	1961	959	965	953	958
	1971	957	957	957	957
	1981	963	968	971	961
	1991	960	962	961	959
Kerala	1961	1,022	1,013	1,006	1,022
	1971	1,016	1,012	995	1,017
	1981	1,032	1,022	992	1,033
	1991	1,036	1,029	996	1,038
Madhya Pradesh	1961	953	973	1,003	934
	1971	941	941	998	925
	1981	943	932	997	926
	1991	931	915	985	916
Maharashtra	1961	936	962	978	932
	1971	930	947	973	926
	1981	937	948	974	932
	1991	934	944	968	928
Manipur	1961	1,015	942	1,022	1,014
	1971	980	914	1,009	969
	1981	971	956	975	969
	1991	958	973	959	957
Meghalaya	1961	937	796	1,001	670
	1971	942	898	996	743
	1981	954	790	1,002	776
	1991	955	821	997	739
Mizoram	1961	1,009	0	1,026	390
	1971	946	38	1,021	208
	1981	919	125	997	227
	1991	921	157	982	243
Nagaland	1961	933	575	1,007	287
	1971	871	–	973	332
	1981	863	–	955	495
	1991	888	–	946	558
Orissa	1961	1,001	1,015	1,016	991
	1971	988	993	1,00	979
	1981	981	988	1,012	969
	1991	971	975	1,002	959
Punjab	1961	854	858	–	852
	1971	865	856	–	868
	1981	879	868	–	883
	1991	882	873	–	885
Rajasthan	1961	908	923	926	902
	1971	911	914	930	907
	1981	919	913	945	916
	1991	910	899	930	909
Sikkim	1961	904	–	–	904
	1971	863	842	–	864
	1981	835	913	927	801
	1991	878	939	914	862
Tamil Nadu	1961	992	993	951	992
	1971	978	984	951	977
	1981	977	980	968	976
	1991	974	978	960	973
Tripura	1961	932	921	955	921
	1971	943	940	954	938
	1981	946	942	962	940
	1991	945	949	965	931
Uttar Pradesh	1961	909	941		901
	1971	879	896	880	874
	1981	885	892	915	883
	1991	879	877	914	879
West Bengal	1961	878	916	969	861
	1971	891	927	955	877
	1981	911	926	969	902
	1991	917	931	964	844

TABLE 3: MISSING FEMALES 1971-1991

(in 000s)

State/UT	Year	Total				SC				ST				Non SC-ST			
		Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase
India	1961	2262.93	2129.42	133.52		329.37	315.12	14.25		151.62	149.69	1.93		1781.94	1664.61	117.33	
					65.87				12.56				1.55				51.77
	1971	2840.49	2641.10	199.39		413.43	386.62	26.81		191.81	188.34	3.48		2235.25	2066.14	169.10	
					26.34				9.86				1.01				15.48
	1981	3439.30	3213.57	225.73		542.11	505.44	36.67		260.39	255.90	4.48		2636.81	2452.23	184.58	
					92.76				19.68				5.20				67.88
	1991	4352.16	4033.68	318.49		719.29	662.94	56.35		343.63	333.95	9.68		3289.24	3036.78	252.46	
Andhra Pradesh	1961	181.62	178.22	3.40		25.12	24.61	0.51		6.70	6.54	0.16		149.79	147.06	2.72	
					1.75				0.29				0.06				1.39
	1971	220.09	214.94	5.15		29.27	28.47	0.80		8.40	8.18	0.22		182.41	178.29	4.12	
					1.54				0.36				0.39				0.78
	1981	271.09	264.41	6.68		40.39	39.22	1.17		16.19	15.57	0.61		214.51	209.61	4.90	
					2.73				0.50				0.25				1.98
	1991	337.25	327.83	9.41		53.80	52.12	1.67		21.43	20.57	0.86		262.02	255.14	6.88	
Arunachal Pradesh	1961	1.78	1.59	0.19		0.00	0.00	0.00		1.48	1.50	−0.02		0.30	0.09	0.21	
					0.16								0.01				0.15
	1971	2.51	2.16	0.35		0.00	0.00	0.00		1.84	1.85	−0.01		0.67	0.31	0.36	
					0.12				0.01				0.00				0.11
	1981	3.39	2.93	0.47		0.02	0.01	0.01		2.20	2.21	−0.01		1.17	0.70	0.47	
					0.19				0.00				0.02				0.17
	1991	4.65	4.00	0.65		0.02	0.02	0.01		2.75	2.75	0.00		1.87	1.23	0.64	
Assam	1961	57.98	50.39	7.59		3.89	3.43	0.46		6.07	5.57	0.50		48.03	41.39	6.64	
					0.44				−0.06				−0.17				0.67
	1971	77.14	69.11	8.03		4.76	4.36	0.40		8.20	7.87	0.33		64.18	56.88	7.31	
					2.35				−0.40				−0.33				3.07
	1981	104.67	94.29	10.38		0.00	0.00	0.00		0.00	0.00	0.00		104.67	94.29	10.38	
					−1.36				0.70				0.49				−2.55
	1991	116.58	107.56	9.02		8.65	7.95	0.70		14.62	14.13	0.49		93.32	85.49	7.83	
Bihar	1961	233.01	231.54	1.47		32.19	33.18	−0.99	1.69	20.88	21.17	−0.29		179.95	177.19	2.75	
					11.93								0.21				9.96
	1971	288.47	275.06	13.41		40.14	39.37	0.77		24.62	24.71	−0.08		223.71	210.99	12.71	
					6.06				0.97				0.28				4.80
	1981	359.31	339.84	19.46		51.58	49.84	1.75		29.15	28.95	0.20		278.57	261.05	17.52	
					20.83				3.92				0.78				16.13
	1991	452.02	411.72	40.30		65.69	60.02	5.67		33.58	32.59	0.98		352.75	319.11	33.64	
									−5.67								
Goa	1961	2.86	3.04	−0.19			0.00	0.00		0.00	0.00	0.00		2.86	3.04	−0.19	
					0.26								0.00				0.26
	1971	4.01	3.94	0.08		0.07	0.07	0.00		0.00	0.00	0.00		3.94	3.87	0.07	
					0.05				−0.00				−0.00				0.05
	1981	5.10	4.98	0.13		0.11	0.10	0.00		0.00	0.00	0.00		4.99	4.87	0.12	
					0.07				−0.00				−0.00				0.07
	1991	5.95	5.75	0.20		0.12	0.12	0.00		0.00	0.00	0.00		5.82	5.63	0.19	

(Contd)

TABLE 3: (*Contd*)

State/UT	Year	Total				SC				ST				Non SC-ST			
		Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase
Gujarat	1961	106.34	99.99	6.34		6.93	6.74	0.20		13.98	13.56	0.43		85.42	79.70	5.72	
					2.73				0.27				0.17				2.29
	1971	138.02	128.95	9.08		9.36	8.89	0.47		18.97	18.37	0.60		109.69	101.68	8.01	
					1.12				0.26				−0.01				0.87
	1981	175.53	165.33	10.19		12.56	11.83	0.73		24.54	25.95	0.59		138.44	129.55	8.88	
					3.81												
	1991	213.55	199.54	14.01		15.90	14.71	1.19		31.32	30.30	1.02		166.34	154.54	11.80	
Haryana	1961	40.63	35.28	5.35		7.20	6.44	0.76		0.00	0.00	0.00		33.43	28.84	4.59	
					1.83				0.55				0.00				1.28
	1971	53.77	46.60	7.18		10.13	8.82	1.31		0.00	0.00	0.00		43.64	37.77	5.87	
					1.80				0.49				0.00				1.30
	1981	69.10	60.13	8.97		13.22	11.42	1.80		0.00	0.00	0.00		55.88	48.71	7.17	
					2.94				0.65				0.00				2.29
	1991	88.27	76.36	11.91		17.48	15.03	2.45		0.00	0.00	0.00		70.80	61.33	9.47	
Himachal Pradesh	1961	14.51	13.61	0.90		3.33	3.11	0.22		0.62	0.61	0.01		10.57	9.90	0.67	
					−0.17				−0.02				−0.01				−0.13
	1971	17.67	16.93	0.73		3.95	3.75	0.20		0.71	0.71	0.00		13.01	12.48	0.54	
					−0.14				0.02				0.02				−0.19
	1981	21.70	21.11	0.59		5.38	5.16	0.22		1.00	0.98	0.02		15.32	14.97	0.35	
					0.05				−0.00				−0.00				0.05
	1991	26.17	25.53	0.64		6.66	6.44	0.22		1.10	1.08	0.02		18.41	18.01	0.40	
Jammu and Kashmir	1961	18.97	16.64	2.32		1.50	1.34	0.17		0.00	0.00	0.00		17.46	15.31	2.16	
					0.68				−0.02				0.00				0.69
	1971	24.58	21.58	3.00		1.98	1.83	0.15		0.00	0.00	0.00		22.60	19.75	2.85	
					0.42				0.05				0.00				0.37
	1981	31.65	28.23	3.42		2.59	2.39	0.20		0.00	0.00	0.00		29.06	25.84	3.22	
					−3.42								0.00				
	1991	0.00	0.00	0.00		0.00	0.00	0.00			0.00			0.00	0.00	0.00	
Karnataka	1961	120.41	115.46	4.95		15.87	15.31	0.56		0.98	0.94	0.05		103.56	99.21	4.35	
					1.50				0.28				0.01				1.21
	1971	149.72	143.27	6.45		19.67	18.83	0.84		1.18	1.13	0.05		128.87	123.31	5.56	
					0.65				0.08				0.22				0.35
	1981	189.23	182.13	7.10		28.43	27.52	0.91		9.26	8.99	0.27		151.53	145.62	5.91	
					2.17				0.51				0.11				1.55
	1991	229.52	220.25	9.27		37.56	36.13	1.43		9.77	9.39	0.38		182.19	174.13	7.46	
Kerala	1961	83.62	85.42	−1.80		7.13	7.22	−0.10		1.06	1.07	−0.01		75.43	77.13	−1.70	
					0.08				−0.01				0.01				0.08
	1971	105.88	107.60	−1.72		8.81	8.91	−0.10		1.35	1.34	0.01		95.72	97.34	−1.62	
					−2.26				−0.17				0.00				−2.10
	1981	125.28	129.26	−3.98		12.61	12.89	−0.28		1.31	1.30	0.01		111.36	115.07	−3.72	
					−1.22				−0.14				−0.00				−1.08
	1991	142.89	148.10	−5.21		14.23	14.64	−0.41		1.61	1.60	0.01		127.06	131.85	−4.80	
Madhya Pradesh	1961	165.78	157.94	7.84		21.56	20.97	0.59		33.34	33.44	−0.10		110.88	103.53	7.35	
					4.73				1.08				0.19				3.45
	1971	214.55	201.99	12.57		28.10	26.44	1.67		41.99	41.89	0.10		144.47	133.66	10.80	
					2.77				0.91				0.10				1.76
	1981	268.26	252.93	15.34		38.08	35.50	2.58		60.03	59.84	0.20		170.15	157.59	12.56	
					8.20				1.71				0.98				5.51
	1991	342.67	319.14	23.53		50.28	45.99	4.29		77.58	76.41	1.17		214.81	196.74	18.07	

(*Contd*)

TABLE 3 (*Contd*)

State/UT	Year	Total				SC				ST				Non SC-ST			
		Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase	Male	Female	Missing Female	Incremental Increase
Maharahstra	1961	204.29	191.25	13.04		11.35	10.92	0.43		12.12	11.86	0.26		180.82	168.48	12.35	
					5.16				0.40				0.15				4.62
	1971	261.16	242.96	18.20		15.54	14.71	0.83		14.97	14.57	0.41		230.64	213.68	16.97	
					2.26				0.35				0.35				1.55
	1981	324.15	303.69	20.46		22.99	21.81	1.18		29.24	28.48	0.76		271.92	253.40	18.52	
					6.68				1.34				0.41				4.92
	1991	408.26	381.12	27.14		45.05	42.52	2.53		37.18	36.00	1.17					
Manipur	1961	3.87	3.93	–0.06		0.07	0.06	0.00		1.23	1.26	–0.03		2.57	2.61	–0.04	
					0.17				0.00				0.01				0.15
	1971	5.42	5.31	0.11		0.09	0.08	0.01		1.66	1.68	–0.01		3.67	3.55	0.11	
					0.10				–0.00				0.06				0.04
	1981	7.21	7.00	0.21		0.09	0.09	0.00		1.96	1.92	0.05		5.15	5.00	0.16	
					0.19				0.00				0.08				0.10
	1991	9.38	8.99	0.40		0.19	0.18	0.01		3.23	3.09	0.13		5.97	5.71	0.26	
Meghalaya	1961	3.97	3.72	0.25		0.01	0.01	0.00		3.19	3.20	–0.00		0.77	0.52	0.26	
					0.05				0.00				0.02				0.03
	1971	5.21	4.91	0.30		0.02	0.02	0.00		4.08	4.06	0.01		1.11	0.83	0.29	
					0.01				0.00				–0.03				0.03
	1981	6.84	6.52	0.32		0.03	0.02	0.01		5.38	5.39	–0.01		1.43	1.11	0.32	
					0.09				0.00				0.04				0.05
	1991	9.08	8.67	0.41		0.05	0.04	0.01		7.60	7.58	0.03		1.42	1.05	0.37	
Mizoram	1961	1.32	1.34	–0.01		0.00	0.00	0.00		1.29	1.32	–0.03		0.04	0.01	0.02	
					0.10				0.00				0.00				0.10
	1971	1.71	1.62	0.09		0.00	0.00	0.00		1.55	1.58	–0.03		0.16	0.03	0.12	
					0.11				0.00				0.04				0.08
	1981	2.57	2.37	0.21		0.00	0.00	0.00		2.31	2.31	0.01		0.26	0.06	0.20	
					0.07				0.00				0.05				0.02
	1991	3.59	3.31	0.28		0.01	0.00	0.01		3.30	3.24	0.06		0.29	0.07	0.22	
Nagaland	1961	1.91	1.78	0.13		0.00	0.00	0.00		1.71	1.72	–0.01		0.20	0.06	0.14	
					0.23				–0.00				0.07				0.15
	1971	2.76	2.40	0.36		0.00	0.00	0.00		2.32	2.26	0.06		0.44	0.15	0.29	
					0.21				0.00				0.09				0.12
	1981	4.16	3.59	0.57		0.00	0.00	0.00		3.33	3.18	0.15		0.83	0.41	0.42	
					0.15								0.14				0.01
	1991	6.41	5.69	0.72		0.00			0.00	5.45	5.16	0.29		0.96	0.54	0.43	
Orissa	1961	87.71	87.78	–0.08		13.71	13.92	–0.21		20.95	0.00 21.29*	–0.34		53.04	52.57	0.48	
					1.45				0.32				0.16				0.97
	1971	110.41	109.04	1.38		16.61	16.50	0.11		25.27	25.45*	–0.19		68.53	67.08	1.45	
					1.12				0.11				–0.17				1.17
	1981	133.10	130.60	2.49		19.44	19.21	0.23		29.40	29.75*	–0.35		84.26	81.64	2.62	
					2.19				0.41				0.29				1.49
	1991	160.64	155.96	4.69		25.96	25.33	0.64		35.13	35.19*	–0.06		99.55	95.43	4.11	
Punjab	1961	60.08	51.28	8.80		13.38	11.49	1.89		0.00	0.00	0.00		46.69	39.79	6.91	
					1.02				0.69				0.00				0.32
	1971	72.67	62.85	9.82		18.04	15.45	2.59		0.00	0.00	0.00		54.63	47.40	7.23	
					1.04				0.61				0.00				0.42
	1981	89.37	78.52	10.86		24.16	20.96	3.20		0.00	0.00	0.00		65.21	57.56	7.65	
					1.89				0.69				0.00				1.20
	1991	107.78	95.04	12.74		30.66	26.77	3.89			0.00	0.00		77.12	68.27	8.85	

(*Contd*)

TABLE 3: (*Contd*)

State/UT	Year	Total Male	Total Female	Total Missing Female	Total Incremental Increase	SC Male	SC Female	SC Missing Female	SC Incremental Increase	ST Male	ST Female	ST Missing Female	ST Incremental Increase	Non SC-ST Male	Non SC-ST Female	Non SC-ST Missing Female	Non SC-ST Incremental Increase
Rajasthan	1961	105.64	95.92	9.73		17.47	16.12	1.35		11.99	11.11*	0.88		88.17	68.69	19.48	
	1971	134.84	122.81	12.03	2.30	21.29	19.46	1.83	0.47	16.19	15.06*	1.13	0.25	113.55	88.29	25.57	5.79
	1981	178.54	164.08	14.46	2.43	30.52	27.87	2.66	0.83	21.51	20.32*	1.18	0.05	148.02	115.89	32.13	6.86
	1991	230.43	209.63	20.80	6.33	40.07	36.01	4.07	1.41	28.37	26.38*	1.99	0.81	190.36	147.25	43.11	10.98
Sikkim	1961	0.85	0.77	0.08				0 00		0.00	1.50	−1.50		0.85	0.77	0.08	
	1971	1.13	0.97	0.15	0.07	0.00	0.00		0.01				1.50				0.06
	1981	1.72	1.44	0.28	0.13	0.05	0.04	0.01	0.00	0.00	0.00	0.00	0.03	1.08	0.93	0.15	0.48
	1991	2.16	1.90	0.26	-0.02	0.10	0.09	0.01	-0.00	0.38	0.35*	0.03	0.01	1.63	1.00	0.63	0.06
Tamil Nadu	1961	169.11	167.76	1.35		0.12	0.12	0.01		0.48	0.43*	0.04		2.04	1.35	0.69	
	1971	208.28	203.71	4.57	3.22	30.45	30.23	0.22	0.35	1.29	1.23*	0.06	0.02	138.66	136.31	2.35	3.16
	1981	244.88	239.20	5.67	1.10	36.86	36.29	0.57	0.32	1.60	1.52*	0.08	0.00	171.42	165.90	5.51	1.82
	1991	282.99	275.60	7.39	1.72	44.85	43.96	0.89	0.28	2.64	2.56*	0.08	0.03	200.02	192.69	7.34	1.69
Tripura	1961	5.91	5.51	0.40		54.15	52.98	1.17		2.93	2.81*	0.12		228.84	219.81	9.03	
	1971	8.01	7.55	0.46	0.05	0.63	0.58	0.05	0.01	1.84	1.76*	0.08	0.02	5.29	3.17	2.11	0.49
	1981	10.55	9.98	0.57	0.11	0.99	0.93	0.06	0.03	2.31	2.20*	0.11	0.01	7.02	4.42	2.60	0.74
	1991	14.18	13.39	0.79	0.22	1.60	1.51	0.09	0.03	2.98	2.86*	0.11	0.04	8.95	5.61	3.34	1.52
Uttar Pradesh	1961	386.34	351.12	35.22		2.32	2.20	0.12		4.34	4.19*	0.15		11.86	7.01	4.86	
	1971	470.16	413.25	56.92	21.70	79.35	74.65	4.70	5.49	0.00	0.00	0.00	0.13	306.99	276.47	30.52	17.14
	1981	588.19	520.43	67.77	10.85	97.84	87.65	10.19	3.22	1.06	0.93*	0.13	-0.02	372.32	324.67	47.66	7.81
	1991	740.37	650.75	89.62	21.85	123.97	110.56	13.41	5.81	1.22	1.11*	0.10	0.03	464.22	408.76	55.46	16.31
West Bengal	1961	185.99	163.27	22.72		155.99	136.77	19.22		1.50	1.37*	0.13		584.38	512.61	71.77	
	1971	234.36	208.76	25.60	2.88	35.97	32.94	3.03	0.32	10.43	10.11*	0.32	0.26	150.03	120.22	29.80	4.83
	1981	285.61	260.20	25.41	-0.19	45.75	42.41	3.35	1.28	12.95	12.38*	0.58	-0.10	188.61	153.98	34.63	1.27
	1991	355.11	325.67	29.43	4.02	62.32	57.69	4.63	1.10	15.59	15.11*	0.48	-3.58	223.29	187.39	35.90	6.50
						83.27	77.54	5.73		15.59	18.70*	−3.11	−	271.84	229.44	42.40	

Where M(i) and W(i) are men and women in ith category and P(i) is the proportion of male population.

It is easy to see that further disaggregation would render

$$F = \Sigma p(i)*f(i) = \Sigma_{i,j}[p(i)*\ p(i,\ j).f(i,\ j)] \quad ...3.5$$

and so on where f(i, j) is the fmr for the jth subgroup of ith category and p(i, j) the proportion of male population of the jth subgroup to that of the ith category.

If we use the above expression into the expression for missing females, i e, in 3.3 above the disaggregation would become messy indeed. A simple way out of this would be to take the desirable or 'base' fmr to be unity or 1000 females per thousand men. In that event, the number of missing females dW = M – W; i e, the difference between the male and the female population would give the number of missing females. This expression lends itself immediately to further disaggregation, for,

$$dW = \Sigma dW(i,j,k...) = \Sigma\ [M(i,j,k....) - W(i,j,k...)] \quad ...3.6$$

where i,j,k... represent the progressive disaggregation into different relevant subgroups. One could now really play around with disaggregation as the reference fmr has been 'normalised' to unity.

Table 3 gives the estimate of the missing females statewise and categorywise arrived at in the above manner. It also shows the incremental increase in the number of missing females in successive decades. Tables 4.1, 4.2, 4.3 and 4.4 estimate this number for the 1991 census data. It also indicates the percentage contribution made by a particular state to the number of missing females in a given category to that at all India level. This is further compared to the share of population of that state to the all India population in that category. This helps one in getting some idea whether the state contributes disproportionately or otherwise to the number of missing females in a given category. Andhra Pradesh, for example, has 7.93 per cent of the country's population but its contribution to the number of missing females is hardly 2.95 per cent. U.P. on the other hand has 16.59 per cent of the country's population but contributes 28.14 per cent of the number of missing females.

In addition to this we also have to look at whether the fmr is declining or increasing in a given category and in a given state. Some states may be doing badly on all the three scores, e g, larger contribution to the number of missing females on all India basis in a given category compared to its share of population, larger contribution to overall missing female population in the state compared to its share in population and declining fmr. Some others may be improving in all three respects. For scheduled castes, UP provides the example of the former while Kerala provides an example in latter category. West Bengal on the other hand gives a mixed picture of high contribution to the number of missing SC females but steadily improving fmr.

The number of missing females has gone up from 133.52 lakh in 1961 to 318.49 lakh in 1991. However, the tribals who contribute about 8 per cent to country's population contribute about 3 per cent to the missing female population. The non-SC/ST category contributes disproportionately to it – about 79.3 per cent while its share of population is 75.4 per cent. The scheduled castes contributed 17.69 per cent to the missing female population as against their share of 16.5 per cent of the overall population.

If we notice the trend across time, the incremental increase in the number of missing females has gone up sharply in 1991. Further, the percentage contribution of the SC population to the missing female population is increasing while that of the 'general' category coming down. In fact, the picture becomes sharper in focus if we look at the addition to the number of missing females across 1971-1991 period. The contribution of ST, SC and general streams to this addition (66 lakhs) in 1971 was 2.3 per cent, 19 per cent and 78.8 per cent which changed to 5.6 per cent, 21.2 per cent and 73.2 per cent, respectively.

If we disaggregate the data at the state level, few more useful insights can be obtained. Different states contribute differently to the national aggregate and one can identify the major contributors or 'culprits' in a given category. The trend in fmr pattern in such states is also worth noting.

The ST population: Three categories of states can be mainly discerned on the basis of the fmr – the tribal majority states, states with significant tribal population, i e, Orissa

TABLE 4.1: MISSING FEMALES-STATEWISE 1991
(Total Population)

State/UT	Male	Female	Missing Female	Percentage Contribution All India Total	Percentage Share of Population
	(in 000s)				
India	4352.16	4033.68	318.49	100.00	100.00
Andhra Pradesh	337.25	327.83	9.41	2.96	7.93
Arunachal Pradesh	4.65	4.00	0.65	0.21	0.10
Assam	116.58	107.56	9.02	2.83	2.67
Bihar	452.02	411.72	40.30	12.65	10.30
Goa	5.95	5.75	0.20	0.06	0.14
Gujarat	213.55	199.54	14.01	4.40	4.93
Haryana	88.27	76.36	11.91	3.74	1.96
Himachal Pradesh	26.17	25.53	0.64	0.20	0.62
Jammu and Kashmir	–	–	–	–	–
Karnataka	229.52	220.25	9.27	2.91	5.36
Kerala	142.89	148.10	–5.21	(1.63)	3.47
Madhya Pradesh	342.67	319.14	23.53	7.39	7.89
Maharashtra	408.26	381.12	27.14	8.52	9.41
Manipur	9.38	8.99	0.40	0.12	0.22
Meghalaya	9.08	8.67	0.41	0.13	0.21
Mizoram	3.59	3.31	0.28	0.09	0.08
Nagaland	6.41	5.69	0.72	0.23	0.14
Orissa	160.64	155.96	4.69	1.47	3.78
Punjab	107.78	95.04	12.74	4.00	2.42
Rajasthan	230.43	209.63	20.80	6.53	5.25
Sikkim	2.16	1.90	0.26	0.08	0.05
Tamil Nadu	282.99	275.60	7.39	2.32	6.66
Tripura	14.18	13.39	0.79	0.25	0.33
Uttar Pradesh	740.37	650.75	89.62	28.14	16.59
West Bengal	355.11	325.67	29.43	9.24	8.12
A and N Island	1.54	1.26	0.28	0.09	0.03
Chandigarh	3.59	2.83	0.75	0.24	0.08
Dadra and Nagar Haveli	0.71	0.68	0.03	0.01	0.02
Daman and Diu	0.52	0.50	0.02	0.01	0.01
Delhi	51.56	42.65	8.90	2.80	1.12
Lakshadweep	0.27	0.25	0.02	–	0.01
Pondicherry	4.08	4.00	0.08	0.03	0.10

and MP and the 'mainland' states of Rajasthan, Gujarat, Maharashtra. Bihar, Andhra Pradesh and West Bengal. The former two categories have high fmr values but these are coming down at a rate which should cause concern particularly in MP and Orissa. The 'mainland' states show a sharper decline still and contribute significantly to the number of missing females. Rajasthan deserves particular attention in this context. With an fmr decline of 15 women per thousand men between 1981 and 1991 its contribution to the number of missing ST females has gone up to 20.57 per cent while its share of the country's tribal population remains only 8 per cent. If we look at the incremental increase in the number of 'missing females' between 81 and 91, we find that the four states of Bihar, MP, Gujrat and Rajasthan contribute to about 60 per cent to this increase.

The decline in the ST fmr values across the 1981-1991 period has virtually occurred in all the states and is in a sharp contrast with the trends between 1961 to 1981. This is a matter of worry and warrants further scrutiny.

The scheduled caste population has witnessed a steady deterioration in the fmr values across all the regions. Notable exceptions are Kerala, Himachal Pradesh, Punjab, West Bengal, Sikkim and Manipur. In general wherever the SC fmrs have gone up during a given decade, the non-SC/ST fmr values have also gone up but not vice versa.

The decline of the fmr in Bihar from 966 in 1981 to 914 in 1991 shows that there is something seriously wrong. In fact, the trend across 1961 to 1991 shows similar decline: in 1961 Bihar had fmr of 1031 which declined to 981 in 1971 and further to 966 in 1981. This merits further attention as well as policy intervention.

As indicated earlier, the contribution of the SC population to the number of missing females is growing over the years. In absolute numbers it has moved from 14.25 lakh in 1961 to 56.35 lakh in 1991. In 1991 its percentage contribution to the total number of missing females was 17.7 while its contribution to the incremental increase was higher still, i e, 21.2 per cent. Of this incremental increase of 19.68 lakh, UP, Bihar and MP contribute about 58 per cent while their share of the country's scheduled caste population is 37 per cent .

If we look at the absolute figures for 1991, we find that UP alone contributes 34.11 per cent to the total number of missing females on all India basis. This is about 13 per cent in excess of its population share (21.2 per cent). Haryana, Punjab and Rajasthan contribute another 18.5 per cent while sharing only about12 per cent of the country's SC population. West Bengal and Madhya Pradesh contribute in large numbers but not disproportionately compared to their share of the population on all India basis. The southern states and Orissa contribute much less to the number of missing females compared to their share in the country's SC population. But as the fmr tables reveal, the fmr values for the SC population are going down in all these states except Kerala.

The 1991 Census data reveals a sharp increase in the number of missing females in this category. Their number has gone up from 184.6 lakh in 1981 to 252.5 lakh in 1991. The incremental increase which had come down in 1981 (15.5 lakh) has jumped nearly four-fold to 67.88 lakh. Bihar and UP which share about 28 per cent of the country's non-SC/ST population contribute about 41 per cent to the number of missing females in 1991. Their contribution to the incremental increase is higher still and is over 47 per cent. These two states are singled out not just for the magnitude of their contribution alone but also for the declining trends in fmr. The decline in Bihar by about 32 females per thousand men across 1981-1991 period is rather serious. Haryana, Punjab and Rajasthan again contribute disproportionately to the number of missing females compared to their share of population. The share of West Bengal is expected to steadily come down with improving fmrs and as indicated below, the figures would improve further if migration correction is made.

The Migration Effects

The above analysis of the sex ratios has to incorporate the effects of migration on sex ratios. FMR values will be higher if there is an outmigration of males or inmigration of females. Similarly, outmigration of females or inmigration of males will depress the FMR values. All the four types of migration occur in any region. As such one has to work out the net outmigration of both male and the female population for each state and add it to the enumerated population to arrive at the corrected FMRs. It is quite possible that different social groups exhibit different patterns of migration. This would necessitate a disaggregated analysis of the migration figures as well. Some

Table 4.2: Missing Females, 1991
(Non-SC/ST)

State/UT	Male	Female	Missing Female	Percentage Contribution		Percentage Share of Population
				State Total	All India Total	
	(in 000s)					
India	3289.24	3036.78	252.46	79.27	100.00	100.00
Andhra Pradesh	262.02	255.14	6.88	73.08	2.72	8.18
Arunachal Pradesh	1.87	1.23	0.64	97.90	0.25	0.05
Assam	93.32	85.49	7.83	86.86	3.10	2.83
Bihar	352.75	319.11	33.64	83.49	13.33	10.62
Goa	5.82	5.63	0.19	97.80	0.08	0.18
Gujarat	166.34	154.54	11.80	84.21	4.67	5.07
Haryana	70.80	61.33	9.47	79.46	3.75	2.09
Himachal Pradesh	18.41	18.01	0.40	62.62	0.16	0.58
Jammu and Kashmir	–	–	–	–	–	–
Karnataka	182.19	174.73	7.46	80.50	2.95	5.64
Kerala	127.06	131.85	–4.80	92.19	(1.90)	4.09
Madhya Pradesh	214.81	196.74	18.07	76.79	7.16	6.51
Maharashtra	326.02	302.59	23.44	86.36	9.28	9.94
Manipur	5.97	5.71	0.26	65.19	0.10	0.18
Meghalaya	1.42	1.05	0.37	91.55	0.15	0.04
Mizoram	0.29	0.07	0.22	76.68	0.09	0.01
Nagaland	0.96	0.54	0.43	59.05	0.17	0.02
Orissa	99.55	95.43	4.11	87.80	1.63	3.08
Punjab	77.12	68.27	8.85	69.48	3.51	2.30
Rajasthan	161.99	147.25	14.74	70.87	5.84	4.89
Sikkim	1.56	1.35	0.22	81.55	0.09	0.05
Tamil Nadu	225.91	219.81	6.10	82.58	2.42	7.05
Tripura	7.52	7.01	0.52	65.65	0.20	0.23
Uttar Pradesh	582.87	512.61	70.27	78.41	27.83	17.32
West Bengal	252.45	229.44	23.01	78.19	9.12	7.62
A and N Island	1.41	1.13	0.27	97.40	0.11	0.04
Chandigarh	3.00	2.36	0.64	85.20	0.25	0.08
Dadra and Nagar Haveli	0.15	0.11	0.04	–	0.02	–
Daman and Diu	0.44	0.42	0.01	81.61	0.01	0.01
Delhi	41.77	34.49	7.28	81.74	2.88	1.21
Lakshadweep	0.02	0.01	0.01	89.73	0.01	–
Pondicherry	3.42	3.35	0.07	86.82	0.03	0.11

useful observations could nevertheless be made.

The migration effects will be more pronounced as we go down from the national level to the regional, state, district and the village level. At the state level the effects are still insignificant as revealed by the 1971 census figures (Table 5.1). Inter-state migrations hardly involve 3 to 3.5 per cent of the total and 10 to 15 per cent of the migrant population. Major migration takes place within the states.

Among different states, Maharashtra and West Bengal have traditionally attracted migrants from other states for occupational reasons. In these two states the migrant population accounts for 6.41 and 4.72 per cent of the population of the State, respectively. Haryana (8.54 per cent) and Punjab (4.32 per cent) are the other two states with high migrant population. This is mainly on account of the agricultural prosperity following the green revolution. Madhya Pradesh is the only other non-border state where the migrant population accounts above 4 per cent of the population of the state.

A preliminary study of the effect of migration on FMR for different states was done for the total rural population (Table 5.2). The total population was taken for the analysis as the disaggregated data for migration in terms of the ST, the SC and the general categories is not readily available. The population of the state was corrected for by adding the figure for the net outmigration separately for the male and the female population and the corrected FMRs were worked out. The expression for the corrected population is thus:

$$CP = EP + Out - In$$

where CP is the corrected population, EP is the enumerated population, 'out' is the outmigrating population and 'in' the inmigrating population.

A comparison of the fmrs for different states with the corrected fmrs shows marginal changes in the fmr values. However, there is a significant improvement in the fmr for both Maharashtra (965 to 993) and West Bengal (942 to 978), respectively. For Madhya Pradesh the improvement is marginal (956 to 961). All the northern states of UP, Rajasthan, Punjab, Haryana and Himachal Pradesh show a decrease in the fmr. The decrease for Bihar (971 to 952) is quite significant and it would be interesting to study the categorywise breakup. There is a likelihood of significant outmigration of tribal males from Bihar which may account for the high fmr for the tribal population.

Kerala is the only southern state where the corrected fmr drops appreciably from 1020 to 1005. But this is consistent with the known and traditional male outmigration from Kerala. While a disaggregated analysis of the migration figures and necessary migration corrections are needed to be made one can expect that the picture would change only marginally in most cases. These changes would certainly not account for the trends in the fmr and the number of missing females observed above.

This analysis establish the usefulness of disaggregation while analysing the observed sex ratio imbalances in India. It also presents a simple and useful method of analysing the problem by unpacking the missing females issue through equation 3.6

The above disaggregation prioritises the areas needing remedial intervention and suggests that it has to be designed differently in different parts of the society. Tribal Orissa for example, would require different intervention compared to, say, the 'developed' Haryana. In areas where fmrs are already favourable, the intervention should aim at consolidating the position. On the other hand, where the fmrs are low and deteriorating, immediate corrective interventions, e g, improvement in girl child's access to nutrition and female literacy

TABLE 5.1 : PERCENTAGE OF TOTAL MIGRANTS TO TOTAL POPULATION IN EACH STATE ACCORDING TO PLACE OF BIRTH

State	Total Migrants	Within the States	Outside the State
Andhra Pradesh	31.57	29.86	1.63
Assam	33.21	23.03	3.58
Bihar	27.96	25.87	1.66
Gujarat	32.06	28.53	2.87
Haryana	32.61	18.6	8.54
Himachal Pradesh	33.17	27.96	3.85
Jammu and Kashmir	18.79	16.38	1.5
Kerala	21.83	20.56	1.17
Madhya Pradesh	34.16	29.1	4.27
Maharashtra	38.7	31.51	6.51
Manipur	18.73	15.23	2.34
Meghalaya	29.98	18.41	5.39
Mysore	31.26	27.21	3.95
Nagaland	17.91	8.32	7.27
Orissa	30.62	27.95	2.24
Punjab	36.34	24.04	4.32
Rajasthan	29.76	25.42	3.32
Tamil Nadu	28.56	26.21	1.94
Tripura	47.15	11.46	1.62
Uttar Pradesh	25.01	23.04	1.42
West Bengal	30.22	18.19	4.72
India	30.42	25.31	3.4

(Migrants from outside India 1.66)

Source: Census of India 1971, Paper No 2 of 1979
S C Shrivastava: *Migration in India*.

TABLE 4.3: MISSING FEMALES 1991
(Scheduled Caste)

State/UT	Male	Female	Missing Female	Percentage Contribution: State Total	Percentage Contribution: All India Total	Percentage Share of Population
	(in 000s)					
India	719.29	662.94	56.35	17.69	100.00	100.00
Andhra Pradesh	53.80	52.12	1.67	17.77	2.97	7.66
Arunachal Pradesh	0.02	0.02	0.01	1.42	0.02	–
Assam	8.65	7.95	0.70	7.74	1.24	1.20
Bihar	65.69	60.02	5.67	14.07	10.06	9.10
Goa	0.12	0.12	–	2.09	0.01	0.02
Gujarat	15.90	14.71	1.19	8.50	2.11	2.21
Haryana	17.48	15.03	2.45	20.54	4.34	2.35
Himachal Pradesh	6.66	6.44	0.22	34.05	0.39	0.95
Jammu and Kashmir	–	–	–	–	–	–
Karnataka	37.56	36.13	1.43	15.42	2.54	5.33
Kerala	14.23	14.64	-0.41	7.93	(0.73)	2.09
Madhya Pradesh	50.28	45.99	4.29	18.23	7.61	6.96
Maharashtra	45.05	42.52	2.53	9.32	4.49	6.34
Manipur	0.19	0.18	0.01	1.28	0.01	0.03
Meghalaya	0.05	0.04	0.01	2.19	0.02	0.01
Mizoram	0.01	0.00	0.01	1.78	0.01	–
Nagaland	–	–	–	–	–	–
Orissa	25.96	25.33	0.64	13.58	1.13	3.71
Punjab	30.66	26.77	3.89	30.52	6.90	4.15
Rajasthan	40.07	36.01	4.07	19.55	7.22	5.50
Sikkim	0.12	0.12	0.01	2.89	0.01	0.02
Tamil Nadu	54.15	52.98	1.17	15.82	2.08	7.75
Tripura	2.32	2.20	0.12	15.15	0.21	0.33
Uttar Pradesh	155.99	136.77	19.22	21.45	34.11	21.18
West Bengal	83.27	77.54	5.73	19.47	10.17	11.63
A and N Island	–	–	–	–	–	–
Chandigarh	0.59	0.47	0.11	14.80	0.20	0.08
Dadra and Nagar Haveli	0.01	0.01	–	3.09	–	–
Daman and Diu	0.02	0.02	–	(7.92)	–	–
Delhi	9.79	8.16	1.63	18.26	2.88	1.30
Lakshadweep	–	–	–	–	–	–
Pondicherry	0.66	0.65	0.01	13.18	0.02	0.09

TABLE 5.2: INTER-STATE MIGRATION CORRECTED FMRS

State/UT		Total(M)	Total(F)	FMR	Migration (Total PDP) OUT(M)	OUT(F)	IN(M)	(INF)	Correction (0.1) Corrected PDP NET(M)	NET (F)	POP+W(M)	POP+W(F)	Corrected FMR
India	T	284049	264116	930	(Correction in the total category not effected on account of the								
	R	225320	213716	949	'Unspecified' Category included in the Census Figures								
	U	58729	50390	858									
Andhra	T	22009	21494	977	–	–	–	–	–	–	–	–	–
	R	17698	17402	983	326.06	364.81	165.9	248.7	160.16	116.11	17858.16	17518.11	981
	U	4311	4092	949	175.3	182.22	144.7	149.3	30.6	32.92	4341.6	4124.92	950
Assam	T	7714	6911	896	–	–	–	–	–	–	–	–	–
	R	6975	6361	912	69.6	52.3	300.8	131.6	231.2	79.3	6743.8	6281.7	931
	U	739	550	744	33.6	29	46.6	31.3	0.13	2.3	726	547.7	754
Bihar	T	28847	27506	954	–	–	–	–	–	–	–	–	–
	R	25729	24990	971	1045.7	686.2	249.5	437	796.2	249.2	26525.2	25239.2	952
	U	3118	2516	807	184.06	119.14	115.2	127.3	68.86	8.16	3186.86	2507.84	787
Gujarat	T	13802	12895	934	–	–	–	–	–	–	–	–	–
	R	9842	7358	951	256.51	240.56	256.9	189.6	0.39	50.96	9841.61	9408.96	956
	U	3960	3537	893	182.26	171.92	159.6	149.2	22.66	22.72	3982.66	3559.72	894
Haryana	T	5377	4660	867	–	–	–	–	–	–	–	–	–
	R	4420	3844	870	225.8	374.8	225.5	405.5	0.3	30.7	4420.3	3813.3	863
	U	957	816	853	103	127.5	95.7	124.6	7.3	2.9	964.3	818.9	849
Himachal	T	1767	1693	958	–	–	–	–	–	–	–	–	–
	R	1629	1590	976	89.14	65.54	39.7	37.3	49.44	28.24	1678.44	1618.24	964
	U	138	103	746	37.7	28.6	27.4	28.5	10.3	0.1	148.3	103.1	695
J and K	T	2458	2158	878	–	–	–	–	–	–	–	–	–
	R	1997	1762	882	19.13	16.01	26.5	14.6	7.37	1.41	1989.63	1763.41	886
	U	461	396	859	22.88	20.91	14.3	13.4	8.58	7.51	469.58	403.51	859
Kerala	T	10588	10759	1016	–	–	–	–	–	–	–	–	–
	R	8852	9029	1020	317.9	184.3	83.2	76.9	234.7	107.4	9086.7	9136.4	1005
	U	1736	1730	997	254.6	164.5	44.1	41.4	210.5	123.1	1946.5	1853.1	952
M P	T	21455	20198	941	–	–	–	–	–	–	–	–	–
	R	17823	17046	956	215.9	448.3	540.9	675.4	325	227.1	17498	16818.9	961
	U	3632	3152	868	126.7	174.9	268	282.7	141.3	107.8	2490.7	2044.2	872
Maharashtra	T	26116	24296	930	–	–	–	–	–	–	–	–	–
	R	17842	17219	965	249.4	362.4	1172.8	779.5	923.4	417.1	16918.6	16801.9	993
	U	8274	7077	855	242.8	280.2	719.4	567	476.6	286.8	7797.4	6790.2	871
Manipur	T	542	531	980	–	–	–	–	–	–	–	–	–
	R	470	461	981	4.86	2.91	12.8	7	7.94	4.09	462.06	456.91	989
	U	72	70	972	2.11	1.14	2.9	1.22	0.79	0.08	71.21	69 92	982
Meghalaya	T	521	491	942	–	–	–	–	–	–	–	–	–
	R	444	423	953	8.34	7.48			8.34	7.48	452.34	430.48	954
	U	77	638	883	6.84	6.38	–	–	6.84	6.38	83.84	74.38	887
Karnataka	T	14972	14327	957	–	–	–	–	–	–	–	–	–
	R	11249	10928	971	268.5	366.1	311.4	371.2	-42.9	-5.1	11206.1	10922.9	975
	U	3723	3399	913	238	240.4	243.6	218.8	-5.4	21.6	3717.6	3420.6	920
Nagaland	T	276	240	870	–	–	–	–	–	–	–	–	–
	R	241	224	929	2.5	1.7			2.5	1.7	243.5	225.7	927
	U	35	16	457	1.31	1.15			1.31	1.15	36.13	17.15	472
Orissa	T	11041	10903	988	–	–	–	–	–	–	–	–	–
	R	10041	10056	1002	194.3	198.8	166	207.2	28.3	–8.4	10069.3	10049.6	998
	U	1000	845	845	44 4	34	62.2	54 8	-17.8	–20.8	982.2	824.2	839
Punjab	T	7267	6285	865	–	–	–	–	–	–	–	–	–
	R	5533	4801	868	386.6	338.8	163.7	202.1	222.7	136.7	5755.7	4937.7	858
	U	1734	1484	856	225.2	215.6	104.4	112.4	120.8	103.2	1854.8	1587.2	856
Rajasthan	T	13484	12281	911	–	–	–	–	–	–	–	–	–
	R	11061	10161	919	438 6	520.9	186	410	252.6	110.9	11313.6	10271.9	908
	U	2423	2120	875	189.5	184.1	109	146	80.5	38.1	2503.5	2158.1	862
Tamil Nadu	T	20828	20371	978	–	–	–	–	–	–	–	–	–
	R	14439	14296	990	288	269	178.7	183.4	109.3	85.6	145423	14381.6	989
	U	6389	6075	951	277.8	244.2	218	216.6	59.8	27.6	6448.8	6102.6	946
Tripura	T	80	755	943	–	–	–	–	–	–	–	–	–
	R	707	677	944	12.3	7.22	10.3	6.4	2	0.82	719	677.82	943
	U	84	78	929	4.1	3.1	4.29	3.6	–0.19	–0.5	83.81	77.5	925
UP	T	47016	41325	879	–	–	–	–	–	–	–	–	–
	R	40214	35739	889	1414.9	982	268.9	550.4	1146	431.6	41360	36170.6	875
	U	6802	5586	821	555.6	427.6	172.9	249.9	382.7	177.7	7184.7	5763.7	802
West Bengal	T	23435	20876	891	–	–	–	–	–	–	–	–	–
	R	17174	16171	942	164.6	262.4	1009.9	463	–845.5	–200.6	16328.5	15970.4	978
	U	6261	4705	751	168.3	177.4	224.9	123	–56.6	54.4	6204.4	4759.4	769
Arunachal Pradesh	T	251	216	861	–	–	–	–	–	–			
	R	231	211	883	–	–	–	–	–	–	239	211	883
	U	12	5	417	–	–	–	–	–	–	12	5	417
Goa, Daman Diu	T	431	427	991	–	–	–	–	–	–			
	R	311	320	1029	26.09	27.85	–	–	26.09	27.85	337.09	347.85	1032
	U	120	107	892	31.2	33.95	–	–	31.2	33.95	151.2	140.95	932

(– Indicates insignificant value)

campaign would be called for. Areas where the fmrs are low but improving the measures already taken should be accelerated.

While a detailed discussion of the interventions and their design would be outside the scope of this presentation; two observations can be made. The author has elsewhere analysed the 71 census data in more details and has examined the link between fmr and flp. The significant differences between the three sociocultural groups, i e, the ST the SC and the 'general' population are in conformity with above analysis. However, the flp emerges as a dominant variable in determining the fmr. The implications of these findings are that creation of opportunities for female labour participation in productive activities and ensuring the female's control over the income thus generated will be the immediate need in areas of low and deteriorating fmrs.

The second issue relates to further disaggregation of the missing female patterns. The analysis of 1971 census data referred to above indicates that agricultural labourers, cultivators and non-agricultural workers also exhibit important differences between themselves within each of the above categories. The magnitude of the problem of sex ratio imbalance among these subgroups will warrant further scrutiny.

Conclusion

It will be ambitious to draw detailed conclusions at this stage of the analysis. But it is clear that the problem of sex ratio imbalance in India needs a disaggregated analysis. It is also clear that the absence of such analysis masks the seriousness of the problem among certain groups and also in certain areas. This has perhaps been the reason why fmr deteriorations as sharp as 50 women per thousand men during different decades in some of the states, failed to attract policy or academic attention. The decline in fmrs revealed in 1991 necessitates that such attention is focused on the major problem areas. Such problem areas can be identified with the help of the data presented here and through further disaggregation among various subgroups. We already notice that the northwestern states of India exhibit an adverse trend towards female survival. It can further be seen that such a trend is making inroads in other parts of the country, as well. Certain regions also stand out for not succumbing to this trend. The strategy for improving the declining fmr trend will differ between these two regions. That would be the objective of the next stage of this analysis.

Table 4.4: Missing Females, 1991
(Scheduled Tribe)

State/UT	Male	Female	Missing Female	Percentage Contribution		Percentage Share of Population
		(in 000s)		State Total	All India Total	
India	343.63	333.95	9.68	3.04	100.00	100.00
Andhra Pradesh	21.43	20.57	0.86	9.15	8.90	6.20
Arunachal Pradesh	2.75	2.75	–	0.68	0.05	0.81
Assam	14.62	14.13	0.49	5.40	5.03	4.24
Bihar	33.58	32.59	0.98	2.44	10.14	9.77
Goa	0.00	0.00	–	0.11	0.00	–
Gujarat	31.32	30.30	1.02	7.29	10.55	9.09
Haryana	0.00	–	–	0.00	0.00	0.00
Himachal Pradesh	1.10	1.08	0.02	3.33	0.22	0.32
Jammu and Kashmir	–	–	–	–	0.00	0.00
Karnataka	9.77	9.39	0.38	4.08	3.90	2.83
Kerala	1.61	1.60	0.01	(0.13)	0.07	0.47
Madhya Pradesh	77.58	76.41	1.17	4.98	12.12	22.73
Maharashtra	37.18	36.00	1.17	4.32	12.11	10.80
Manipur	3.23	3.09	0.13	33.53	1.37	0.93
Meghalaya	7.60	7.58	0.03	6.26	0.26	2.24
Mizoram	3.30	3.24	0.06	21.54	0.63	0.96
Nagaland	5.45	5.16	0.29	40.95	3.05	1.57
Orissa	35.13	35.19	–0.06	(1.37)	(0.66)	10.38
Punjab	–	–	–	0.00	0.00	0.00
Rajasthan	28.37	26.38	1.99	9.58	20.57	8.08
Sikkim	0.48	0.43	0.04	15.56	0.42	0.13
Tamil Nadu	2.93	2.81	0.12	1.60	1.22	0.85
Tripura	4.34	4.19	0.15	19.20	1.56	1.26
Uttar Pradesh	1.50	1.37	0.13	0.14	1.34	0.42
West Bengal	19.39	18.70	0.69	2.35	7.15	5.62
A and N Island	0.14	0.13	0.01	2.60	0.08	0.04
Chandigarh	–	–	–	–	0.00	–
Dadra and Nagar Haveli	0.54	0.55	–0.01	(34.30)	(0.12)	0.16
Daman and Diu	0.06	0.06	–	26.31	0.04	0.02
Delhi	–	–	–	–	0.00	0.00
Lakshadweep	0.24	0.24	–	10.27	0.02	0.04
Pondicherry	–	–	–	–	–	0.00

Note

1 Miller opines, in her analysis of the social variations that "...Given the choice between using the modern (census) data for just three categories (i e ST, SC and General) or using somewhat old data (1931 census) on castes, I opted for the latter.

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Demographic Outcomes, Economic Development and Women's Agency

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This paper examines the determinants of fertility, child mortality and gender bias in child mortality in India using district-level data from the 1981 Census. The findings highlight the powerful effects of variables relating to women's agency (e g, female literacy and female labour force participation) on mortality and fertility. Further, higher levels of female literacy and female labour force participation are associated with significantly lower levels of female disadvantage in child survival. In contrast, variables relating to the general level of development and modernisation have relatively weak effects on demographic outcomes.

INDIA is a country of striking demographic diversity. Even broad comparisons between different states within the country bring out enormous variations in basic demographic indicators. At one end of the scale, Kerala has demographic features that are more typical of a middle-income country than of a poor developing economy, including a life expectancy at birth of 72 years, an infant mortality of only 17 per 1,000 live births, a total fertility rate below the replacement level (1.8 in 1991), and a female-male ratio well above unity (1.04 in 1991). At the other end, the large north Indian states find themselves in the same league as the least developed countries of the world in terms of the same indicators. In Uttar Pradesh, for instance, the infant mortality rate is six times as high as in Kerala, the total fertility rate is as high as 5.1, and the female-male ratio (879 in 1991) is lower than that of any country in the world.[1]

India is also a country of rapid demographic change. As in many other developing countries, mortality rates in India have significantly declined in recent decades, e g, the infant mortality rate has been reduced by about 50 per cent since 1961. The same period has seen a sustained decline in fertility, particularly in the south Indian states (in Tamil Nadu, for instance, the total fertility rate declined from 3.5 to 2.2 during the 1980s). There have also been significant changes in the relative survival chances of men and women.[2]

Apart from being of much interest in themselves, these inter-regional and inter-temporal variations provide useful opportunities to study the determinants of demographic outcomes in India. This paper is an attempt to examine some of the relevant relationships based on a cross-section analysis of district-level data for 1981. A more detailed presentation and discussion of this analysis can be found in Guio (1994) and Murthi, Guio and Dreze (1995).[3]

The reference year for this analysis is 1981. For that year, a fair amount of district-level information is available from the 1981 Census and related sources. Table 1a presents a list of the variables used along with their definitions. The relevant information is available for 296 districts, all located in 14 of India's 15 largest states (these 14 states had a total of 326 districts in 1981, and accounted for 94 per cent of the total population of India). The sample averages of the variables used in the analysis are presented in Table 1a, while the state averages are in Table 1b.

The regressions presented below may be interpreted as the 'reduced form' of a system of simultaneous equations which determines three endogenous variables: the total fertility rate (TFR), the level of child mortality for both sexes combined (Q5), and the extent of female disadvantage in child survival (FD), as measured by the proportionate difference between female and male child mortality (or, more precisely, by $FD = [Q5_f - Q5_m]/Q5_f$, where $Q5_f$ and $Q5_m$ are the levels of female and male child mortality, respectively). The other variables listed in Table 1a are the independent variables.[4]

The variable we have used to measure 'poverty' requires comment. Poverty indicators at the district level are not available in India. However, Jain et al (1988) have computed 1972-73 poverty measures for the National Sample Survey 'regions', which are intermediate units between the state and the district. The 296 districts included in our analysis belong to 51 different regions, and the poverty indicator used for each district is the 'Sen index' of poverty for the region in which the district in question is situated. This procedure involves the implicit assumption that intraregional variations in poverty are small. This is not implausible, since the NSS regions are meant to be relatively homogeneous in terms of agro-climatic and socio-economic features.[5]

Two further remarks are due concerning the poverty variable. First, the poverty estimates calculated by Jain et al (1988) relate to rural areas specifically. For want of information on the level of poverty in rural and urban areas combined, we have used these estimates, and also included a separate independent variable indicating the level of urbanisation (Table 1a). Second, the reference year for this variable is 1972-73 (rather than 1981, as with the other variables). This is the only year, prior to 1981, for which the relevant estimates are available. The use of 1972-73 as the reference year for the poverty variable seems legitimate, since the 1981 mortality estimates are based on birth and death information pertaining to the late 1970s, and since poverty levels in different regions during that period must have been quite close to those observed in 1972-73. As a matter of fact, the relative position of different regions in terms of poverty levels does seem to be reasonably stable in the short run. Replacing the Sen index for 1972-73 with the Sen index for 1987-88 (also available for NSS regions) has little effect on the results presented in this paper.[6]

The regression equations were initially estimated by ordinary least squares. However, statistical tests indicate that the error terms are spatially correlated, i e, the error terms of adjacent districts are correlated. We therefore present estimates based on a more general model in which the errors may be spatially correlated.[7] In this model, the error terms are assumed to have the following structure:

$$u = k.W.u + e$$

where u_i is the error term for the ith observation, k is a scalar measure of the intensity of spatial correlation, and W is a matrix of spatial weights with entry '1' in row i and column j if districts i and j are adjacent, and '0' otherwise. Estimation is based on the principle of maximum likelihood. Interestingly, the choice of model (with or without spatial correlation) does not affect the broad conclusions of the analysis.

We found no evidence of non-linearity in the relationships, except in the equation for female disadvantage. Visual examination and non-parametric methods suggested that the relationship between female disadvantage and the individual independent variables follows a logistic pattern. We therefore used a logistic transformation of female disadvantage (FD) as defined earlier as the dependent variable in that regression equation.

Basic Results: Child Mortality and Gender Bias

Table 2 presents the main regression results. Apart from indicating the signs of different coefficients, and whether they are statistically significant at the 5 per cent level, Table 2 makes it possible to assess the quantitative effects of different variables on child mortality and fertility (by combining the information given in Table 2 with the mean values presented in Table 1a). As far as child mortality is concerned, the following observations deserve explicit mention:

(1) *Female literacy*: Female literacy has a negative, large and statistically significant effect on child mortality. Female literacy also has a negative (and statistically significant) effect on FD, the extent of female disadvantage in child survival. The last result contrasts with the position, taken by several other researchers, according to which higher female literacy may be a tool of intensified discrimination against female children.[8]

It is worth noting that higher female literacy reduces child mortality, and anti-female bias in child survival, independently of male literacy. Male literacy also has a negative effect on child mortality (independently of female literacy), but the effect of male literacy is much smaller than that of female literacy, and is not statistically significant. Male literacy has a significant effect on the extent of gender bias in child survival, in the direction of enhancing female disadvantage.[9]

(2) *Female labour force participation*: Female labour force participation has no statistically significant effect on the absolute level of child mortality.[10] This is plausible, given the opposite effects of different links between female labour force participation and child mortality. For instance, greater involvement in remunerative employment gives women greater control over household resources, and this may be expected to have a positive influence on child health. On the other side, to the extent that female employment outside the home imposes a 'double burden' on women, and reduces the time available for child care, it may also have some negative effects on child survival.

Higher female labour force participation unambiguously reduces the extent of gender bias in child survival, and this effect is statistically significant. There are a number of possible reasons for this link, including that higher female labour force participation: (i) raises the status of women in society, and therefore the value attached to young girls; (ii) raises the returns to 'investment' in girls; (iii) lowers dowry levels, and therefore reduces the costs of bringing up daughters; (iv) makes women less dependent on adult sons for security in old age, and therefore reduces boy preference; (v) raises the bargaining power of adult women, and their ability to resist male pressure to discriminate in favour of boys.[11]

(3) *Urbanisation*: Urbanisation has a negative and statistically significant effect on child mortality. The effect on male mortality is larger than the effect on female mortality, so that urbanisation is also associated with higher levels of female disadvantage in child survival, but this effect is not statistically significant.

(4) *Medical facilities*: Medical facilities have essentially the same effects as urbanisation: they reduce child mortality, and amplify the female disadvantage in child survival, but the last effect is not statistically significant.

(5) *Poverty*: As expected, higher levels of poverty are associated with higher levels of child mortality. Less evidently, there is a negative and statistically significant association between poverty and FD, i e, higher levels of poverty go with lower levels of female disadvantage in child survival. This is consistent with the observation, made in a number of studies, that anti-female discrimination may be particularly strong among privileged classes.[12]

(6) *Scheduled tribes*: A higher proportion of 'scheduled tribes' in the population reduces the extent of anti-female bias in child survival, and this effect is statistically significant. It is interesting that this variable has a significant effect even after controlling for female labour force participation (which is generally higher among scheduled tribes than in the population as a whole). This suggests that tribal societies have other features that enhance the relative survival chances of female children. Examples of possibly relevant features are kinship systems and property rights.

It is also worth noting that the absolute level of child mortality seems to be relatively low in districts with a high proportion of scheduled tribes, even after controlling for poverty and literacy. This is consistent with the common notion that tribal lifestyles have some healthy aspects (e g, relatively low levels of crowding and pollution). But the precise basis of this statistical association requires further investigation.

(7) *Scheduled castes*: There is no significant association between the proportion of scheduled castes in the population and the extent of female disadvantage in child survival. This is in line with the fact that female-male ratios among scheduled castes, which used to be higher than average, are now very similar to those of the population as a whole.[13] In contrast with the corresponding finding for scheduled tribes, child mortality levels among scheduled castes appear to be comparatively high, even after controlling for poverty and literacy (but this association is not statistically significant).

(8) *Regional 'dummies'*:[14] Even after controlling for the other variables, the southern region has considerably lower levels of child mortality. This is particularly the case for girls, so much so that female children have a survival advantage over boys in that region (Table 1b). In both respects (child mortality and gender bias), the contrast between the southern region and the rest of the country is statistically significant.

The particular demographic features of south India, including the relatively favourable survival chances of female children, have been much discussed in the

Table 1a: Variable Definitions and Sample Summary Statistics

Variable	Definition	Mean	Standard Deviation
TFR	Total fertility rate, 1981	5.02	0.95
Q5	Under-five mortality rate, 1981: probability that a child will die before the fifth birthday (x 1,000)	156.91	42.84
FD	Female disadvantage in child survival, 1981, defined as $FD=(Q5_f - Q5_m)/Q5_f$ (per cent)	5.36	10.74
Female literacy	Crude female literacy rate, 1981 (per cent)	22.08	13.71
Male literacy	Crude male literacy rate, 1981 (per cent)	44.77	12.20
Female labour force participation	Proportion of "main workers" in the female population, 1981 (per cent)	14.54	10.49
Urbanisation	Proportion of the population living in urban areas, 1981 (per cent)	19.81	12.02
Poverty	Sen index of rural poverty, 1972-73, for the "region" in which the district is situated (x 100)	17.60	8.50
Medical facilities	Proportion of villages with some medical facilities (per cent)	21.36	20.50
Scheduled castes	Proportion of scheduled-caste persons in the population, 1981 (per cent)	16.01	6.95
Scheduled tribes	Proportion of scheduled-tribe persons in the population, 1981 (per cent)	8.04	13.51
South	Dummy variable, with value 1 for districts in Andhra Pradesh, Karnataka, Kerala and Tamil Nadu	0.23	0.42
East	Dummy variable, with value 1 for districts in Bihar, Orissa and West Bengal	0.16	0.37
West	Dummy variable, with value 1 for districts in Gujarat and Maharashtra	0.14	0.35

Sources: See Dreze and Murthi (forthcoming). Most of the information is derived from 1981 Census data. The Sen index of rural poverty is taken from Jain et al (1988).

literature. The findings presented in Table 2 suggest that the demographic contrast between south India and the rest of the country cannot be explained entirely in terms of female literacy, female labour force participation, and other variables included in the regression. This is consistent with the view that differences in kinship systems, property rights, and related features of the economy and society not captured in this analysis (for lack of adequate statistical information), play an important role in this north-south contrast.[15]

Table 2 includes further results relating to the determinants of the total fertility rate (TFR). Female literacy and female labour force participation have a negative and statistically significant effect on TFR. Fertility is also significantly lower in the southern region, and in districts with a high proportion of scheduled tribes. None of the other variables is statistically significant.

Discussion

The findings summarised in this note sharply bring out the role of women's agency and empowerment in reducing mortality, fertility and gender inequality.

Consider, for instance, the determinants of gender bias in child mortality rates. It is rather striking that, while the variables directly relating to women's agency (specifically, the female literacy rate and female labour force participation) have a strong and statistically significant negative impact on FD, those relating to the general level of economic development and modernisation in the society as a whole (e g, poverty, urbanisation, male literacy and medical facilities) do nothing to improve the relative survival chances of girls *vis-a-vis* boys. In fact, to the extent that these variables do have a statistically significant influence on female disadvantage, this influence turns out to go in the 'wrong' direction in each case, i e, higher levels of male literacy and lower levels of poverty are both associated with a larger female disadvantage. Insofar as a positive connection does exist in India between the level of development and reduced gender bias in survival, it seems to work through variables that are directly related to women's agency, such as female literacy and female labour force participation.[16]

Similarly, while indicators of development such as male literacy, reduced poverty, urbanisation and the spread of medical facilities do have positive effects on absolute levels of child survival, these effects are relatively small compared with the powerful effect of female literacy. This point is illustrated in Table 3, which indicates how the predicted values of Q5 and FD respond to changes in female literacy when the other variables are kept at their mean value (and similarly with male literacy and poverty). It can be seen that the influence of female literacy on child mortality is quite large, in comparison with that of male literacy or poverty.

The same point also emerges in connection with the determinants of fertility. In fact, in this case, none of the variables relating to the general level of development and modernisation is statistically significant. By contrast, female literacy and female labour force participation appear to be crucial determinants of the total fertility rate. As shown in Table 3, for instance, female literacy alone is a considerable force in reducing fertility. Here again, the message seems to be that some variables relating to women's agency (in this case, female literacy) often play a much more important role in demographic outcomes than variables relating to the general level of development.

Notes

[This paper is based on a more extensive analysis presented in Guio (1994) and Murthi, Guio and Dreze (1995). We are grateful to Satish Agnihotri, Sudhir Anand, Peter Boone, Jean-Marie Baland, Monica Das Gupta, Angus Deaton, Tim Dyson, Haris Gazdar, Stuti Khemani, Sunita Kishor, P N Mari Bhat, Jean-Philippe Platteau, Rohini Somanathan and P V Srinivasan for helpful discussions and comments. This collaborative work was completed under the Economic Security Programme of the Centre for Development Economics.]

1 The figures cited in this paragraph are taken from Dreze and Sen (1995), statistical appendix, and are based on census and sample registration system data. A few countries of west Asia (e g, Kuwait and the United Arab Emirates) actually have a lower female-male ratio than Uttar Pradesh, but this is due to exceptionally high levels of male in-migration.

2 On the latter, see e g, Dyson (1988).

3 For related analyses based on Indian district data, see Rosenzweig and Schultz (1982); Gulati (1992); Kishor (1993); Khemani (1994).

4 We have also examined the effects of other independent variables, e g, relating to the structure of economic activity. But the variables

Table 2: Maximum Likelihood Estimates

Independent Variable	Dependent Variable		
	FD	Q5	TFR
Constant	0.857	205.822	6.594
	(3.00)*	(14.37)*	(23.10)*
Female literacy	–0.036	–0.873	–0.031
	(–4.46)*	(–2.45)*	(–4.28)*
Male literacy	0.015	–0.489	–0.005
	(1.97)*	(–1.40)	(–0.70)
Female labour force participation	–0.020	0.440	–0.017
	(–3.85)*	(1.82)	(–3.57)*
Urbanisation	0.005	–0.310	–3.9E–04
	(1.73)	(–2.40)*	(–0.15)
Medical facilities	0.005	–0.246	–0.002
	(1.84)	(–2.23)*	(–1.04)
Poverty	–0.021	0.535	0.007
	(–3.13)*	(1.76)	(1.14)
Scheduled castes	–0.007	0.548	–0.007
	(–1.13)	(1.89)	(–1.23)
Scheduled tribes	–0.014	–0.598	–0.011
	(–3.96)*	(–3.57)*	(–3.40)*
South	–0.820	–41.504	–0.548
	(–4.91)*	(–3.85)*	(2.60)*
East	0.154	–38.080	–0.254
	(0.81)	(–2.91)*	(–0.99)
West	–0.148	–12.245	–0.379
	(–0.87)	(–1.32)	(–2.06)*
λ	0.610	0.836	0.821
	(11.00)*	(28.07)*	(25.95)*
Mean squared error	0.39	15.15	0.31
Adjusted R^2	0.81	0.87	0.89
Log likelihood	–190.80	–1310.26	–155.95
Sample size	296	296	296

Notes: Asymptotic t-ratios in brackets.
* Significant at 5 per cent level.

Table 1b: State-Level Averages of the Regression Variables

	TFR	Q5	FD	Female Literacy	Male Literacy	Female Labour Force Participation	Urbanisation	Medical Facilities	Poverty	Scheduled Caste	Scheduled Tribe
Andhra Pradesh	4.35	138.6	–6.2	19.4	38.4	27.5	22.8	25.9	15.8	15.0	6.4
Bihar	5.24	141.1	14.4	13.4	37.6	8.6	11.6	18.1	24.8	14.9	1.8
Gujarat	4.80	126.1	6.2	30.9	53.1	10.7	28.2	28.2	15.5	7.4	11.0
Haryana	5.40	139.0	17.5	21.5	48.0	4.5	21.4	58.2	3.7	18.9	0.0
Karnataka	4.68	142.3	–3.4	27.1	48.0	19.9	24.5	13.4	14.5	14.2	5.1
Kerala	3.40	81.2	–10.5	66.0	75.4	13.1	17.9	95.8	20.9	10.4	0.9
Madhya Pradesh	5.57	202.9	4.4	14.5	38.5	20.3	19.6	5.8	19.3	14.9	21.1
Maharashtra	4.34	155.7	–2.0	31.8	56.4	26.2	26.2	18.3	25.1	7.3	10.1
Orissa	4.81	175.7	–4.2	18.9	44.9	11.8	11.6	10.8	37.8	14.2	24.9
Punjab	3.26	110.6	10.6	33.4	47.4	2.4	26.7	26.8	3.8	26.7	0.0
Rajasthan	6.05	174.6	9.8	10.5	34.4	9.6	19.2	16.7	13.2	16.7	14.2
Tamil Nadu	3.92	126.8	–2.8	35.7	58.5	22.7	32.3	32.6	17.6	17.6	1.1
Uttar Pradesh	5.89	185.6	15.1	14.7	50.2	8.0	17.3	11.8	13.0	20.8	0.5
West Bengal	4.57	123.0	1.0	28.2	46.6	7.1	23.3	15.2	28.4	22.9	7.2

for which data were available, other than those included in Table 1a, were found to have no significant effect on mortality, fertility or gender bias; nor does their inclusion affect the basic results presented in this appendix.

5 An alternative approach is to carry out the entire analysis at the level of 'regions' rather than that of districts. This approach has the advantage that it involves an accurate poverty indicator for each observation, but reducing the number of observations from 296 to 51 also entails a major loss of information. As it turns out, the main results obtained under this alternative approach are similar to those obtained on the basis of district-level analysis. In this appendix, we present the district-level results; the region-level results can be found in Murthi, Guio and Dreze (1995).

6 To our knowledge, 1972-73 and 1987-88 are the only two years for which poverty indicators have been calculated for the NSS regions.

7 For further details of this approach, see Anselin (1988). The method of estimation is fully described in Murthi, Guio and Dreze (1995). For a similar application of this method see Kishor (1993).

8 See e g, Das Gupta (1987); Amin (1990); Basu (1992); Gupta et al (1993); for the opposite view, see Caldwell et al (1989) and Bourne and Walker (1991).

9 Interestingly, the last statement remains true even if female literacy is dropped from the regression.

10 In an earlier analysis of 1981 district data, Sunita Kishor (1993) found that female labour force participation has a positive and statistically significant effect on both female and male child mortality. The contrast between that result and our own may be due to the fact that, in the analysis presented here, the levels of poverty and female literacy are included as explanatory variables. Indeed, when examining the effects of female labour force participation on child mortality, it is important to control for the economic and social disadvantages that motivate many women to seek employment. For further discussion of these issues, see Guio (1994) and Murthi, Guio and Dreze (1995).

11 Some of these hypotheses have been discussed by Miller (1981); Rosenzweig and Schultz (1982); Dreze and Sen (1989); Kishor (1993), among many others. For reviews of these and other studies, see Guio (1994) and Kishor (1994).

12 For some relevant studies, see Miller (1981, 1993); Das Gupta (1987); Krishnaji (1987); Basu (1992); Dasgupta (1993).

13 See Agnihotri (1994) and Dreze and Sen (1995), chapter 7.

14 In the regressions presented in Table 2, the 'control' region is northern India, consisting of Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh.

15 On these different influences, see the studies cited in Guio (1994) and Dreze and Sen (1995); also Alaka Basu (1992); Sunita Kishor (1993); Satish Agnihotri (1994) and Bina Agarwal (1994) among other recent contributions. The persistence of regional influences on relative survival chances, even after controlling for a wide range of district characteristics on which quantitative data are available, has been noted earlier by Sunita Kishor (1993).

16 In the light of these findings, the decline of India's female-male ratio since 1901 (on which see Dreze and Sen 1995, and the literature cited there) may not be much of a mystery. There has been much progress, in the intervening years, in terms of general development, but comparatively little expansion of women's agency. There is little evidence, for instance, of a substantial increase in female labour force participation over time, and while female literacy has slowly increased, the crude female literacy rate remained as low as 22 per cent in 1981. The fact that, taken together, these different developments have gone hand in hand with a decline in the female-male ratio is quite consistent with the cross-section findings summarised in this paper.

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TABLE 3: EFFECTS OF SELECTED INDEPENDENT VARIABLES (FEMALE LITERACY, MALE LITERACY AND POVERTY) ON CHILD MORTALITY (Q5), FEMALE DISADVANTAGE (FD) AND FERTILITY (TFR)

Assumed Level of Independent Variable (Percentage)	Predicted Values of Q5, FD and TFR, when the Female Literacy Rate Takes the Value Indicated in the First Column			Predicted Values of Q5, FD and TFR, when the Male Literacy Rate Takes the Value Indicated in the First Column			Predicted Values of Q5, FD and TFR, when the Proportion of the Population Below the Poverty Line Takes the Value Indicated in the First Column@		
	Q5	FD	TFR	Q5	FD	TFR	Q5	FD	TFR
10	166.4	10.7	5.38	172.9	–2.0	5.18	151.5	9.8	4.79
20	157.7	5.9	5.07	168.0	–0.1	5.13	152.7	8.5	4.85
30	149.0	1.1	4.76	163.1	1.8	5.08	153.8	7.1	4.91
40	140.2	–3.34	4.45	158.2	3.9	5.03	154.9	5.8	4.97
50	131.5	–7.1	4.15	153.3	5.9	4.98	156.0	4.4	5.03
60	122.8	–10.3	3.84	148.4	8.0	4.93	157.2	3.1	5.09
70	114.0	–12.8	3.53	143.5	10.1	4.88	158.3	1.8	5.15
80	105.3	–14.8	3.22	138.7	12.2	4.83	159.5	0.5	5.21

Note: a For convenience of interpretation, the "Sen index" has been replaced, in this table, by the "head-count ratio" (i e, the proportion of the population below the poverty line). The figures presented in these columns are based on the same regressions as in Table 3, with the Sen index replaced by the head-count ratio.

Juvenile Sex Ratios in India

A Disaggregated Analysis

S Agnihotri

This paper studies the regional variations in sex ratio patterns in India in the juvenile age group (0-9 years). Such study offers two major advantages; (a) the juvenile sex ratios (JSRs) are not affected by migration and therefore, (b) their analysis provides useful insights into patterns of differential mortality among children by sex. A disaggregation of these sex ratios into the 0-4 and 5-9 age groups brings into sharper focus the pattern of excess female mortality beyond the age of one year. This is a socially driven phenomenon as against excess infant male mortality which is essentially a biological phenomenon. The female to male ratio (FMR) in the 5-9 age group emerges as an appropriate parameter for analysis of the sex ratio variations across the country. It reveals significant differences in the sex ratio patterns among three major social groups, viz, the tribal, the scheduled castes and the rest of the population. It displays a remarkable spatial contiguity across different geophysical regions of the country. These regions turn out to be a more suitable unit for analysis of spatial variations in the sex ratios than the administrative units of different Indian states. Certain regions, cutting across the state boundaries, stand out for their alarmingly low FMRs. The observed patterns raise important questions about design of women and child welfare programmes and indicates the need for plurality in their design and for area and group specific interventions.

I

SEX ratios in India are highly masculine compared to most other regions in the world. The proportion of females in its population continues to decline and stands at 927 females per thousand men in the 1991 population Census. The female male ratios (FMRs),[1] however, are neither uniformly low nor uniformly declining across different regions in the country and show a considerable variation across these regions. These variations have attracted considerable attention in literature, dominated by one major feature; the 'north south' divide.[2] This refers to the highly masculine sex ratios in the north-western states and more favourable FMRs in the south-eastern states of India. Concern has also been expressed at the growing masculinisation of the sex ratios in the south-eastern states over the years [Miller 1989; Heyer 1992].

Apart from recognition of this 'divide', different correlates of these sex ratios have also been analysed; economic as well as socio-cultural. The economic factors have mainly been analysed in terms of female labour participation as a determinant of female 'worth' [Bardhan 1974; Miller 1981; Rosenzweig and Schultz 1982 and Meis 1988]. Recently, the role of capital in terms of dowry has also been examined in greater detail [Heyer 1992; Rao 1993; Wadley 1993; Kapadia 1994].

Studies of the role of socio-cultural factors has mainly focused upon the status of women shaped by culture [Dyson and Moore 1983; Dasgupta 1987; Berreman 1993; Madan 1993]. Different kinship systems in the north and the south and the process of assimilation of a woman into the family of her marriage have informed the bulk of this analysis which has by and large been qualitative. In the absence of suitable quantitative data and analysis, the debate on the cultural aspects has not moved much beyond highlighting the north-south divide. Given India's cultural diversity, this is not adequate.[3]

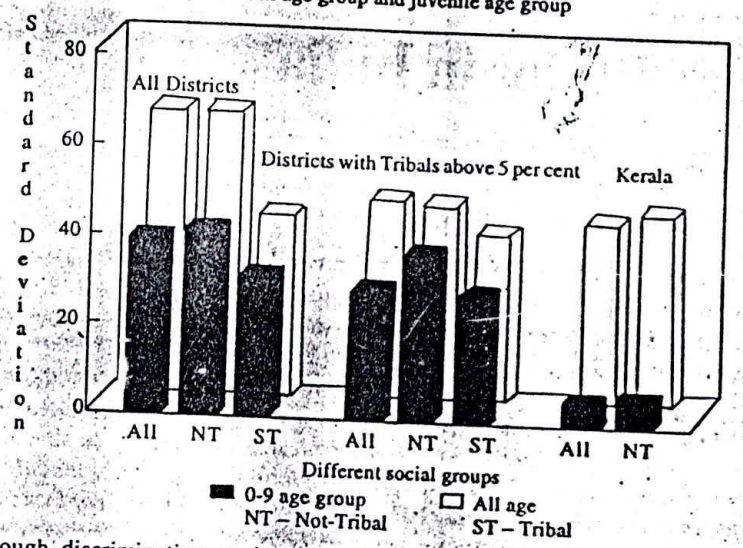
This paper elaborates upon this regional diversity. It departs from the conventional analyses on four counts. It uses district level data. Further, it uses juvenile sex ratios (JSRs) instead of overall population sex ratios to cut down the migration 'noise'. It then disaggregates these among three major social groups – the tribal, the scheduled castes and the rest of the population. The sex ratio patterns among these three groups differ significantly – a point which has been consistently overlooked in the literature.[4] Finally, the juvenile FMRs are broken down into 0-4 age group and 5-9 age group FMRs to capture the differences in the mortality patterns in the juvenile age group. The effect of excess male mortality during infancy gets reflected in the 0-4 age group FMRs while the 5-9 age group FMRs capture the excess girl child mortality in later years of the childhood.

The received literature uses state-level sex ratio data for much of its analysis.[5] It also uses the all age group sex ratios, not corrected for migration. Differences in sex ratio patterns among the tribal, the scheduled castes and the rest of the population have also not been systematically analysed. Separate analysis of the 0-4 and 5-9 age group FMRs has also not been done earlier.

We use the 1981 Census data, which has for the first time provided the five year age group break up for the scheduled tribe and the scheduled caste population. We use the data in respect of 355 districts based on the Indian District Development Database[6] and the special tables for scheduled castes and scheduled tribes from the 1981 Census reports. As random fluctuations in sex ratios are large for small population sizes,[7] we have not considered districts with very low population of tribal or scheduled castes in the analysis of the SC or ST FMRs. Districts in the north-eastern region have also been excluded from the analysis.[8] Data from the 1991 Census for the five year age groups is yet to become available.

Using these data, we (i) show that the JFMRs are free from 'migration noise' which affects the all age group FMRs, (ii) bring out significant differences in the FMR patterns among the ST, SC and the rest of the population and (iii) show that the 0-4 and 5-9 age group FMRs differ significantly from each other. The 0-4 age group FMRs capture the excess male infant mortality, essentially a biological phenomenon, while the 5-9 age group FMRs capture the patterns of excess female mortality that set in during later years of childhood. These reflect the different extents to which the biological advantage of the female infant is 'reversed' beyond the age of one year in different regions mainly

FIGURE 1: COMPARING FMR VARIANCES
All age group and juvenile age group



through discrimination against the girl children which is a socio-cultural process.

The FMRs in the 5-9 age group show a remarkable homogeneity within different ecological or geophysical regions. These regions sometimes cut across the boundaries of different states and a state often contains more than one such region. It turns out that these regions provide a much more satisfactory basis of spatial analysis than the states. One immediate outcome of focus on these regions is the identification of a 'Bermuda Triangle' for the female child;[9] a region cutting across districts of Haryana, western UP, three districts of Rajasthan and the ravines of MP with alarmingly low FMRs. This has important implications for the woman and child welfare policies and the design of interventions.

The paper is organised in five sections. Section II examines the suitability of the JFMRs over the all age FMRs in the context of migration. Section III elaborates upon the need to disaggregate the 0-9 age group FMRs into 0-4 and 5-9 age group FMRs and examines their broad spatial variation across different regions. Differences in the FMR patterns among the tribal, the scheduled caste and the rest of the population are highlighted. The regionalisation of sex ratios is examined in further detail in the next section, primarily in respect of the 5-9 age group FMR. Usefulness of grouping by geophysical regions over the states as units of spatial analysis is established. Final section summarises the implications and the scope for further research.

II

The Migration Factor

Analysis of regional variations in sex ratio patterns in India has often relied upon data not corrected for migration and continues to do so. While female migration in India mostly arises on account of marriage, most of the long distance migration is heavily male dominated and arises out of economic reasons.[10] High net male inmigration in metropolitan areas, net male outmigration from Kerala or the male dominated inmigration among the non-tribal population of some of the north-eastern states bear this out. This results in considerable variation in the FMRs at the district level, e g, 772 for Bombay, 1032 for Kerala and, 558 for non-tribal Nagaland.

Juvenile FMRs do not suffer from such fluctuation as there is hardly any sex selective migration in that age group [see Miller 1981]. This can be seen by comparing the JFMR for Bombay; 934, compared to the all age FMR of 772 or the JFMR figures for the districts of Kerala (Table 1) with the all age FMRs not corrected for migration. Both Sopher (1980) and Miller (1981) have used the JSRs in their analyses of the regional variation of the sex ratios at the district level. Use of JSRs has nevertheless not gained currency in subsequent analyses and some of the debate about sex ratio variations still continues around the role played by migration.[11]

Table 2 establishes this feature of the JFMR through comparison of variance for the all age group FMRs and juvenile FMRs at all India level. Variance of the JFMRs is considerably less compared to that in the all age group FMRs for the total population as well as its tribal and non-tribal segments. Districts with significant tribal population, i e, above 5 per cent of the overall population yield similar result. The reduction is much sharper for the state of Kerala known for its pattern of net male outmigration (Figure 1).

The difference between the all age FMRs (mean 936.1) and juvenile FMRs (mean 957.8) is highly significant at 1 per cent level and below (t-value of 7.93) as revealed by t-test for paired samples. That JFMRs are free from migration 'noise' can also be inferred by analysing the urban and the rural FMRs. The low mean for the urban FMRs; 895 females per thousand males compared to a mean of 946 females in rural areas is consistent with net excess male inmigration in urban areas. The difference between these sex ratios; urban and rural, is highly significant at 1 per cent level and below (t-value of 16.3).

If sex selective migration between urban and rural areas is insignificant in the 0-9 age group, the rural and urban JFMRS should not differ significantly. This is indeed the case. The mean for the JFMR for the overall population in rural area 955 and that in the urban areas, 958, are close to each other and the difference between them is not significant at 5 per cent level (t-value of -1.76).

Migration data from the Indian census do not provide the composition of the migrant population in terms of social groups. A comparison of all age FMRs and the JFMRs among these groups, e g, tribal or the scheduled castes can throw interesting light on the nature of migration among these communities. But this point is not pursued here further.

III

Once migration effects are eliminated, sex ratios are primarily determined by the male female mortality differentials. As such, the JFMRs will be determined mainly by the pattern of deaths among the children within the 0-9 age group.[12]

In India, a substantial portion; nearly 60 per cent, of the deaths in the 0-9 age group occur during infancy, i e, in the 0-1 age group. Deaths in the 1-4 age group account for little above 30 per cent whereas deaths in the 5-9 age group account for the remaining 10 per cent.[13]

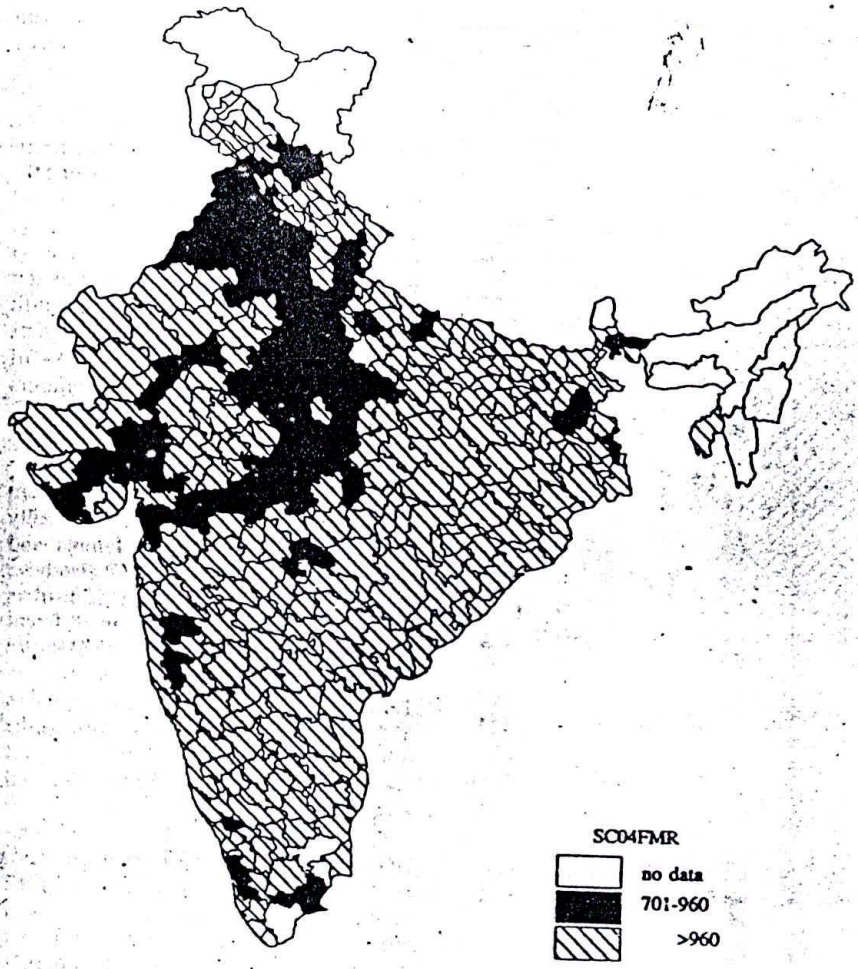
Different Mortality Patterns

There is however, an important difference in the pattern of these deaths. During infancy, there is always an excess of infant male

TABLE 1: COMPARISON OF ALL AGE AND 0-9 AGE GROUP FMRS IN KERALA

District	All Age FMR	0-9 Age FMR
Cannanore	1034	974
Wayanad	949	979
Kozhikode	1020	976
Malappuram	1052	964
Palghat	1056	986
Trichur	1100	971
Ernakulam	998	967
Idukki	963	991
Kottayam	1001	969
Alleppey	1050	977
Quilon	1026	971
Trivandrum	1030	977

FIGURE 2a: 0-4 FMRs FOR SC POPULATION



mortality. This is due to inherent vulnerability of the male infant compared to the female infant in a health neutral environment [see among others Miller 1989; Caldwells 1990; Mukherjee 1986; Government of India 1988b]. This physiological advantage of the female child gets reversed from the age of one onwards and by the age of 5 excess female mortality becomes the norm. It is marginal in some areas, significant in some others and substantial in yet others. District level estimates of the probability of death based on the 1981 Census data [Government of India 1988b] bear this out. The q1 and q2 tables, which indicate the probability of a child dying by the first and the second year respectively, indicate excess male mortality. At q3, i e, by the age of three years, the survival chances for both the sexes are nearly balanced while at q5 level the girl children show a higher mortality.

The strong reversal of the mortality pattern after infancy in south Asia is well recognised and attributed to the differential care of the girl child or to put it more plainly to her access inequality to food, nutrition and care including health care compared to the male child.[14] This is essentially a socio-cultural process linked with the perceptions about the role of the sons and the daughters, and reflects the 'son preference',[15] its extent and its operational consequences. As a matter of fact excess male mortality is never ascribed to any discrimination against the male members of the household whereas excess female mortality is more often than not attributed to such a discrimination. To that extent one can term the excess male child mortality as natural and the excess female child mortality as socio-cultural. The former is driven by exposure to health risks and possibly the absence of effective health care, while the latter is driven by access inequalities described above.

Juvenile sex ratio aggregates both these mortality patterns It is a combined ratio of 10 single year age cohorts. The first two cohorts among these will reflect the pattern of excess male mortality during infancy while the subsequent eight cohorts will reflect the reversal of this pattern to various degrees. If we were able to disaggregate the JFMRs into two age groups; the 0-2 age group and the 3-9 year age group, some significant differences could be anticipated between the two.

The FMR in the 0-2 age group (0-2FMR henceforth), would show preponderance of female children compared to those in the 3-9 age group (3-9FMRs). Further, as the excess male mortality during infancy is a biological phenomenon, it will be distributed randomly across different regions and there should not be any significant spatial variation.[16]

The 3-9FMRs on the other hand will reflect the effects of discrimination against the girl children driven by the socio-cultural practices. These practices vary from region to region in their extent and nature. As such the 3-9FMRs can be expected to display a less random regional distribution. We can in fact expect these FMRs to be significantly contiguous within different socio-cultural regions and significantly different across these regions.

Such differences will also be observed across different social groups, e g, the tribals, the scheduled castes and the rest of the population which differ in terms of the position of women in their society. It will

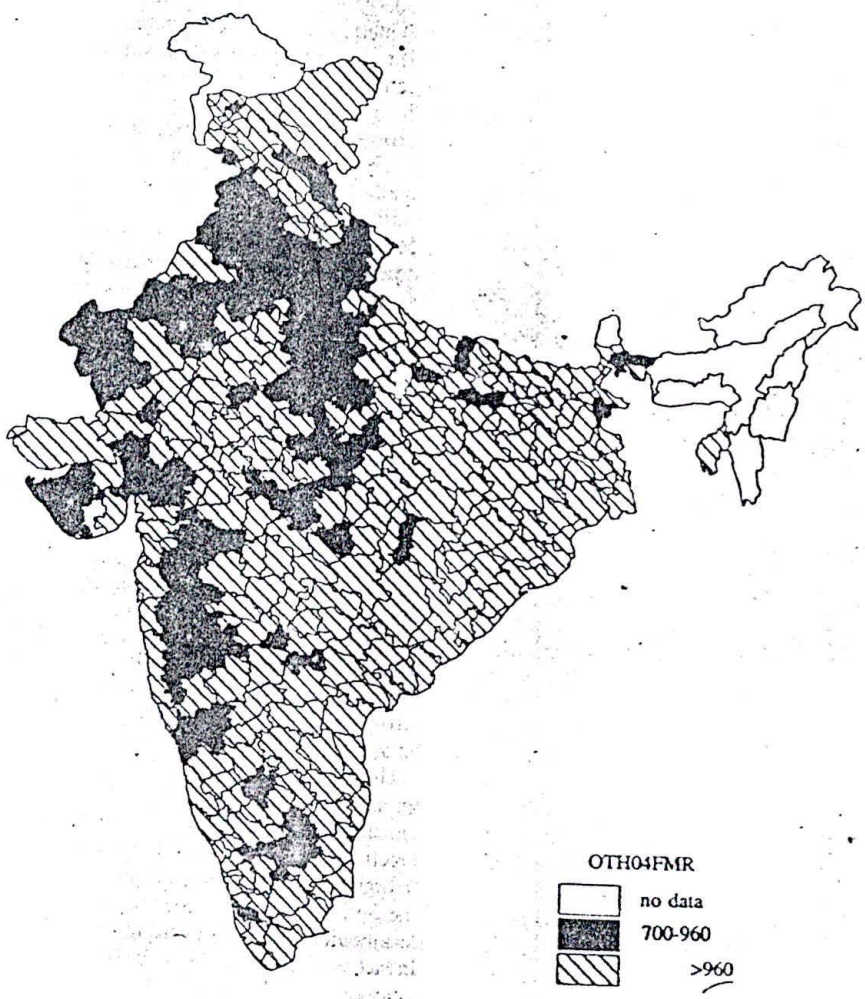
TABLE 2: ANALYSIS OF VARIANCE OF MFRs, 1981

(Female per 1,000 male)

Variable	All Age Group FMRs			Juvenile Age Group FMRs		
	Mean Value	Variable	Std Dev	Mean Value	Variance	Std Dev
						355 districts
All FMR	936	4095	64	958	1678	41
NT FMR	934	4034	64	957	1835	43
Districts with tribal population above 1 per cent of the total population						189 districts
ST FMR	963	1751	42	988	1068	33
Districts with tribal population above 5 per cent of the total population						125 districts
All FMR	949	2140	46	981	976	31
NT FMR	942	2024	45	979	1534	39
ST FMR	974	1548	39	993	903	30
Kerala						12 districts
All FMR	1023	1730	42	975	59	8
NT FMR	1022	1920	44	975	62	8

Note: Variable description: All FMR - FMR for total population; NTFMR - FMR for non-tribal population; and STFMR - FMR for all age group and tribal population.

FIGURE 2b: 04FMRs FOR NON-ST/SC POPULATION



be worthwhile to explore therefore, the differences in the FMR patterns between these two age groups; 0-2 and 3-9 years, across different regions and social groups.

Unfortunately, the suitable census data available for this purpose is the 5-year age group data at the district level. Even this break-up has become available separately for the first time for the tribals and the scheduled castes in the 1981 Census. As a result one can only use the 0-4 and 5-9 year age group data for working out the FMRs among these age groups.

We could nonetheless examine the sex ratio patterns among the 0-4 age group and the 5-9 age group. The differences in the 04FMRs and the 59FMRs may not be as sharp as those between the 02FMRs and the 39FMRs. Yet, valuable insights may be obtained through such an exploration. The 04FMRs would contain two additional single age group cohorts in addition to the three in the 02FMR. Both these will carry the effects of excess female mortality that sets in by the age of three years. As such the 04FMR values will be lower than those for the 0-2 age group and the randomness in the spatial variation may also be less.[17] But this 'blurring' may get compensated in the patterns that 59FMRs reveal. The five single year age group cohorts that contribute to the 59FMR will reflect the mortality pattern from the age of 5 and above; a stage where the pattern of excess female mortality has already 'stabilised'. As a result we may expect the 59FMRs to be significantly lower than the 04FMRs and to reflect the regional differences more sharply. We will see if this really happens.

Before analysing these differences in detail, we examine the district level maps of these FMRs for different social groups. These maps give a clear idea of the variations in the sex ratio patterns across different regions for the two age groups and the three social groups. Figures 2a and 2b show the 04FMRs for the SC and the non-ST/SC or the general population separately (in this paper the terms non-ST/SC, general and others will be used interchangeably). Figures 3a, 3b, 3c display the 59FMRs for the SC, general and the tribal population.

Setting aside the niceties of sequencing, we first examine the 59FMR map (3b) for non-SC/ST population. Four broad FMR ranges which are more or less spatially contiguous can be noted. The region with lowest FMR range; below 900, spreads across the plains north of Narmada. It contains a 'hard' core area of alarmingly low FMRs; below 850; spanning 21 districts in Haryana, western UP, north eastern Rajasthan and the ravines of MP. The next range of FMRs between 900 and 950 covers most of the remaining districts in the plains in the north, districts of West Bengal, districts in the central regions and descends across Narmada into south through Jalgaon, Dhule and Nasik districts of Maharashtra. The gradual 'recovery' of the FMRs and the contiguous contours make the description of 'pit with sloping sides' very apt for the region with very low FMRs [Oldenberg 1992].

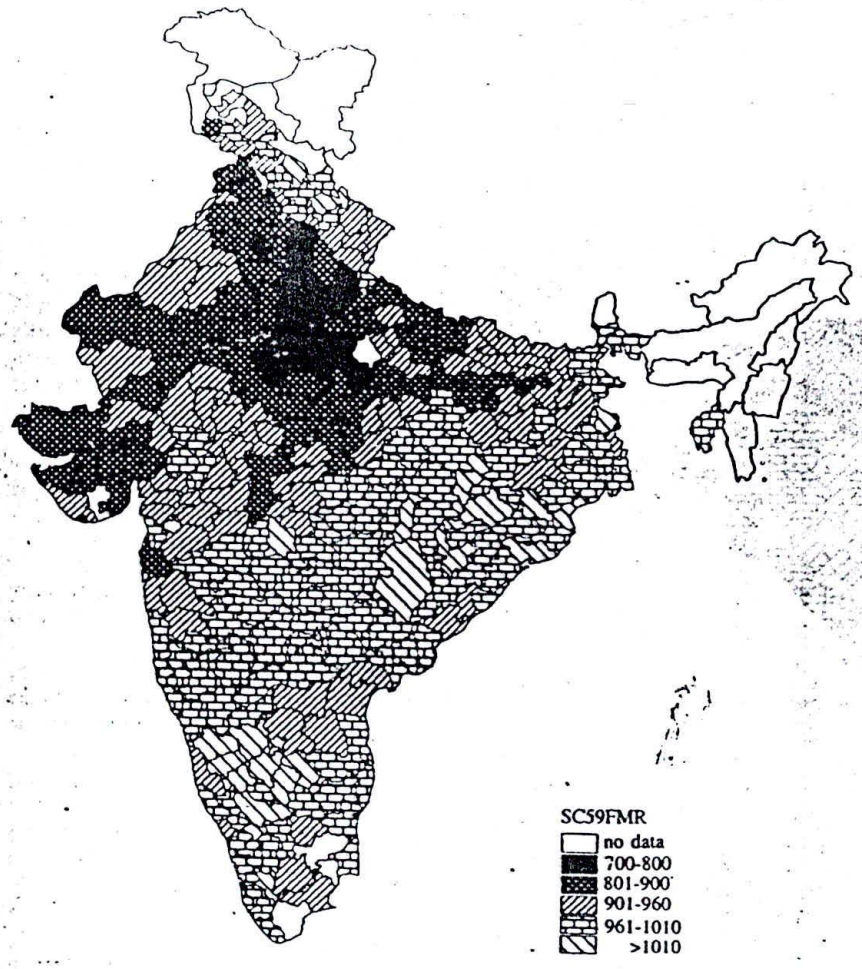
The remaining regions in the south-eastern states have 59FMRs above 950. The hilly state of Himachal Pradesh, Jammu and Kashmir and hill districts of UP also have FMRs above 950. There are some 52 districts in the south eastern region, in different contiguous patches where the 59FMRs are above 1000. One significant block covers Telangana region of Andhra, Chandrapur in Maharashtra, Chhattisgadh in MP and the tribal tract of Orissa. Most of these districts are known to be economically poor and backward.

The 59FMRs for scheduled caste population follow a similar pattern (Figure 3a), but the FMRs are disturbingly low in the northern region. There are 24 districts with 59FMRs below 800. This situation, to put it mildly, is scandalous. Oldenberg's (1992:2658) use of the term 'Bermuda triangle for the girl children' will be applicable for this region.

The range of 59FMRs below 900 for the SC population spreads over a larger area covering 107 districts, all confined to regions north of Narmada. The next FMR range of 900 to 950; in 79 districts, does make inroads in the Rayalseema region of Andhra and in Salem region of Tamil Nadu. Rest of the districts, 110 in number, mostly in south-east have FMR range between 950 and 1000. The contiguous patches of FMR above 1000 in 43 districts in the south eastern region more or less coincide with the districts where 59FMR for the general population are also high.

For tribal population the 59FMR rarely goes below 900 (Figure 3c) except in 11 districts of Rajasthan.[18] The next set of about 45 districts in the FMR range of 900 to 950, lie mainly in the plain regions of Rajasthan and northern MP. Another contiguous cluster covers the Rayalseema region of Andhra and its adjoining regions in Tamil Nadu. Most other districts; 133 in numbers, have FMRs above 950 with a sizeable number; 45 among

FIGURE 3a: 59FMRs (SC)



them, having FMRs above 1000. Most of the districts of north-eastern states have FMRs in range of 950 to 1000. We have, however, not included these in our analysis as indicated earlier.

The 04FMRs for the scheduled caste population (Figure 2a) reveal a contiguous patch of about 80 districts with 04FMR values below 950. There are only 12 districts where the 04FMRs go below 900. In rest of the districts the 04FMRs are above 950; in 96 of them 04FMRs exceed 1000. The contiguous patch of low FMRs is confined to the north-western belt. It starts from the plains of Punjab and Haryana, and through plains of western UP and ravines of Madhya Pradesh descends down to East Nimar and West Nimar districts of Madhya Pradesh. Another patch starts with Ajmer in Rajasthan and descends down the Pali, Sirohi route to the plains of Gujarat down to Vadodara. But for Nagaur and Sikar districts it could have joined the Haryana region in a contiguous chain.

The pattern of 04FMRs for the non-ST/SC population (Figure 2b) is similar but more intriguing. The number of districts with FMR below 900 is only 8, and those with 59FMRs below 950 is 85. These form a contiguous tract which again descends down the plains of Punjab, Haryana and western UP, to Hoshangabad and Betul districts of MP. But it makes further ingress into the south across Khandesh region of Maharashtra, into its western ghat region and goes as far as inland Karnataka. (Permitting a minor liberty taken with FMR in East Nimar (969) and Bijapur (965) districts.) The belt joins up with the Sirohi, Vadodara belt through Khandesh region of Maharashtra and, except a break in Ajmer district, joins the Haryana plains through the Pali, Nagaur and Sikar.

There are other stray cases of districts with low 04FMR. Two of these deserve attention; Lahaul and Spiti and Kinnaur in Himachal Pradesh and Salem in Tamil Nadu. Lahaul and Spiti and Kinnaur districts stand out for their low FMR values for both the 0-4 and 5-9 age groups. Being situated in a zone with otherwise favourable sex ratios these present an anomaly that needs to be investigated.

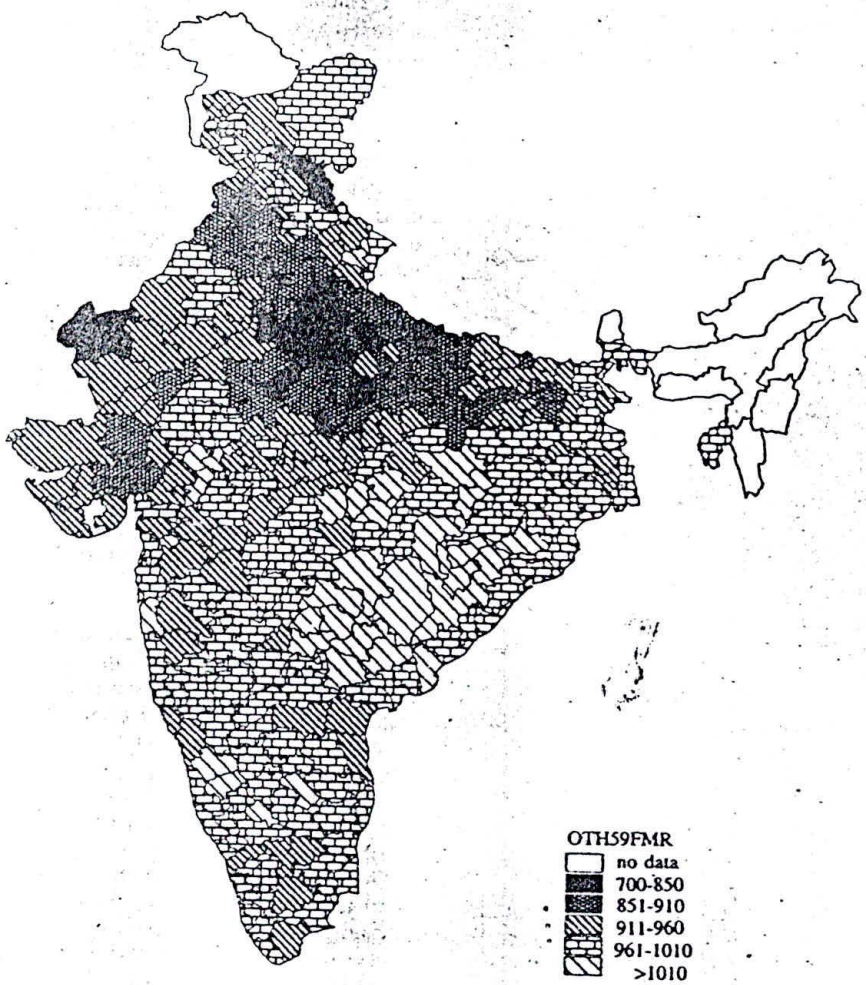
Salem district has already been in focus for the practice of sex selective infanticide [George et al 1992:1153-57]. Such practice in large numbers will automatically show up in low 04FMRs and this is precisely the case with Salem. It is the only district in south where 04FMR value goes below 900 (876 for the non-ST/SC). It is pertinent to suggest that a focused search for extremely low values of 04FMRs among different regions and groups at block levels (for which 1991 Census data is available), may be a very useful method of detecting areas where sex selective infanticide or foeticide may have assumed serious proportions.

Low 04FMRs are in any case indicative of the regions where the excess female child mortality has made ingress into early years of childhood. As such these indicate intensification of anti-female bias. In view of the concerns expressed by Miller (1989) and others about the ingress of northern sex ratio patterns into the south, the route of low 04FMRs described above assumes significance. If such ingress is taking place it is most likely to take place along the route of cultural circulation between the north and south. The low 04FMR route appears to coincide more or less with this route of cultural circulation.[19] This aspect needs attention from a combined perspective of cultural geography, gender and demography. This issue is intended to be pursued in further details once the five year age group break-up for different social groups in the 1991 Census becomes available.

Among the tribals, 04FMRs rarely go below 950 (8 districts) and are above 1000 in majority of districts (about 116). In 16 districts out of these the 04FMR exceeds 1050. There are no particular spatial patterns. As such a district level map is not presented here.

We thus find that the disaggregation of the juvenile age group FMRs into 59FMR and the 04FMR is a useful one and these FMRs have significantly different patterns. We can therefore proceed to examine in some detail, the differences between these FMRs for different regions and different social groups. We first analyse the differences between the 09FMRs, 59FMRs and 04FMRs for different groups and examine the hypothesis that the 04FMRs will be significantly higher than the 59FMRs. This indeed happens to be the case. Table 3.1 provides the data for the overall population, as well as its three segments the tribal, the scheduled caste and the rest. For all these groups the 04FMRs are significantly higher and 59FMRs significantly lower. The gap between 04FMRs and 59FMRs is pronounced for the SC population and becomes even more so if we take the 94 districts where the SC population accounts for above 20 per cent of the district population. This gap is less pronounced for the tribal and tends to narrow down as we go to the 50 districts which have 20 per cent or more tribal population.

FIGURE 3b: 5-9F AGE-GROUP FMR NON-SC/ST (1981)



We next examine the differences in the 59FMRs across different social groups (Table 3.2). This is done for the 355 districts as well as for districts with different concentration of scheduled caste and scheduled tribe population. The 59FMRs for the overall population, the non-tribal population and the non-ST/SC population do not differ significantly from each other. But the 59FMRs for the SC population (339 districts) and the tribal population (189 districts) differ from these significantly. The difference between the 59FMRs for the SC and the non-ST/SC population remains significant when we take sub-samples of districts with increasing concentration of the SC population. The 59FMRs for the non-ST/SC and the tribal population also differ significantly in these sub-samples and so do the 59FMRs among the tribal and the scheduled castes. FMRs for tribals are high, FMRs for the scheduled castes are low while those for the non-ST/SC population occupy an intermediate position.

When we group the districts by the percentage of tribal population, the difference between the tribal and the non-ST/SC population FMRs becomes insignificant while the 59FMRs for the SC population remains significantly different and low. The difference narrows down considerably in the 50 districts where tribal population is above 20 per cent of the district population.

When we compare the 04FMRs between the three social groups (Table 3.3) we find that these do not differ significantly among the SC and the non-ST/SC groups. 04FMRs for the tribal population are, however, significantly higher in all the groups of districts and have a mean value above 1000. As the percentage of tribal population goes from 1 per cent to 20 per cent, these FMRs show an increasing trend for all the three groups. But when the SC population percentage increases similarly, the 04FMRs for the SC and the non-ST/SC group shows a declining trend. The 04FMRs for the tribal population remain unaffected.

We thus see a clear difference between the two 'layers' within the juvenile age group FMRs: the 04FMRs and the 59FMRs. The 04FMRs are significantly higher then the 59FMRs for the three social groups and different sub-samples of districts. They are more evenly spread across different regions and do not differ significantly within the non-tribal population, i e, between the SC and the non-ST/SC group. The 04FMRs for the tribals are different and have quite high values, typically above 1000.

The 59FMRs on the other hand, assume much lower values, differ between the three social groups significantly across different sub-samples of the districts. They show a remarkable contiguity across different regions and vary over a much larger range than the 04FMRs are. In certain regions they have alarmingly low values.

The relatively even range of the 04FMRs compared to the 59FMRs can be seen through an analysis of variance in the two FMRs over same set of districts and social groups (Table 4). The variance or the standard deviation in the 04FMR values is considerably lower than that for the 59FMR values. The pattern persists in the sub-sample of districts where the SC or the ST population percentage exceeds 20 per cent.

Thus we find that 59FMR satisfactorily captures the socio-cultural patterns of excess female mortality in the juvenile group. Lower 59FMRs indicate adverse survival conditions faced by the girl children compared to the male children while higher 59FMRs indicate less discrimination between the two.

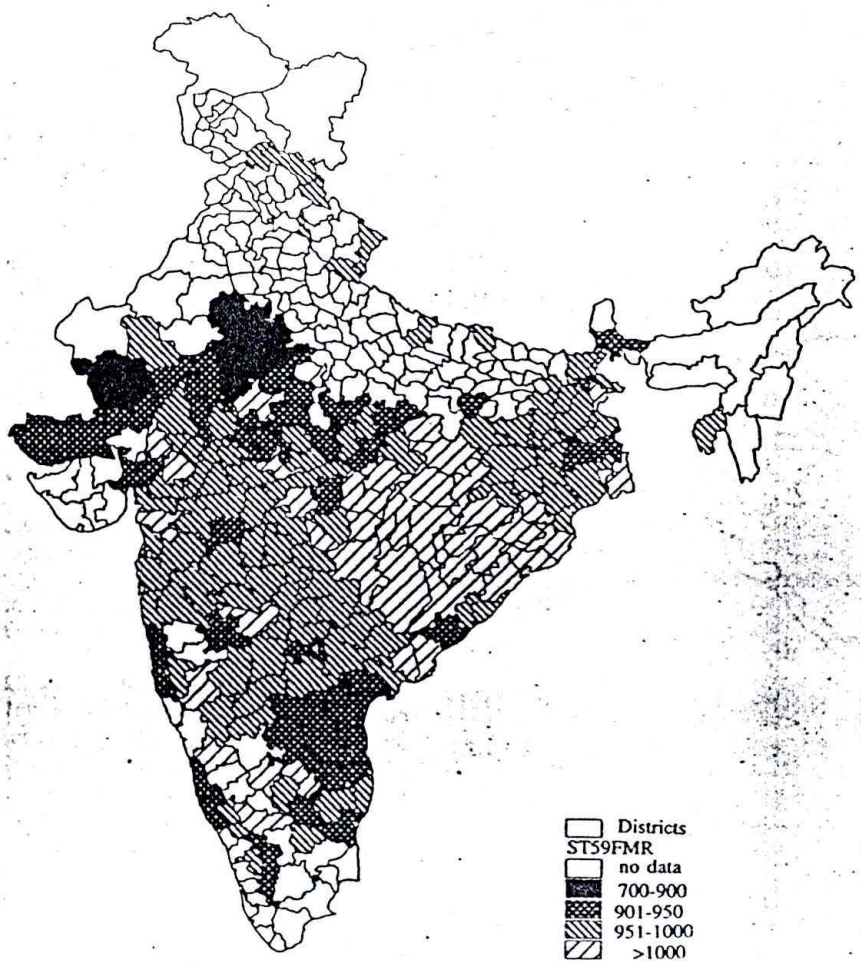
We can notice that the districts with low 04FMR also have low 59FMRs. They will rarely, if at all, have high 59FMRs. Districts with high 04FMRs, on the other hand, can have low 59FMRs; typically in the north-western region, or high 59FMRs; typically in the south eastern region.

We thus get four categories of districts: (a) those with low 04FMRs and low 59FMRs, (b) those with high 04FMRs but low 59FMRs, (c) those with high 04FMRs and high 59FMRs, and (d) those with low 04FMRs and high 59FMRs.

The first category covers districts where the pattern of excess female mortality gets established during infancy, or in extreme cases even before it through infanticide or sex selective abortions. The second category will be indicative of the districts where the excess female mortality sets in during later years of childhood. The third category of districts will be the ones where the discrimination against the girl child is not very strong. The last category will hardly be encountered anywhere as the pattern of excess female mortality that sets in early is unlikely to be reversed in later years of childhood.

One possible way of grouping different districts is the percentage of the scheduled caste or scheduled tribe population. This has been used in some of the recent analyses [Kishore 1993; Murthy 1995] and we have used it above. The concentration of the scheduled caste or the tribal population by itself may not, however, be a very useful indicator

FIGURE 3c: 59FMRS (TRIBAL POPULATION)



of the differences in the survival patterns by sex. The 59FMRs can, as we have seen above, be more useful indicators of such differences and so can the 04FMRs; at least at the lower end of the range. It will be relevant therefore to examine the differences in FMR patterns by different FMR ranges.

This analysis is presented in Table 5. We examine the 04FMR and 59FMR patterns for different sub-samples of districts grouped according to different 59FMR ranges. Four ranges of 59FMRs are chosen: (i) below 900, (ii) between 900 and 950, (iii) between 950 and 1,000, and (iv) above 1,000. For SC 59FMRs an additional range of very low FMRs (below 800) is also considered.

We analyse both 04FMRs and 59FMRs in these ranges for the three social groups. We also look at the drop from the mean 04FMR to the mean 59FMR for the given set of districts. The extent of this drop indicates the survival adversity faced by the girl children. We find out how the three social groups fare within different sub-samples relative to each other.

There are 24 districts with 59FMR for SC population below 800. The 04FMRs in these districts are low (mean 901) as well. The non-ST/SC population fares relatively better (mean 04FMR 940), but only relatively. Clearly, the adversities in survival impinge upon the girl children among the scheduled castes more sharply. The drop from the mean 04FMR to the mean 59FMR is 138 points for the scheduled castes and 92 points for the others. There are only three districts in this group with significant tribal population, viz, Bharatpur and Sawai Madhopur of Rajasthan and Morena of MP.

In the 107 districts where 59FMRs for the SC population are below 900, the pattern of adverse survival for the girl children of the scheduled castes persists. While the 04FMRs for the SC population are higher compared to the previous group of 24 districts and are comparable to those for the general category, the 59FMRs remain significantly lower. The drop between mean 04FMR and mean 59FMR is 105 points for the scheduled caste population compared to a drop of 64 points for the general category. The 04FMR for the tribal population in 30 districts are high (mean of 993) but the drop from 04FMRs to 59FMRs (mean of 925) is quite large. Even though the 59FMR for tribal in these districts are higher compared to those for non tribal, these are not high in terms of the FMRs for the tribal population.[20]

In the next range of 59FMRs between 900 and 950, one finds that the 04 FMRs improve sharply for both the SC and the general categories. The 04FMRs for the tribal remain significantly higher, though the gap between these and the 04FMRs for the non-tribal groups is quite narrow now. But the 59FMRs for the SC population remain significantly low while those for the tribal population improve considerably. The 59FMRs for the general category occupy intermediate position.

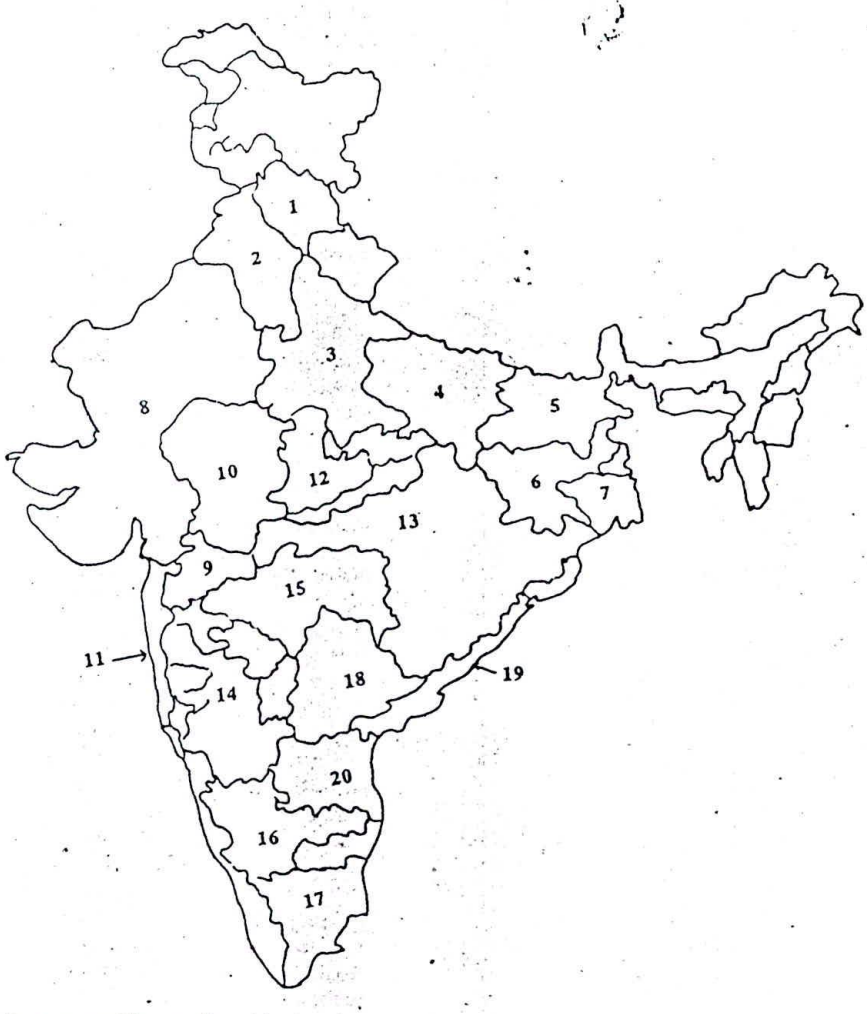
As the 59FMR for SC population rises above 950, the 04FMRs for the SC and ST population converge and become significantly higher than those for non-ST/SC groups. This is seen more sharply in the next range where the 59FMRs for the SC population exceed 1,000 in 43 districts. The difference in the 59FMRs for the three groups is insignificant.

We now examine the sub-sample of 189 districts with tribal population above 1 per cent. Slightly different results are obtained at the low FMR end. In the 11 districts of Rajasthan with 59FMR for the tribal is below 900, the 04FMRs are comparable for all the three groups and fall in the range of 955 to 970. But the drop to 59FMRs is sharp for both the tribal and the SC population. These are comparable and are lower than those for the general population. This pattern remains more or less the same for the 56 districts (mostly in Rajasthan and Madhya Pradesh) where the 59FMRs for the tribal population are below 950. The FMRs for the tribal population, in both 0-4 and 5-9 age group, become significantly higher than those for the SC population in the FMR range of 950 to 1,000 (88 districts), and higher than those for both SC and non-SC/ST group in the 1,000 plus range.

When we take the 21 districts where the 59FMRs for the non-ST/SC population are below 850, the 04FMRs for the SC and the general category are comparable (there are only six districts with significant tribal population). But the drop between mean 04FMR and mean 59FMR is far sharper for the SC population and their 59FMRs are still significantly lower, than those of the non-ST/SC population.

It thus appears that the scheduled castes are worse off at the lower end of the 59FMR range no matter what the selection criterion is, i e, 59FMR for the SC, ST or the non-ST/SC group. Further, at this end, the girl children among tribal and the SC groups fare worse than those in the non-ST/SC population. The situation in the tribal pockets improves quite sharply but that does not happen for the scheduled castes. This may

FIGURE 4: REGIONAL CLUSTERS



have something to do with the pattern of 'assimilation' of these two groups in the 'mainstream' of the society – tribals have been relatively isolated from this 'mainstream' even where their population percentage is moderate [Raza and Ahmad 1990]. But we would not pursue this discussion here.

While the patterns observed at the lower FMR end provide certain insights into the differences, those observed at the higher end also raises certain questions. In almost all the cases where 59FMRs are above 1,000, two trends can be noticed; the 04FMRs are also very high and, more importantly, the drop from 04FMR to 59FMR is insignificant and even negative. This would indicate that the pattern of excess male mortality persists beyond infancy. While this may indicate an absence of discrimination against the girl children beyond the age of one year, there could be other more worrying possibilities. It could also mean higher health risks and poor health infrastructure resulting in unusually high male infant deaths. Continuation of the excess male child mortality beyond infancy may not be an indicator of the girl children faring well but of the male children faring badly. The subsequent absence of discrimination against the girl child may also be indicative of the poverty in the region, i e, the material wherewithals for such discrimination may themselves be absent. Both these possibilities should cause concern. It is not a mere coincidence that the districts with 59FMRs above 1,000 are by and large the poorer and backward districts. This point needs further investigation.

IV

We saw above that the sex ratio patterns, especially for the 59FMRs, vary considerably within the boundaries of a state. On the other hand, they show remarkable contiguity across certain groups of districts. Some of these clusters have been noted for discernible ecological or geophysical boundaries.[21]

The 1981 population census has demarcated different geophysical regions and subregions across the country [Government of India 1988; 1981 Census Atlas 192-28]. 1961 Census had laid considerable emphasis on such a classification and had initiated a number of studies related to it [Bose 1994]. There have also been other classifications of regions, apart from the one done by the census. A comprehensive compilation of these has been done by Bose (1994). These regions considerably overlap. While regional studies have not been a new phenomenon in India, their application in the field of demography, at least sex ratio analysis, has not been very frequent.[22]

We use the census classification here to identify 19 different contiguous regions within which the 59FMRs display homogeneity (Figure 4). We then examine the significance of such a classification in terms of analysis and policy implication. A list of these regions and corresponding census regions and subregions is given in Appendix 1. Departure from the census scheme, when done, is indicated separately. Table 7 gives the mean of the 04FMRs and 59FMRs values of the districts in these regions.

The first region consists of the state of Himachal Pradesh, Jammu and Kashmir and the hilly region of UP, representing the 'south' within the north. Mean 59FMR for the 32 out of 34 districts in this region is 961 (barring the districts of L and S and Kinnaur which merit separate scrutiny for their low FMRs). FMRs for the scheduled castes are comparable (mean 957). This region, largely above 300 metres from the sea level, marks an important ecological boundary between the northern mountains and the plains in northern India.

Adjoining this region are the plains of Punjab and Haryana marked by highly masculine sex ratios; the mean 59FMR being 887 for the non-ST/SC population and 842 for the scheduled caste population. There is no tribal population in this belt.

But region 3 is the more alarming region, the 'pit'. It comprises of the upper Ganga plain of western UP, the three districts of Alwar, Bharatpur and Sawai Madhopur of Rajasthan, the ravines of Chambal in MP and the Zhansi uplands of UP. These 32 districts have a mean 59FMR of 850 for the non-ST/SC population and 797 for the scheduled caste population.

Low FMRs in these two regions, given that these are relatively prosperous regions of India, should be a matter of concern in both policy and academic realm. This also warrants a special coverage of at least some of the districts in this region during the 2001 Census to set at rest some of the optimistic speculation that underenumeration of females may be the cause of low FMRs in India.

The 23 districts of the middle Ganga plain represent the eastern side of the sloping region around the 'pit' with mean 59FMR for the non-ST/SC group being 892 and those for the SC population being 883. The

FMRs continue to look up along the lower Ganga plain of north and south Bihar (region 5 with mean 59FMR for the 22 districts being 920 for non-ST/SC and 908 for the SC population). In fact Purnia and Katihar districts of Bihar show a closer pattern to the lower Gangetic plain districts of West Bengal and have been grouped with these as such. These districts have high and comparable 59FMRs for all the three groups and a sizeable presence of tribal population.

The southern Bihar hills and plateaus mark an ecological transition from plains to hills and also mark one end of the north-south divide. These seven districts with sizeable tribal population have high 59FMRs for the tribals and others and relatively lower 59FMRs (mean 956) for the SC population.

The semi arid plains of Rajasthan and Gujarat, the Kachchh and Kathiawar peninsula and some areas of semi arid Rajasthan, form a block of 34 districts. These adjoin the low FMR regions 2 and 3 on one side and the central belt dividing the north and the south on the other. The 59FMRs for the non-ST/SC population are marginally better (mean of 920) but continues to be low for the SC population (mean of 886). The 59FMRs for the tribal population in 21 of its districts are low by the standards of tribal population (mean of 937). As a matter of fact there is a low FMR track starting from Ajmer in Rajasthan descending down through Pali and Sirohi districts to the Mehasana, Ahmedabad, Bhavnagar route in Gujarat. This track is flanked by relatively higher FMR regions on its western side and regions of high FMRs on its south-eastern side. But we have not separated this region on the basis of FMRs as this track cuts across different geophysical regions.

The districts of Udaipur, Chittaurgard, Dungarpur, Banswara and Bhilwara in the relatively difficult terrain of the Aravali range of Rajasthan form a contiguous block with districts of Malwa plateau in MP extending to the three districts of Narmada Valley, viz, Jabalpur, Narsimhpur and Hoshangabad through West Nimar in the Satpura hills. It has high FMRs for the non-ST/SC and the tribal population but low FMRs still for the scheduled castes.

The other remaining region north of Narmada covers the northern uplands of MP, the Sagar and Bhopal plateau and through East Nimar, descends into the Khandesh region of Maharashtra and the Nasik Basin. It has mean 59FMR values of 925 for the non-ST/SC, 886 for the SC, and 955 for the tribal population.

The transition to high FMR zones begins with the central and eastern Satpura hill range of MP, the Baghelkhand plateau, the Chhattisgarh region Dandakaranya and Orissa highlands. This block of 23 districts also lies on the central tribal belt and joins up with the south Bihar hills and plateau region. The mean 59FMRs here are 1,000 or above for all three social groups. South of the dividing belt, we have the west coast region spreading from Valsad in Gujarat (Dang included), to Kerala through Maharashtra Konkan, Goa and Karnataka Konkan. It has high FMRs for all three groups.

TABLE 3.1: COMPARISON OF FMRS IN THE AGE-GROUPS 0-9, 0-4, AND 5-9

Variable	Mean	CI		Per Cent CI	Remarks
		Lower	Upper		
					355 districts
All04FMR	976	973	980	95	
All09FMR	958	954	962	95	Overall population
All59FMR	942	936	948	95	
Oth04FMR	974	970	978	95	Non ST/SC population
Oth09FMR	959	954	963	95	
Oth59FMR	946	940	952	95	
Districts with percentage of scheduled caste population, SCPCT >1 per cent					339 districts
SC04FMR	978	973	982	95	
SC09FMR	949	943	955	95	
SC59FMR	925	917	932	95	
Districts with percentage of scheduled caste population, SCPCT > 20 per cent					94 districts
SC04FMR	962	952	972	95	
SC09FMR	923	911	936	95	
SC59FMR	890	874	906	95	
Districts with percentage of tribal population STPCT > 1 per cent					189 districts
ST04FMR	1008	1003	1014	95	
SC09FMR	988	983	993	95	
SC59FMR	970	964	976	95	
Districts with percentage of tribal population STPCT > 20 per cent					50 districts
ST04FMR	1018	1011	1024	90	
SC09FMR	1002	994	1009	90	
SC59FMR	988	978	998	90	

TABLE 3.2: ANALYSIS OF FMRS IN AGE-GROUP 5-9 YEARS

Variable	Mean	CI		Per Cent CI	Remarks
		Lower	Upper		
					355 districts
All59FMR	942	936	948	95	Total population
NT59FMR	957	952	961	95	Non-tribal population
Oth59FMR	946	940	952	95	Non-ST/SC population
Districts with percentage of scheduled caste population, SCPCT >1 per cent					339 districts
SC59FMR	925	917	933	95	Scheduled caste population
Oth59FMR	945	939	951	95	Non-ST/SC population
ST59FMR	970	964	976	95	Tribal population
Districts with percentage of scheduled caste population, SCPCT > 10 per cent					272 Districts
SC59FMR	917	908	926	95	
Oth59FMR	939	932	946	95	
ST59FMR	966	958	974	95	
Districts with percentage of scheduled caste population, SCPCT > 20 per cent					94 districts
SC59FMR	890	876	904	90	
Oth59FMR	915	906	924	90	
ST59FMR	946	928	963	90	
Districts with percentage of tribal population STPCT > 1 per cent					189 districts
ST59FMR	970	964	976	95	Tribal population
Oth59FMR	969	962	976	95	
SC59FMR	951	943	960	95	
Districts with percentage of tribal population STPCT > 10 per cent					88 districts
ST59FMR	983	974	991	95	
Oth59FMR	983	971	995	95	
SC59FMR	957	947	968	95	
Districts with percentage of tribal population STPCT > 20 per cent					50 districts
ST59FMR	988	978	998	90	
Oth59FMR	989	973	1005	90	
SC59FMR	966	954	977	90	

On the inland side of this coastal belt, we have the western ghats of Maharashtra, north Karnataka plateau and the central Maidan forming one block of 13 districts and the Vidarbha, Marathwada and Mahakoshal region if Maharashtra forming another contiguous block of 13 districts with high FMRs for all three groups (mean 59FMR typically in the 975 to 990 range). 17 districts of Tamil Nadu follow similar 59FMR pattern, except that the tribal 59FMRs are low.

There are two contiguous blocks of very high 59FMR (mean 59FMR above 1,000) which need attention. One block covers 11 districts of the central south and the southern Karnataka plateau and Chittoor district of Andhra. The other block covers 10 districts of Telangana region in Andhra Pradesh. This block adjoins the Dandakaranya region and the Chandrapur, Bastar, Koraput tribal belt known for its backwardness. The eastern coastal region of Andhra including the district of Ganjam in Orissa also has uniformly high FMRs for the three groups.

A group of five districts in Rayalseema region of Andhra stands out for its low FMRs by southern standards (mean 59FMRs of 961 for non-ST/SC, 936 for the SC, and 931 for the tribal population). This covers the districts of Prakasam, Nellore, Cudappah, Anantpur and Kurnool.

We now examine, through analysis of variance if these 19 regions provide a more homogeneous grouping compared to the 20 states involved. The within group variance would be significantly less if a given grouping is more homogeneous. The F-ratios would as a result be higher. Table 6 indicates the within group variance and the total variance for both 04FMRs and the 59FMRs by region and state for the three social groups separately. Corresponding F-ratios are also indicated.

The regions provide much more homogeneous grouping than the states do for the 59FMRs for the general and the scheduled caste population. In the case of grouping by states, the within group variance accounts for nearly half of the total variance whereas if we group by regions it reduces to less than one-fourth of the total variance. The corresponding jump in the F-ratios is also significant. (It is possible to further 'fine tune' the regional grouping taking other factors into account and improve the F-ratios further. Such an exercise of cluster formation with minimum internal variance is not within the scope of present paper. We only intended to demonstrate that these regions, comparable in number to the number of states involved, achieve substantial reduction in the variance within the groups.)

While the grouping by regions appears much appropriate for the spatial analysis for the not tribal population segments, such is not the case with the tribal population. A study of the regionalisation of the tribal sex ratios, however, is outside the scope of this paper.

Such change is also not significant for the 0-4 age group FMRs (Table 6). Although regions provide a more homogeneous grouping, the improvement in F-values is small and not as sharp as in the case of 5-9FMRs. This should not be surprising in view of the random spatial spread of the 04FMRs notwithstanding regions with low 04FMRs. It will be instructive to compare the situation with the one revealed by 1991 Census data.

V

What do the patterns above signify? Four pertinent points emerge. First, the sex ratio analysis has to move away from the state level and take into account the regional diversities. Even at the regional or the district level the differences in the patterns for the tribal, the scheduled caste and the rest of the population have to be taken into consideration. For these analyses, the JSRs or the JFMRs will be more appropriate variables compared to the all age group sex ratios. But even this has to be disaggregated into the 0-4 and 5-9 age group FMRs because of the different mortality patterns in the 0-1 and 1-9 age group.

The regionalisation of the 59FMRs has important implications for the analysis of the correlates of sex ratio variations. It has of late been recognised that both cultural and economic factors affect female survival together [Kishore 1993; Murthy 1995]. It is quite likely that the regional patterns will throw a better light on the role of cultural variables. Even the economic factors like female labour participation would show considerable variation among different regions and social groups. The ravines of Madhya Pradesh, for example, will have a very different pattern of female labour participation than, say, Chhattisgarh region.

The reversal of mortality patterns within the 0-9 age group and differences in the 0-4 and 5-9 age group FMR patterns among the three social groups raise two important methodological points. One relates to the use of under-5 mortality as a composite variable. The other relates to the use of the population percentage of the SC or the tribal population.

TABLE 3.3: ANALYSIS OF FMRS IN AGE-GROUP 0-4 YEARS

Variable	Mean	CI		Per Cent CI	Remarks
		Lower	Upper		
All04FMR	976	973	980	95	Total population
NT04FMR	975	971	978	95	Non-tribal population
Oth04FMR	974	970	978	95	Non-ST/SC population
Districts with percentage of scheduled caste population, SCPCT >1 per cent					339 districts
SC04FMR	978	973	982	95	Scheduled caste population
Oth04FMR	974	970	978	95	Non-ST/SC population
ST04FMR	1008	1003	1014	95	Tribal population (193 districts)
Districts with percentgage of schedule caste population, SCPCT > 10 per cent					272 districts
SC04FMR	978	972	984	95	
Oth04FMR	973	969	977	95	
ST04FMR	1009	1002	1015	95	143 districts
SC04FMR	988	982	995	95	143 districts
Oth04FMR	983	978	98	95	143 districts
Districts with percentage of scheduled caste population, SCPCT > 20 per cent					94 districts
SC04FMR	962	952	972	95	
Oth04FMR	964	957	972	95	
ST04FMR	1004	986	1022	95	28 districts
SC04FMR	973	955	991	95	28 districts
Oth04FMR	981	968	994	95	28 districts
Districts with percentage of tribal population STPCT > 1 per cent					189 districts
ST04FMR	1009	1004	1014	95	Tribal population
Oth04FMR	983	978	988	95	
SC04FMR	985	979	991	95	
Districts with percentage of tribal population STPCT > 10 per cent					88 districts
ST04FMR	1013	1007	1019	95	
Oth04FMR	993	984	1002	95	
SC04FMR	987	977	997	95	
Districts with percentage of tribal population STPCT > 20 per cent					50 districts
ST04FMR	1018	1009	1026	95	
Oth04FMR	993	979	1007	95	
SC04FMR	983	969	997	95	

may have to be given suitable incentives. Such provisions can be built into the planning process itself.

Appendix – I

Regions with Homogeneous Sex Ratio Patterns

Region 1: All districts of Himachal Pradesh, Jammu and Kashmir and hilly districts of UP, viz, Chamoli, Pithoragarh, Uttarkashi, Dehradun, Garhwal, Tehri Garhwal, Almora and Nainital. These form part of the Northern Himalayas.

Region 2: Part of the 'Great Plains'; All districts of Punjab and Haryana. (Although couple of districts in Haryana could go in the region 3)

Region 3: Districts of western UP in the upper Ganga plain; Saharanpur, Muzaffarnagar, Bijnor, Meerut, Ghaziabad, Bulandshahar, Moradabad, Rampur, Budaun, Bareilly, Pilibhit, Shahjahanpur, Aligarh, Mathura, Agra, Etah, Mainpuri, Farrukhabad, Etawah, Jalaun, Jhansi, Lalitpur, Hamirpur, Banda and Kheri, Bharatpur and Sawai Madhopur which constitute the subregion of Banas Chambal basin and Alwar (Alwar defies the subregional classification; it has been included here although it belongs to the subregion of Aravalli range and associated uplands of Semi-arid Rajasthan).
Chambal ravines of Bundelkhand in MP; the districts of Bhind, Morena, Gwalior and Datia (the 1981 classification includes Guna and Shivpuri. We have used the 1961 classification quoted in Bose (1994:44-48). These classify Guna and Shivpuri under northern Malwa uplands.

Region 4: Middle Ganga plain; Remaining districts of UP

Region 5: Districts of Bihar in lower Ganga plain; All districts of Bihar, except Katihar and Purnia clubbed with region 7 and the districts in region 6.

Region 6: South Bihar Hills and plateau; Districts of Palamau, Ranchi, Hazaribagh, Singhbhum, Dhanbad, Santhal Parganas.

Region 7: Katihar and Purnia of Bihar, all districts of West Bengal and Cuttack, Puri and Balasore districts of Orissa. (Although Purulia could be clubbed with region 6, and the hilly districts could form a separate group.)

Region 8: Semiarid Rajasthan and plains of Gujrat; All districts of Rajasthan except those in region 10 (hilly region) and all districts of Gujarat except Valsad and Dang clubbed in region 11 covering districts on west coast.

Region 10: Hilly districts of Rajasthan [Bose, 1994:45], viz, Bhilwara, Udaipur, Chittaurgarh, Dungarpur, Banswara and Jhalawar.
Malwa plateau and Narmada valley [Bose, 1994:46] in MP; the districts of Mandsaur, Ratlam, Ujjain, Shajapur, Dewas, Jhabua, Dhar, Indore, West Nimar, Rajgarh, Hoshangabad, Jabalpur, Narsimhapur
(West and East Nimar show a sharp divide which may be worth analysing at the block level).

Region 11: Western coastal districts; Starting from districts of Valsad and Dang at its northern end, going down through Thane, Raigarh and Ratnagiri in Maharashtra, Goa, Uttar and Dakshin Kannada in Karnataka to all districts of Kerala.

Region 12: North Malwa uplands i.e. Guna and Shivpuri; north central MP, i e, Chhatrapur, Tikamgarh, Vindhya range and Rewa plateau Vidisha, Raisen, Sagar, Damoh, Bhopal, Panna, Rewa, Satna, East Nimar and; Jalgaon, Dhule and Nasik districts of Maharashtra. (This grouping draws upon the 1961 regions Bose (1994).)

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Region 14: Western Ghats in Maharashtra; Ahmednagar, Pune, Satara, Sangli, Solapur and Kolhapur; Inland Karnataka, ie, Belgaum and Dharwar; North Maidan, ie, Bidar, Gulbarga and Bijapur and Central Maidan, ie, Bellary and Raichur [Bose 1994: 47; 1961 Census classification]

Region 15: Marathwada, Vidarbha and Mahakosal regions of Maharashtra covering rest of its districts

Region 16: Rest of the districts of Karnataka covering South Maidan and Malnad and Chittoor of Andhra which shows different characteristics from Rayalseema where it is included in the census classification.

Region 17: Eastern Coastal region I; all districts of Tamil Nadu and Pondichery

Region 18: Telangana region of Andhra; Mahboobnagar, Rangareddy, Hyderabad, Medak, Nizamabad, Adilabad, Karimnagar, Warangal, Khammam and Nalgonda

Table 6: Analysis of FMRs by Regions and by States

	Region (DF = 18)				State (DF + 19)			
	Sum of Squares (in 000s)				Sum of Squares (in 000s)			
Variable	Within	Between	Total	F-Ratio	Within	Between	Total	F-Ratio
Oth59FMR	245	835	1080	62.48	526	554	1080	20.53
SC59FMR	369	1422	1790	67.73	811	980	1790	22.53
ST59FMR	187	166	326	8.9	219	134	326	8.99
Oth04FMR	242	186	428	14.06	297	131	428	8.58
SC04FMR	422	284	705	11.8	528	177	705	6.26
ST04FMR	66	179	245	3.69	205	41	245	2.92

(F Probability in all the cases is 0.0000)

Table 7: Mean FMR Values in Different Geophysical Regions

	04FMRs			59FMRs		
Region No	ST	SC	Others	ST	SC	Others
1	1015	988	972	977	957	956
2	–	921	924	–	842	887
3	972	932	947	854	792	850
4	1028	992	979	996	882	892
5	1056	1012	993	949	908	920
6	1033	989	1022	989	956	972
7	1003	996	997	975	981	980
8	988	958	958	937	886	920
10	1009	988	1010	961	934	980
11	1001	974	975	964	975	979
12	1008	948	962	955	886	925
13	1030	1019	995	1017	1000	1019
14	989	978	952	977	982	972
15	998	980	975	992	983	982
16	1008	1004	984	1001	1016	1009
17	1004	991	971	945	981	973
18	1020	1013	1007	968	998	1014
19	1027	1001	995	979	971	993
20	987	996	980	931	937	961

Note: Mean values here are mean of the FMR value of the districts in the region and NOT the mean FMR values for the region.

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19	1027	1001	995	979	971	993
20	987	996	980	931	937	961

Note: Mean values here are mean of the FMR value of the districts in the region and NOT the mean FMR values for the region.

Region 19: East coastal Andhra and south Orissa; Ganjam district of Orissa and rest of the districts of Andhra except those in region 20.

Region 20: Anantpur, Cudappah and Kurnool of Rayalseema and the two southern coastal districts of Prakasam and Nellore classified as a separate subregion.

Remarks: (1) Delhi, Chandigarh and Bombay not included in the regional analysis. (2) The central zone which represents the north-south transition is difficult to classify and indicates tracks which further cut across these regions. These could be analysed at a more detailed level with smaller regions.

Notes

[This work is part of my ongoing research on Sex-Ratio Imbalances in India at the Eshool of Development Studies University of East Anglia, Norwich, UK, NR4 7TJ.

I wish to gratefully acknowledge the help and guidance of Richard Palmer-Jones in preparation of maps 2A to 3C. He and Cecile Jackson also gave useful comments and suggestions on the draft version of this paper. I have also benefited from discussions with Bina Agarwal, Ashish Bose, K S Natarajan and Ravi Verma.]

1 We use the term FMR defined as the number of females per thousand male population to avoid confusion in use of the term sex ratios. In India the term sex ratios is traditionally used to mean number of women per thousand male population; exactly opposite to the international convention.

2 While this was noted in the earlier literature [Bardhan 1974; Visaria 1971], this pattern was explicitly brought into focus by Sopher (1980), Miller (1981) and later by Dyson and Moore (1983) among others.

3 Dyson and Moore have also recognised the difficulty in placing the eastern region into the northern or southern stereotype. Caldwells (1990) in fact consider this 'dichotomy' as exaggerated. In a recent paper, the author has attempted to extend the two-fold; north-south, classification into a five-fold classification using the sex ratio data for different language groups in India [Agnihotri Forthcoming].

4 There have been occasional references to the generally high FMRs among the tribals. Dange (1972:282) has raised this point explicitly in the context of Madhya Pradesh but this has not been pursued further. Miller (1981:74) has in fact considered the classification of tribals, scheduled castes and the rest as too gross. It is only recently, [Agnihotri 1995; and Agnihotri Forthcoming] that the differences between the sex ratio patterns among these three social groups has been examined systematically on a all-India basis leading to the present analysis. The possibility of significant differences between the scheduled caste and the non-SC/ST population has also not been seriously explored so far.

5 The trend normally is to use the state level data. Valuable contributions have been made by Sopher (1980), Libby (1980), Miller (1981) and more recently Kishore (1993) and Murthy, Guio and Dreze (1995) by using district level data, yet most of the analysis continues to draw upon state level figures not corrected for migration.

6 Vannemann and Barnes (1992) provide extremely useful data on various aspects at district level including the population Census data from 1961 to 1981. They too have not included the detailed data on the tribal and SC population in some respects. For these the special tables from 1981 Census have been used. This database tends to aggregate some of the data at the state level for the small states, particularly in the north-east.

7 Visaria (1971:26) has calculated the effect of random errors on the sex ratios for different sample sizes of live births. He indicates that one requires a surprisingly high number of births, 10,000 and above, to get the sex ratios at birth within a narrow confidence range.

8 Present analysis does not cover the tribal districts in the north-east. This may appear unusual, but in our opinion the tribal in the north-east and in central India belt differ considerably, a point intended to be dealt with elsewhere. Inclusion of these districts could have resulted in aggregation of non-comparable groups.

9 Oldenberg (1992:2658) has used this term although not on the basis of the juvenile sex ratios. We will later see that this is an apt description for a group of 24 districts with very low 59FMRs. This region resembles, to use Oldenberg's graphical term, a 'pit' with sloping sides when we look at the spatial distribution of the FMRs across districts.

10 Desai (1969:Ch 7 and pp 206-207); Srivastava (1979:58-59 and 71) for details based on 1961 and 1971 Census data.

11 See, for example, Kundu and Sahu (1991), who opine that "at the state or district level, migration, is the single most important factor explaining the temporal and cross-sectional variations in sex ratio". In our opinion, once the relative survival of the females is recognised as the central issue of analysis, the debate on migration becomes unnecessary if the sex ratios for the juvenile population are used.

12 We assume here that the sex ratio at birth is nearly constant across different regions; 104 to 109 male children per thousand female children. We also assume that enumeration errors are not significant enough. We do not rule out enumeration errors, but do not share the view that the low sex ratios can be explained away by sex selective underenumeration of female children. Visaria (1971) has adequately dealt with this issue but this view persists nevertheless. Also see Kishore (1993) and Murthy (1995).

13 (a) Government of India (1991).
(b) Deaths in 0-9 age group account for about one-fourth of the total deaths and little less than half of the deaths below the age of 60 (Government of India 1991).

14 See Hariss (1987), Miller (1981, 1989), Basu (1989), Caldwells (1990), Mukherjee (1986), Bhatia (1983) (quoted in Caldwells (1990)). An elaborate discussion of this 'neglect' has been done in Miller (1981). There is some debate about the relative importance of different factors in survival, e g, nutrition versus health care, etc. We do not intend going into it in this paper except observing that parity in one aspect does not necessarily mean parity in other aspects and the combined impact of different factors in terms of mortality will always be guided by the factor in which the gap is larger (and critical). There may be equality in consumption of calories, for example, but a critical gap in access to health care between two groups. The mortality differences will be driven by the latter and if the situation is reverse, then by the gap in calorie consumption.

15 See Kielmann (1983:185) quoted in Caldwells (1990:17)

16 This will not be the case where excess female child mortality is very sharp in the toddler (1-2) age group or has made inroads in the 0-1 age group or even prior to it through infanticide or sex selective abortions. Also see note 17.

17 This will particularly be the case in districts where excess female child mortality has become significant between the age of one and two years itself or even earlier as some recent data from the National Family Health Survey (NFHS, 1995: Table 8.5) shows. Caldwells (1990) have also discussed such possibility. Government of India (1988b) in fact, lists out 142 districts, (20 in Bihar, 9 in Gujarat, 12 in Haryana, 9 in Punjab, 14 each in Rajasthan and MP, 46 in UP being main contributors) where the q2 values for the girl children are high compared to those for the boys.

18 These districts are: Alwar, Bharatpur, Sawai Madhopur, Jhunjhunu, Sikar, Jaipur, Tonk, Bundi, Jalor and Barmer.

19 See Bharadwaj (19??: 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 across Narmada-Chhotanagpur belt.

20 It will be very interesting to see how the underenumeration optimists*, will like to explain away this pattern except by invoking an underenumeration in the 5-9 age group and its absence in the 0-4 age group. The sharp decline in the FMRs from 0-4 age group to 5-9 age group among the tribal is even more hard to explain away by invoking underenumeration. The tribal are far less likely to practice underreporting of the girl children given their social structure. (* Those who expect the relative underenumeration of the girl children to be the main cause of the low FMRs.)

21 Libby (1980:94) has noted, for example, the ecological distinction between eastern and western UP. Bardhan (1974) has also talked about the wheat and the rice divide in the sex ratios, arguing that the low female participation in wheat regions *vis-a-vis* high participation in rice regions affects the sex ratio patterns in these regions.

22 Even recent studies like Raju (1991) who has dealt with 'Gender and Deprivation – A Theme Revisited with Geographical Perspective' or Agarwal (1994: Ch 8, 316-419) while 'tracing cross-cultural diversities' in respect of women's position have confined their attention at state level. Murthy, Guio and Dreze (1995) are perhaps the first to take up regional classification systematically in the gender context.

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CENTER for HEALTH and GENDER EQUITY

A Less Valued Life: Population Policy and Sex Selection in India

By Rupsa Mallik
October 2002

Demographic research over the past two decades has confirmed that a preference for sons over daughters remains entrenched in many countries throughout the world. In such se tings, religious traditions and social norms coupled with economic discrimination against women and girls conspire to ensure that young boys have greater access to education, health care, and even food than do their sisters. Such neglect leads to markedly higher rates of illiteracy, malnutrition, and poor health among girls. In the worst cases, discrimination against girls takes the form of female infanticide, in which girl children are killed outright immediately after birth. These practices have evolved in recent years to include the use of modern technologies to determine the sex of children in the womb and the subsequent use of sex-selection abortion to avoid the birth of a girl child altogether. The result of such practices is evident in the growing imbalance in the survival of girls relative to boys in some countries today.

Such is the case in India, where the combined effects of historical discrimination against girl children and the use of advanced technology for sex selection are now clear. Data collected in the 2001 Census of India[1] reveal that the juvenile sex ratio has declined steadily over the past decade, from 945 girls per 1,000 boys ages 0-6 years old in 1991 to 927 girls per 1,000 boys in 2001. This decline has been attributed both to excess neo-natal female mortality due to the spread of female infanticide, and to the rapidly expanding use of pre-natal diagnostic technology for the purposes of sex determination (SD) followed by use of sex-selection abortion (SSA).

It is now indisputable that, as India enters the 21st century, SD and SSA have been integrated into the range of family building strategies used by couples to ensure a desired "imbalance" in the number of male and female offspring. What is less well understood are the ways in which population policies supported by both the government and international donor agencies have fueled the insidious use of modern technology to eliminate girl children even before they are born.

The Roots of Gender Bias

The roots of son preference in India lie in deeply entrenched social, cultural, and economic discrimination against women and girls. The predominant system of patrilineal descent and inheritance legitimizes and propels the desire for sons. Sons, for example, traditionally perform the last rites after the death of a parent. Indeed, a strict interpretation of Hindu tradition holds that salvation in the afterlife can only be achieved if a son lights his parent's funeral pyre (Mutharayappa, et al.; 1997). As a result, many religious Hindus strive to ensure they have at least one son.

Economic calculations are increasingly a factor in the perpetuation of son preference. In much of the country, men and boys are more likely to work for cash wages than are women and girls. Although women often work longer hours than men, they are more likely to be engaged in unpaid subsistence and domestic work that, while critical to family survival, is ironically perceived to be less valuable. At marriage, daughters leave their natal homes and must bring a dowry to their husband's family, to which they are also expected to contribute economically, whether in the form of paid or unpaid work. Sons are expected to support their parents in old age, and therefore are viewed as a source of social security.

In fact, the desire to accumulate wealth has become an increasingly important factor in son preference in recent years, in part as a result of the desire among the growing middle class for upward mobility. The spread of consumerism and the associated increase in the cost of dowry and marriage, plus the desire to maintain landholdings within a family all have contributed to an environment that is extremely hostile to women and girl children, even among the educated middle and upper classes. Indeed, contrary to what might be expected, the most dramatic declines in the sex ratio over the past decade were found in Punjab, Haryana and Maharashtra, among the richest states in India (Census of India; 2001).

Sex Discrimination and the Small Family Norm

Average family size in India has been declining over the past two decades, in response to a number of economic and social changes, including rising aspirations for children coupled with the increased costs of rearing them, and the entry of large numbers of women into the formal labor force. Such changes have taken root more quickly among some segments of the population than

others, and families of three children remain the norm in a number of states, including Andhra Pradesh, Bihar, and Uttar Pradesh. The Government of India has attempted to hasten the transition to small families among every segment of the population through population policies and programs implemented largely through the Indian Family Welfare program. These strategies have ranged from the heavy-handed approaches of the seventies and eighties—which relied on social pressure and outright coercion to increase contraceptive use and reduce family size—to the "Target-Free Approach" adopted in the mid-nineties, which was intended to eliminate the coercive tactics that had become commonplace in the rush to raise contraceptive prevalence rates.

Over the past three years, however, political pressure has once again been mounting for the government to redouble its efforts on "population control." Today, national and state population policies focus variously on building voluntary support for small families through a variety of strategies to the outright imposition of two-child families through the use of social and economic incentives and disincentives. In Andhra Pradesh and Rajasthan, for example, preferred access to housing, education, and other needed social resources is now given to couples that have no more than two children. In Andhra Pradesh, Rajasthan, Madhya Pradesh, Haryana and several other states, laws also prohibit individuals with more than two children from contesting local government elections.

The shift to smaller families now evident in India has not, however, been accompanied by a concurrent shift in the social and economic pressures that underlie the preference for sons over daughters (George; 1997). Indeed, if anything, the pressure to have sons has intensified as couples strive simultaneously to reduce family size and ensure the birth of the desired number of sons, leading to increased acceptance of and reliance on the use of sex-selection strategies to achieve these results.

Evidence of these trends has been clear for a number of years, but neither the national nor the state governments in India have effectively addressed the root causes of pervasive son preference. Population and health policies have focused on building pressure for smaller families through a variety of means, but largely have failed to address the social norms that simultaneously privilege sons over daughters, and tacitly support the epidemic of gender violence that afflicts women and girls throughout their lifecycle. The government has failed to effectively address persistent gender gaps in education, employment and access to productive resources such as land and property. Even existing laws, such as the Child Marriage Restraint Act and the Dowry Prevention Act, have been poorly implemented, if at all.

With the exception of UNICEF and UNFPA, international donors also have largely ignored the issues surrounding the stark decline in the sex ratio. USAID, for example, has played an active role in the planning and formulation of state population policies in several states--including Andhra Pradesh and Uttar Pradesh--none of which address the issues of discrimination, violence, and sex selection in any but the most superficial manner. Instead, these policies take the same simplistic approaches to reducing fertility in the short run which exacerbate son preference over the long run.

Civil Society Responses

Official neglect notwithstanding, numerous civil society organizations have been working on this issue since the eighties. In 1986, for example, the Forum Against Sex Determination and Sex Pre-Selection (FASDSP) began a campaign to enact legislation to regulate the misuse of technologies, and subsequently played a critical role in focusing national attention on the issue of sex-selection abortion.

A direct outcome of this effort was the passage of a national law to regulate pre-natal diagnostic technologies as well as their misuse – the Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act passed in 1994. The Act was meant to establish institutional mechanisms at all levels of the health system to register users of technologies, and record complaints of violation of the law by doctors. The law has been largely ineffective, however, as many of the national and state-level institutional mechanisms were never put in place or have not been effectively implemented.

Renewed efforts focused on better implementation are now underway. In 2000, several individuals and organizations—including long-time activist Sabu George, and two Maharashtra-based advocacy groups, CEHAT and MASUM--filed public interest litigation in the Supreme Court of India seeking to ensure effective implementation of the existing PNDT Act. In response, the Court recently ordered the national and states level health secretaries to impound ultrasound machines in unregistered clinics, and to file comprehensive affidavits with the court detailing all other actions taken to effectively ensure implementation of the law. The lawsuit, court decisions, and release of the 2001 census data showing further declines in the juvenile sex ratio together have generated further media interest in SD and SSA, raising these issues once again to the level of national concern.

The national government also established a technical committee within the Ministry of Health and Family Welfare to review and make recommendations for better implementation of the existing PNDT Act, including those aspects of unregulated use of pre-conception techniques for sex selection that remain outside the ambit of the existing law. This committee proposed an amendment, titled 'Pre-Conception and Pre-Natal Sex Selection/ Determination (Prohibition and Regulation) Act, 2001'[2] preventing use of pre-natal diagnostic techniques for sex determination, banning use of pre-

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conception techniques for sex selection, and setting standards for the use of ultrasound to monitor pregnancies (as is the norm in most countries). The amendment, however, has yet to be passed, in part because of resistance by the medical community itself, a portion of which profits substantially from the increased use of these technologies.

Profiting From Bias

While the government has as yet largely failed to effectively address these issues, the private sector has sought to exploit them for profit. The use of genetics testing and other reproductive technologies for the purpose of sex selection has become a thriving industry in many parts of the country, one that is directly implicated in the rapid and unregulated spread of reproductive technologies used for sex determination and selective abortion. Doctors and quacks alike have cleverly if insidiously used advertisements and other means of communication to market these technologies as a means of expanding reproductive choices for women, playing simultaneously on the negative norms and beliefs that underlie gender bias within Indian society and on the broader movement to secure reproductive rights for Indian women.

In part as a result, public debates regarding sex selection have been linked with the right to access to safe abortion in ways that actually threaten women's access to pregnancy termination services over the longer term. On one hand, some associated with the private sector have argued that offering women the option of abortion for the purpose of sex selection needs to be viewed within the framework of women's autonomy and right to safe abortion services. On the other, some opponents of sex selection have attributed its spread to India's 'liberal abortion laws,' proposing greater restrictions on access to early and safe abortions as the remedy. Neither of these positions addresses the issues in a way the ultimately safeguards women's rights while simultaneously addressing the root causes of this phenomenon.

Meanwhile, the attitude of the larger medical community with regard to banning sex selection remains ambiguous. Widespread protests erupted, for example, when the Government of India proposed the 2001 amendment to the existing PNDT law. Some of the proposed changes in the existing PNDT Act include compulsory maintenance of written records by providers of pre-natal diagnosis, a requirement that has been severely criticized by the medical community. This and other regulations have been contested in a lawsuit filed by the Delhi Medical Association.

Changing Norms at the Local Level

While the legislative and policy issues are debated, efforts are in fact being made in some communities to change the attitudes and behaviors underlying son preference and violence against women and girls. Numerous community-based organizations (CBOs), and non-governmental organizations (NGOs) have sought to address these issues on the ground in both urban and rural areas. In Tamil Nadu, for example, a coalition of organizations (including the Indian Council for Child Welfare, the Community Services Guild and Alternatives for India Development) is working to change both norms and behaviors in a number of districts that show both a high prevalence of female infanticide and an increase in reliance on sex-selection abortion. The efforts focus on mobilizing community leaders to counter the practice of female infanticide and feticide, often using integrated women's development strategies as a way to address the socio-cultural and economic roots of the problem. Their strategies have included a focus on educating adolescent girls and women; forming self-help groups to increase women's access to credit and paid employment; building solidarity among women within these communities; and changing the attitudes of youth toward social practices like dowry and discrimination against girls. In addition, they have formed networks to campaign on the issues, seeking better enforcement of the PNDT Act but also conducting public education on the issues.

The state-level Campaign against Sex-Selection Abortion in Tamil Nadu and Voluntary Health Association of Punjab are other notable examples of efforts that have used diverse strategies, including meeting with religious leaders, organizing protest marches, and reporting unregistered clinics and practitioners to authorities at the district and state levels. The Indian Medical Association and National Commission on Women have collaborated in some of these efforts largely as part of a UNICEF-funded initiative.

Addressing Bias at the Source

As is evident, there are numerous efforts underway at the national and state level within India intended to influence opinion and take action against sex-selection abortion. With the exception of local organizations, however, much of what is happening focuses on addressing the symptoms, rather than the longer-term steps needed to attack gender bias at its roots. Moreover, the disconnect between the problem and the government's own response is no where more evident than in the way contemporary population policies seek to enforce a two-child norm, in spite of growing evidence that doing so in the absence of concerted efforts to address such bias often leads to an increase in practices like female infanticide and feticide.

Yet there is much that could be done to combat the spread of discrimination against girl children, including infanticide and sex selection. Among those steps that should be taken are the following:

Establishment of a permanent and autonomous commission on reproductive and genetic technology, including representation from government, medical associations, research institutes, and civil society organizations with long

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established work in this area: Such a commission should establish regulations governing standards of care and monitoring of clinics providing reproductive technologies, including newer technologies as they become available. Similar commissions have been established to regulate reproductive technologies in both Canada and UK with positive results.

Effective implementation of laws and policies: The government must act to ensure adequate and effective implementation of the PNDT Act, as well as a wide-range of laws and regulations that address gender inequity at different levels of society. Enforcement of related laws is essential, and should include enforcement of the Child Marriage Restraint Act, the Dowry Prevention Act, and the various provisions in family law guaranteeing equal rights to property and inheritance for daughters. Efforts must simultaneously be made to establish effective laws and policies regarding gender violence, including domestic violence and coercion.

Creation of gender and rights-based population policies and programs and multi-sectoral strategies to address gender bias: Current population policies ignore the gender dimensions of reproductive decision-making, and thereby actually exacerbate practices like sex selection. To date, for example, the only national and state programs intended to directly address discrimination against girls have been those providing cash incentives to families that have girl children. These include lump sum deposits made by the government in the name of a girl child to be made available to her when she reaches age 18. This strategy has been criticized for many reasons, including because it appears to sanction dowry by providing a cash savings used by parents to subsidize their dowry payments. Moreover, the program has been dropped in some states where governments were unwilling to allocate the resources necessary to sustain it.

In another 'innovation,' the state of Tamil Nadu put out cradles in health centers intended to enable parents to leave unwanted girls instead of killing them. In the absence of efforts to address the deeply rooted economic and social biases against women and girls, however, these steps have had little if any effect on the practices of female infanticide and feticide in those states where the problems are greatest. The national and state governments need to focus instead on simultaneous implementation of a range of programs, including mid-day meals for school children, community level childcare, and educational opportunities for girls forced to drop out of school to care for younger siblings or work in the field.

Moreover, high priority must be placed on increasing access to primary education, and increased access for women and girls to wage employment, land and other productive resources, issues that have received much rhetorical but little practical attention. Land reform and redistribution policies intended to increase women's inheritance and ownership of land are on the books in many states, for example, but are not implemented despite the fact that the desire to retain undivided control of land through sons has been directly linked to an increase in sex determination and sex selection in several states, including Haryana and Punjab.

Only by undertaking these and other concerted strategies can the government, donors, and civil society can begin to address the issue of female infanticide and sex-selection abortion in a meaningful way. Given what is at stake, there is no time to lose.

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