INEQUALITY IN HEALTH STATUS IN INDIA

Gender, Spatial and Temporal Dimensions

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This dissertation is
dedicated to the fond memory of

Prof. T.N. Krishnan

July 18, 1997.

I hereby affirm that the research for this dissertation titled ***Inequality in Health Status in India: Gender, Spatial and Temporal Dimensions*** being submitted to the Jawaharlal Nehru University, New Delhi for the award of the Degree of Master of Philosophy in Applied Economics, was carried out entirely by me at the Centre for Development Studies, Thiruvananthapuram.

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Certified that this dissertation is the bonafide work of S. Jayachandran. This has not been considered for the award of any other degree by any other university.

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Chapter 1

Introduction

1.1 Dimensions of Health Inequality

Health constitutes an integral part of human well being. It is perceived by societies based on their awareness and understanding of health. The most widely accepted definition of health is that it is "a state of complete physical, mental and social well being and not merely the absence of disease or infirmity".[1] Inequality in health status arises basically from differences in the levels of well being among individuals or groups of individuals. Inequality is observed among societies (social), regions (spatial) and periods (temporal). Illsley *et al.* (1991) have noted that "the meaning of inequality in health is contextually determined; it changes both within and between countries and over time".[2] Inter-society inequality in health status may undergo changes due to large changes in its health status relative to those of other societies.

In fact, data on health-related indicators are scanty and mostly inaccessible across nations. Likewise, morbidity data too are not available on a reliable basis. Further the questions of conceptualising and measuring morbidity are still being debated. Mortality and its related indicators for which a systematic data base is well developed at the national level are, on the other hand, used to assess inequality in health status. Mortality data cannot be directly used, however, for international comparisons of health status because they need to be standardised for differences in age distribution and sex composition among countries. This problem does not arise, however, in intra-national analysis. It means that mortality data becomes the

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[1] WHO (1977), quoted in Kopparty S.N.M. (1994), p.1.

[2] Illsley et *al.* (1991).

second best indicator of assessing the various dimensions of inequality in health status of a nation by sex, region, ethnicity and time.

Inequality in health status is of two types: social and spatial. Social inequality is the one which is associated with the differences in health status between the sexes and among ethnic groups; spatial inequality refers to regional differences in health status arising out of differences in socio-economic and cultural conditions. Sociologists and Anthropologists are of the view that differences in the socio-cultural practices among societies determine the persistence of social inequality in health. More specifically, studies on social stratification define the social dimension of inequality in health as the difference in health among individuals in different social classes of a given society. The social dimension assumes importance in the analysis of health status of a society where the occupational structure is intertwined with caste hierarchy. The difference in health status as between males and females is also a major social dimension of inequality in health. Given the biological norms, the low female life expectancy relative to that of males in most of the low income countries is a telling commentary on the prevalence of gender inequality in health. On the neglect of women, Freeman and Maine (1993) aptly point out that "a shamefully large number of girls and women die each year because of the unique risk inherent in being female in a world where females are second class citizens".[3]

Spatial inequality in health is not an altogether different dimension of health inequality but a related dimension of social inequality in health. The spatial dimension enriches one's understanding of the social dimension. For instance, the analysis of health inequality

[3] Freeman and Maine (1993) quoted in Curtis and Taket (1996), p.90.

between developed and developing countries would indicate not only the gap in human development between them but also highlight the need for developing countries to redirect their resources towards improvements in their health status. This is what the developing countries including India have been doing as a part of the structural adjustment programme since the early 1980s. It has indeed wide ramifications also for narrowing down the global health inequality. Similarly, the persistent regional inequality in health is a matter of concern for a country whose avowed objective is its elimination through processes and programmes targeted for regions with higher incidence of mortality. The dynamics of social and spatial health inequality can be captured only through an inter-temporal analysis. Such analyses help countries to do mid-term appraisals of policy interventions and effect mid-course policy corrections.

Recent studies made with an inter-disciplinary perspective have gone beyond the conventional class-based social relations for getting better understanding of the link between social disadvantage and health status through introduction into the enquiries of characteristics reflecting working conditions, levels of education, housing, income and ownership of consumer assets etc.[4] Indeed, they draw heavily from economics, health and anthropology in order to understand how social factors influence health at various levels such as household, ethnic group, sex, occupational status and living condition. The publication of the Black Report (1980) initiated a debate on the need to find out the nature, extent and causes of inequalities in health and health care systems all over the world, but particularly

[4] Fox *et al.* (1985), Lundberg (1991), Blane *et al.* (1993), Berman *et al.* (1994) and Hammarstrom (1994).

in Britain.[5] This Report has persuaded development professionals particularly economists to examine fresh causes and consequences of inequality in health in developing countries particularly in the context of globalisation since the early 1980s as may be seen from the studies[6] which have appeared in recent years, in which health inequality is linked not only to poverty but also to economic valuation of women and burden of work.

1.2 Dimensions of Health inequality in India

A brief review of Indian studies on the theme is made here to identify the gap in the literature, in the light of the foregoing discussion on dimensions of health inequality. At the outset, it may be noted that the present review is not an exhaustive one because the review of the relevant studies runs through the study. Most of the studies addressed social inequality in health status, particularly gender inequality in health, attributing excess female mortality to decline in female-male ratio (FMR).[7] The attempts at providing explanations for the persistent and prolonged decline in FMR since 1901 have resulted in the development of the concept of 'missing women', a concept which has generated interesting discussions with regard to its magnitude and regional dimensions.[8] The spatial dimension of health inequality has received particular attention of scholars.[9] Besides, while extending their enquiry to other

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[5] Cited in Townsend (1987).

[6] Townsend (1987) and Freeman and Maine (1993).

[7] For a detail discussion, see Visaria (1961), Registrar General, India (1972), Dandekar (1975), Chen (1982), Clark (1987), Krishnaji (1987), Sen (1987), Dreze and Sen (1989) and Raju and Premi (1992).

[8] On this see Dreze and Sen (1989), Coale (1991), Sen (1992), Dreze and Sen (1995), and Agnihotri (1995).

[9] For an excellent survey of the literature, refer Kishor (1993; 1995).

related aspects of demographic transition and epidemiological and health transition, demographers also have tried to make enquiries into questions of health status in India.[10]

Gender Inequality in Health Status

The persistent decline in FMR since 1901 is the one sure indicator of health inequality in India. This disturbing trend has gone in for detailed enquiry in several studies. Various factors responsible for the phenomenon have been identified. A straight forward explanation is that it is excess female mortality that cause the decline in FMR. A pioneering study by Visaria[11] (1961) attempted to find out the underlying factors responsible for high female mortality prevailing in almost all parts of the country, especially in the north and north-west regions of the country. The study attributed the excess female mortality to the following factors: (i) female infanticide and neglect of females; (ii) maternal mortality; (iii) epidemics and famines; and (iv) tuberculosis mortality. In fact, Visaria demonstrated that the decline in FMR is not due to differences in FMR at birth but because of age-specific excess female mortality. Moreover, his explanation for the excess female mortality is that the female throughout her life is considered an economic burden, or liability, to the family, particularly among the poor.

Dandekar (1975) pointed out that excess female mortality is due to social factors rather than biological factors. Her argument is that there are various facets of life namely, education, employment etc. in which females are deliberately discriminated. Chen (1982) attributes the

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[10] To mention a few, Visaria (1961), Bhat and Rajan (1990), Raju and Premi (1992) Mahadevan (1993), Navaneetham (1993a; 1993b) and Zachariah *et al.* (1994).

[11] Visaria, P. (1961), Chapter IX, pp. 53-63.

decline in FMR to sex-biased enumeration and sex-selective migration. He extends his argument to the case of Kerala to say that its high FMR is partly explained by the male out-migration to the Middle East and other countries. This explanation is unconvincing since the decline began much earlier than the emergence of the Gulf migration episode. Dreze and Sen (1989) are of the view that unequal division of food between male and female members and inequalities in access to health care cause excess female mortality which in turn causes decline in FMR. Agnihotri (1995) estimates that the total number of 'missing females' has gone up from 133.52 to lakh in 1961 to 318.49 lakh during 1991.[12] In the light of the experience of Kerala where females outnumber men, Sen (1992) argues that "the missing women may be rescuable, after all, by public policy".

Krishnaji (1987) analysed variations in FMR across families under different size groups of landholdings and between agricultural labour and other rural households. He observed that "discriminatory practices - especially in relation to nutrition and health care - are more effective among the land-owning classes than in poor families, given the very low standard of living of the latter".[13] Krishnaji brings out an important dimension of valuation of women, namely that the better balanced FMR among the labouring poor may be possibly due to the recognition of women's contribution to family income in day-to-day life which is not the case with better-off families. Besides, he also adds that the phenomenon of pronounced female deficit is found more among large land holdings even in the south where the FMR is, in general, more evenly balanced.

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[12] For further details, see Agnihotri (1995).

[13] Krishnaji (1987), p.897.

The review of the studies on gender inequality in health highlights that both FMR and female valuation tend to improve as women's contribution to family income becomes significant. In a society in which women are seen to be a liability, discrimination against women becomes a social phenomenon. In a state like Kerala in which woman is not considered a liability but relatively more or less an equal partner, one finds only negligible discrimination against females, if at all. Nair (1974) provides convincing evidence that it is only education and related factors through which Kerala has made such a remarkable progress in the health status of its people. Nair's study is worth mentioning in the sense that it generated discussions on the issue of spatial inequality in health status in India through a comparison of other states with Kerala.

Spatial Inequality in Health Status

The pace at which Kerala outdistances the other states in the level of health status, has led to the emergence of the recent debate on north-south inequality in health status.[14] Much of the discussion centres around the north-south differentials in mortality, particularly excess female child mortality. In his district level analysis, Deshpande (1995) found that factors such as female literacy, female age at marriage, households electrified and health personnel have decisive influence on levels of child mortality. Besides, he also observed that the proportion of SC/ST and child mortality is positively correlated with each other, implying that areas of more agricultural labourers and SC/ST population are likely to be socially and economically poor compared to other regions and hence likely to have larger incidence of deaths among them.

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[14] For an excellent survey on the debate, see Kishor (1993; 1995) and Deshpande (1995).

He also provides enough evidence for the existence of a divide between the north and the south in India in terms of factors determining child mortality, especially female child mortality. He infers that of the factors considered, female literacy and access to health care have played their contributory role in attaining low levels of child mortality with less female discrimination in the southern states. A widely quaoted study of Kishor (1993) proved statistically that there is a great divide between the northern and the southern regions in terms of female child mortality.

The foregoing review points out that the issues in health inequality in India are largely age-specific, gender-specific and region-specific. To recapitulate, the decline in sex ratio (FMR) in the country is the result of excess female child mortality, particularly in the northern region. A striking observation is that most of the studies have looked at the dimensions of health inequality in isolation rather than in totality. The present study makes a modest attempt to examine the aforesaid dimensions of health inequality together and appraise the health status in India through a measure of Health Status Index ($HS_{(q)}$).

1.3 Objective of the Study

The main focus of the study is to examine various dimensions of health inequality in India using age-specific mortality rates. More specifically, the present study delves into gender and regional dimensions that are critical to the understanding of the inequality in health status. An attempt is also made to go beyond the analysis of mortality rate to enquire into the causes of death for a better understanding of the health status.

The objectives of the present study are as follows:

(i) to examine the 'missing female' hypothesis using gender differentials in mortality across age groups;

(ii) to seek answers to the north-south divide in mortality behaviour;

(iii) to assess gender and regional inequality in health status using a measure of health status index;

(iv) to probe into the causes of sex selectivity in death in terms of causes; and

(v) to appraise the economic valuation of women using the Beckerian approach

The study is based mainly on data obtained from various publications of the Office of the Registrar General of India. Data from the Sample Registration System (SRS) are used to compute various statistical estimates. SRS data published by the Registrar General are considered more authentic than those of other sources. Besides SRS data, the other sources used in the study are: Census Reports and CMIE Report (India's Social Sectors). The methods of analysis followed in the study are discussed in the respective chapters.

1.4 Chapter Scheme

The present study is organised into 5 chapters. Chapter 2 deals with differentials in mortality and dimensions of inequality in health status in India during 1971-1991. An elaborate discussion on the causes of death and gender discrimination is made in chapter 3. The economics of the north-south divide in sex ratio (FMR) is analytically explained with the help of the Beckerian approach in chapter 4. Chapter 5 provides a summary and the conclusion of the study.

Chapter 2

Dimensions and Differentials in Mortality

Mortality rate may be viewed as an important indicator of the health status of a people. Low mortality rate, especially child mortality rate, in a particular region or nation reflects its attainment of fairly high socio-economic and health status. Recent literature identifies a variety of factors, including health care, nutrition, education, housing, water supply, environmental pollution, lifestyle and income, that influence the health status of a population.[1] Sen (1993) argues that mortality rate can be considered a summary indicator of economic performance of a region or a nation.

There is no consensus, however, with regard to the causal factors for the observed trend and pattern of mortality. Researchers have come up with alternative explanations drawn from the view points of different disciplines, namely demography, economics, and sociology.[2] For instance, a review of mortality studies suggests that higher rates of mortality - particularly at childhood and among females in the rural population- is a major feature characteristic of developing societies. India is a typical case in point.[3] It would, therefore, imply that health transition in a society depends as much on the reduction of sex- and region-specific mortality rates at the earlier age groups as on the overall decline in mortality. These two inter-linked aspects of health transition are taken up in this chapter for fresh enquiry.

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[1] Dunlop and Martins (1995).

[2] See Visaria (1961), Sen (1987; 1992), Dreze and Sen (1989) and Kishor (1993).

[3] An excellent survey of the literature is given in Basu (1989; 1993) and Kishor (1995).

This chapter is organised into five sections. Section 1 highlights the features of mortality differentials and their change over time among broad age groups; the sex-specific mortality differentials are discussed in section 2; the spatial differentials, namely differentials among selected Indian states (North-South) and between rural India and urban India, is the topic under discussion in section 3; section 4 attempts to assess health status by regions reckoned in terms of rates. The discussion is summarised and the conclusions therefrom drawn in the final section.

Section 1

Age-specific Differentials in Mortality

Mortality rates are different at the different age intervals among males and females. Between the sexes there exist differentials in the age-specific mortality rates. Therefore it is important that mortality is studied with respect to both age and sex. Accordingly, the present study classifies the life span of the population into several age groups: child-age (0-4), younger-age (5-14), middle-age (15-54) and old-age (55 plus). Mortality rates have been computed using Sample Registration System (SRS) data published annually and decennial Population Census Totals for Rural, Urban and Combined, published by the Registrar General of India.[4] A recent study by Navaneetham (1993a) observed that mortality rates in India have been

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[4] It is to be noted that instead of mid-year population totals, we use Census population totals since there is no much difference between Census and mid-year population. Usually, Census is conducted during the months of April and May whereas mid-of-the-year comes in June. Further, mid-year population is the one which is projected by the demographers on the basis of assumptions while what the Census population gives is the actual data. In 1981, the state of Assam was not covered in the population Census; in 1991 Census, it was Jammu and Kashmir that came to be excluded.

declining during the period 1970 to 1986.[5] The present study, analyses the decadal changes in age-specific mortality rates computed for three time points namely 1971, 1981 and 1991.

It may be seen from Table 2.1 that mortality rate in 1971 was the highest during childhood (0-4) and the lowest during the younger-age group of 5-14. During adulthood (15-54) also the rate remained low, but was higher than that for the younger-age group; thereafter at 55 plus, it shot up. This pattern is found valid also for 1981 and 1991 also. However, significant changes are observed in the mortality rates under the different age groups over the time points.

Table 2.1

Age-specific Mortality Rates by Age group: India, 1971-1991

Age group	1971	1981	1991
	Combined	Combined	Combined
0-4	51.91	41.18	26.51
5-14	3.48	2.90	2.13
15-54	5.56	4.66	3.97
55+	48.57	45.31	41.02
All*	15.05	12.55	9.85

Note: * the negligible difference between the estimated and actual mortality rates is due to the conversion of rate per mille into absolute numbers. 'Combined' refers to overall mortality (male and female).
Source: Registrar General, India (1982; 1985; 1993).

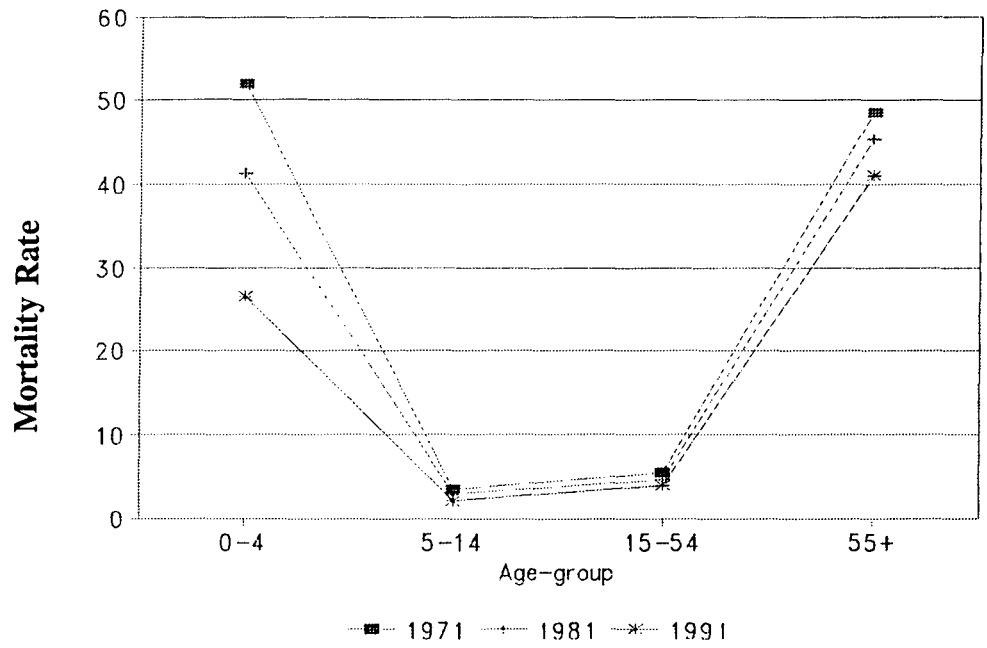
Generally, in a developing country, mortality rate is very high in the lowest and the highest age groups. On the contrary, in developed countries, it is low in all age groups except the

[5] For details see Navaneetham K (1993a).

highest.[6] As far as India is concerned, we observe that, as typical of a developing economy, both the ends of the age distribution have very high rates of mortality. However, during 1971-1991 child-age group mortality has declined significantly.

In fact, the pattern of age-specific mortality in India represents a typical 'U' shape curve normally observed for all developing countries. The curve takes the shape of 'J' for developed countries indicating that mortality rate at childhood is kept in these countries at its natural minimum.[7] The shift in the pattern of age-specific mortality from the 'U' shape

Chart 2.1
Mortality Rate in India: 1971, 1981 and 1991



[6] For details see, United Nations (1992).

[7] For example, in Norway, in the child-age group of 0-4, only 511 deaths were during 1990. Similary, other Scandinavian countries like Sweden and Denmark also follow the same pattern. For details see United Nations (1992).

typical of developing countries to the 'J' shape typical of developed countries indicates the process of transition of health status associated with demographic transition taking place in India. This process of transition in health status may be seen reflected in the changes in age-specific mortality rates over time (see Chart 2.1).

It is seen from Chart 2.1 that the typical 'U 'shape of the age-specific mortality curve has ramained in tact though a tendency has set in for a gradual transformation towards the 'J' shape, resulting from a steady mortality decline during childhood (0-4) since 1971.

Section 2

Sex-specific Differentials in Mortality

The issue of sex-specific mortality differentials across age groups has attracted the attention of several scholars who addressed the perplexing question of 'missing females' in India.[8] The question of 'missing females' derives its strength from the fact that the average life expectancy of females is normally higher than that of males.[9] The biological advantage that females enjoy over males in the average life expectancy at birth, *ceteris paribus*, would produce a female-male ratio (FMR) of at least one, i.e., equal number of males and females in the population, unless there exists in the society some form of discrimination against females. Such discrimination would give rise to the phenomenon of 'missing females' as pointed out by Dreze and Sen (1989). The historic FMR for India is shown in Chart 2.2

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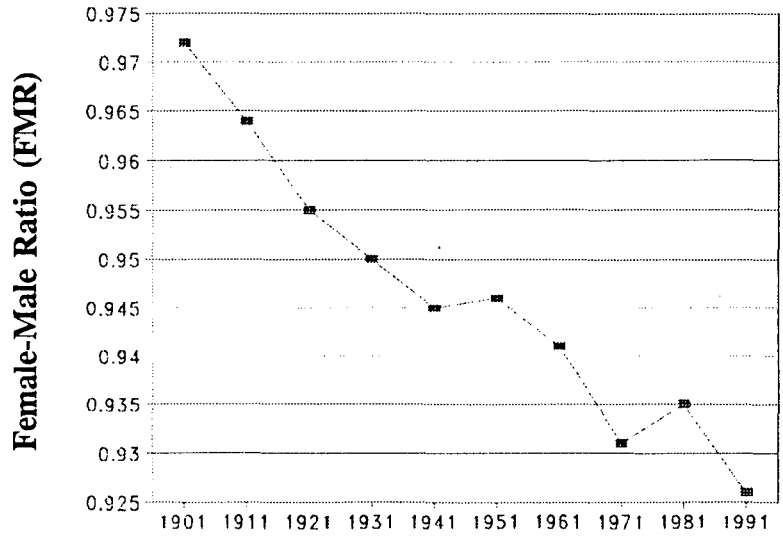
[8] Dreze and Sen (1989; 1995), Coale (1991), Sen (1992), Agnihotri (1995).

[9] However, one may easily find that the situation is different and the reverse in several parts of South Asia, the Middle East and North Africa. For a detailed discussion, see Basu (1989).

which clearly indicates a secular decline in the ratio except a stabilisation in the 1940s and an increase in the 1970s. It is also interesting to note that the trend in the ratio has continued to decline even after independence. This fact would suggest that the policies embarked upon

Chart 2.2
Female-Male Ratio, India: 1901-1991



by the successive governments for the upliftment of women have failed to make any significant positive impact on the social and living conditions of women. In fact, the declining FMR observed over time strengthens the hypothesis of 'missing females'.

In an effort to explain the decline in FMR, Visaria (1961) demonstrated that it is not due to the differences in the sex ratio at birth but possibly because of the age-specific excess female mortality. Along the line of Visaria (1961), we attempt to explain the 'missing females' hypothesis by examining the sex-specific mortality differentials across various age-groups.

It may be seen from Table 2.2 that mortality in India is apparently age-specific in nature. A substantial part of death occurs in the age-group of (0-4) and 55 plus. This tendency has continued to exist till the end of the study period despite a discernible decline in mortality rates across age groups. The decline in mortality rate is relatively more pronounced in the age group of (0-4).

Table 2.2

Age-specific Mortality Rates by Sex: India, 1971-1991

Age-group	1971		1981		1991	
	M	F	M	F	M	F
0-4	49.20	54.80	39.20	43.30	25.60	27.50
5-14	3.37	3.61	2.76	3.06	2.01	2.26
15-54	5.53	5.60	4.62	4.71	4.19	3.73
55+	50.80	46.24	48.33	42.19	44.47	37.54
All	14.72	15.41	12.41	12.70	10.02	9.66

Note: M and F refer to Male and Female respectively.
Source: Registrar General, India (1982; 1985 & 1993, SRS) and (1972b; 1988 & 1994, Census).

The sex differential in mortality across age groups, however, reveals that in all age groups except the 55 plus, there exist excess female mortality (see Table 2.2). Male mortality is higher than female mortality only in the age group (55 plus). By 1991, the excess female mortality in the age group (15-54) has reversed to excess male mortality. Moreover, the sex differentials in mortality rates, in the first two age groups have been narrowing down over time. Still, they are, in general, on the rise for the last two age groups.

As the foregoing analysis is based on the absolute differentials between male and female mortality rates, it might perhaps obscure the actual behaviour of sex differentials in mortality

across age groups, particularly excess female mortality. To overcome this measurement problem, we have computed the ratio of female mortality rate to male mortality rate (FMMR) for the respective age groups. By doing so, the sex differentials in mortality across age groups get adjusted for male-female ratio. This ratio may thus be taken as a relative concept which is capable of bringing out more clearly the sex differentials in mortality across age groups. Besides, this ratio also can be used to demonstrate the probability of more females dying than males do across age groups.

Table 2.3

Ratio of Female-Male Mortality Rate: India, 1971-1991

Age-group	1971		1981		1991	
	FMMR	% of Total Mortality	FMMR	% of Total Mortality	FMMR	% of Total Mortality
0-4	1.114	50	1.105	44	1.074	35
5-14	1.071	6	1.111	6	1.126	5
15-54	1.014	19	1.021	20	0.890	22
55+	0.910	25	0.873	30	0.844	38

Note: FMMR refers to the ratio of female mortality to male mortality rate.
Source: same as Table 2.2.

At the outset, it may be noted that female mortality should be in excess of male mortality if the ratio is greater than one and *vice versa*. It may be seen from Table 2.3 that the child age-group (0-4) and the younger-age group (5-14) continue to have excess female mortality. In fact, the excess female mortality in the age group of (5-14) is found to have been increasing gradually during the study period (1971-1991). In the age group (15-54) excess female mortality has disappeared by 1991. It is seen that the upper age limit of the excess

female mortality has been steadily coming down since 1971. This seems to be the case in all age group below 30; see Appendix Table 2.3.[10]

Section 3

Spatial Differentials in Mortality

Despite decline in excess female mortality in the age group (0-4), the fact remains that the chances of dying continue to be higher for female children than for male children.[11] Sen (1987) argues that excess female child mortality is due to the neglect of female children particularly in north India. This issue has led to studies on spatial dimension of female child mortality. Most of the studies attempt to explain the 'North-South Divide' in female child mortality, especially the difference as between Kerala and the rest of India.[12] In an effort to examine the relationship between poverty and female-male ratio, Krishnaji (1987) observed that "agriculturally rich wheat-based states of Punjab and Haryana have very low female

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10 Owing to the limited number of age groupings followed in the present study, the aggregate estimates given in Tables 2.2 and 2.3 may not reveal the extent of downward shift in age-specific excess female mortality. To overcome this problem, we have expanded the four classes of age groups to 15 classes as given in the SRS Report. It may be noted from the Appendix Table that the age limit of the excess female mortality has declined from (35-39) in 1971 to (30-34) in 1981 and (20-29) in 1991. Apparently, more females are dying during the early part of their life cycle whereas more males die during the later part. This has implication for identifying the source of sex imbalance in Indian population.

11 An excellent survey of the literature, see Basu (1993) and Kishor (1993).

12 On this see Krishnaji (1987), Chen (1982), Basu (1989), Sen (1993), Kishor (1993), Dreze and Sen (1995) . More recent study by Murthi, Guio and Dreze (1997) statistically tested and proved that "southern regions has considerably lower levels of child mortlity".

[male] ratio .... and the paddy-based south has the highest sex ratio".[13] In a study on determinants of child mortality in India, Deshpande (1995) summarises his district-wise analysis of mortality thus: "excess female child mortality districts are found more in the districts of northern states while these are few in the districts of southern states".[14] In a widely quoted study, Kishor (1993) puts an interesting argument with statistical support that "while female mortality is greater on average in the north than in the south, male mortality is greater in the south".[15]

In a more recent study, Murthi, Guio and Dreze (1997) have strengthened the hypothesis of north-south differences in female child mortality with rigorous statistical treatment and stated that "with respect to both child mortality and gender bias, the contrast between the southern region and the rest of the country is statically significant".[16] They attribute the lower levels of female child mortality in the southern region to a survival advantage that female children enjoy over male children.

The foregoing discussion on spatial differentials in child mortality shows clearly that there exist north-south differences at the level of child mortality. With regard to gender bias between the northern and the southern regions of India, there are conflicting views on child mortality such as: (i) the lower levels of female child mortality in the South is the result of excess male child mortality (Kishor) and (ii) lower levels of female child mortality in the

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[13] Krishnaji (1987), p.892.

[14] Deshpande (1995), p.8.

[15] Kishor (1993), p.260.

[16] Murthi, Guio and Dreze (1997), p.387.

South is the reflection of the higher survival advantage of the female child (Murthi, Guio and Dreze). An assessment of these existing explanations requires, however, a clear understanding of the north-south differences in child mortality and gender bias.

North-South Divide

In order to analyse north-south differences in child mortality and gender discrimination, the states were grouped into northern and southern regions in accordance with the broad classification outlined in the literature.[17] The southern region includes Andhra Pradesh, Karnataka, Kerala and Tamil Nadu while the northern region consists of Bihar, Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh. The results are reported in Table 2.4. A striking observation is that both the regions have experienced a decline in child mortality over time. This is true for both the sexes as well. The North-South Ratio (NSR) indicates that despite the decline in child mortality, the north-south gap continues to exist.

The ratio of female mortality to male mortality (FMMR) is examined to see whether there has been a gender bias in mortality decline in the regions under reference. It is seen that gender bias is predominant in the northern region although, even in this region there are signs of decline in gender bias along with the decline in child mortality. In case of the southern region, the decline in child mortality is found to be, in general, gender-neutral. It means that the southern region does not discriminate against female child as much as the

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[17] There is no clear-cut division of northern and southern regions, a fact which has led scholars to classify regions variously. Even though the regional groupings have differed among studies, there is uniformity in regional classification in the case of a few major states. For details, see foot note 15 of Murthi, Guio and Dreze (1997), p.336, foot note 8 of Kishor (1993), p.253 and Registrar General, India (1993), SRS.

Table 2.4

Child Mortality and Gender Bias by Region: 1971-1991

Region	Year	MALE	FEMALE	PERSON	FMMR
NORTH	1971	59.6	74.2	66.5	1.24
	1981	47.9	57.1	52.3	1.19
	1991	29.9	34.5	32.1	1.15
SOUTH	1971	39.5	38.0	38.7	0.96
	1981	27.6	27.4	27.5	0.99
	1991	18.7	17.7	18.2	0.94
NSR	1971	1.51	1.95	1.72	--
	1981	1.74	2.08	1.90	--
	1991	1.60	1.95	1.76	--

Note: NSR refers to North-South Ratio for the variables under study.
-- indicates Not Applicable.
Source: same as Table 2.1

northern region does. What is striking, however, is that the gender discrimination may perhaps be a phenomenon associated with higher mortality. It seems that once mortality begins to decline, gender discrimination also tends to disappear, even if only gradually.

In order to gain more insights into the phenomenon of gender discrimination at higher order mortality, the analysis of north-south is extended to the disaggregate analysis of northern states *versus* southern states. The trend in the pattern of child mortality by states reiterates the one observed at the aggregate level, namely that all the states have experienced a decline in child mortality but the difference in the levels as between the northern and the southern states persists (see Table 2.5). A comparison of the northern states with the southern states (particularly the southern most state of Kerala) in health transition suggests that the former lag far behind. In fact, the lag between the northern states (except Punjab) and Kerala is

Table 2.5

Child Mortality and Gender Bias by North-South Regions and States: 1971-1991

States	Year	Male	Female	Person	FMMR
Northern Region					
Punjab	1971	31.3	47.6	38.9	1.521
	1981	23.8	27.7	25.7	1.164
	1991	15.6	18.4	17.0	1.179
Bihar	1971	--	--	--	--
	1981	40.2	44.9	42.5	1.117
	1991	20.9	24.8	22.8	1.187
Haryana	1971	29.5	35.8	32.5	1.214
	1981	32.7	42.5	37.3	1.300
	1991	22.3	23.8	23.0	1.067
Rajasthan	1971	--	--	--	--
	1981	46.8	54.1	50.3	1.156
	1991	28.4	33.8	30.9	1.190
Uttar Pradesh	1971	72.9	95.7	83.7	1.313
	1981	53.1	68.5	60.3	1.290
	1991	33.2	38.4	35.6	1.157
Madhya Pradesh	1971	48.6	51.2	49.8	1.053
	1981	58.2	63.1	60.6	1.084
	1991	42.4	46.6	44.5	1.099
Southern Region					
Kerala	1971	24.5	24.4	24.5	0.996
	1981	13.3	11.0	12.2	0.827
	1991	4.5	4.1	4.3	0.911
Tamil Nadu	1971	41.7	39.7	40.7	0.952
	1981	35.1	35.2	35.1	1.003
	1991	16.9	15.3	16.1	0.905
Andhra Pradesh	1971	44.7	44.0	44.4	0.984
	1981	30.8	30.0	30.4	0.974
	1991	22.3	20.2	21.3	0.906
Karnataka	1971	39.0	35.9	37.5	0.921
	1981	23.6	24.9	24.2	1.055
	1991	23.4	23.9	23.6	1.021

Note: -- Not Available.

Source: for Cols 3, 4 & 5 are same as in Table 2.4 and the last col. is estimated.

more than twenty years and between Punjab and Kerala is ten years. Of the northern states, both Uttar Pradesh and Madhya Pradesh are the states with the highest incidence of child mortality. The magnitude of child mortality in terms of level is so alarming that even after fifty years of independence 45 children per thousand in Madhya Pradesh and 36 in Uttar Pradesh die before they attain 5 years of age. At the same time, only 4 out of thousand children die in Kerala. This is a telling commentary on widespread disparities in child mortality among states and regions.

This does not mean that all southern states have the same level of achievements in health status in terms of decline in child mortality. The inter-state disparity among the southern states is shown Table 2.5. The process of catching up with Kerala's experience in health status is very much in evidence among the southern states. Like the northern states of Bihar, Haryana and Rajasthan, the southern states of Andhra Pradesh and Karnataka are also lagging behind Kerala by about twenty years. Tamil Nadu has achieved the level of improvements in child survival comparable to those of Punjab in the north. The foregoing discussion suggests an interesting hypothesis that all the states in India are on the march towards catching up with the Kerala's experience in health status (through improvement in child survival).

The disaggregate analysis of gender differentials in child mortality strengthens the findings based on the aggregate level analysis that the southern states have not experienced excess female child mortality to the extent to which the northern states have (see Table 2.5). The ratio of female-male child mortality shows that all the southern states have achieved improvement in child survival without aggravating the gender bias. In the case of the

northern states, the decline in child mortality is not accompanied by decline in excess female child mortality. Uttar Pradesh is the only northern state in which the excess female child mortality has been steadily declining. Madhya Pradesh, presents a quite interesting pattern marked by a drift towards excess female child mortality along with an overall decline in child mortality during the 1980s. It is evident from Table 2.5 that in case of the northern states other than Uttar Pradesh, the decline in child mortality is not accompanied by decline in excess female mortality. It follows that gender discrimination against the female child in the northern states persists even if it is not worsening.

Rural-Urban Divide

The issue of spatial dimension of child mortality has also been looked at from the angle of rural-urban divide. The rural-urban differential in child mortality is studied at length to examine the relative importance of factors specific to rural areas such as social, economic and cultural factors contributing to child mortality and gender bias. Of the factors considered, the economic factors particularly family income and family size, are seen to be the crucial determinants of the existing levels of child mortality. Krishnaji (1984) made two observations: (i) the average household size declines systematically as the per capita expenditure increases; and (ii) both death rate and infant mortality rate are positively correlated with the rise in per capita expenditure. In his subsequent study, Krishnaji (1987) argued that the sex ratio (Female-Male Ratio) declines as the size of land holding increases. The issue of relating the size of land holding with average family size and FMR assumes significance in the Indian demographic analysis for the simple reason that nearly three-fourths of population in India live in rural areas depending on agriculture for their livelihood. Moreover, the process of urbanisation is expected to bring about awareness among people

for better health care and changes in sex preferences of children. We, therefore, postulate here that child mortality and gender discrimination would decline as urbanisation increases. This assumption has prompted us to look at the rural-urban differentials in child mortality and gender bias in order to capture the impact of urbanisation on child mortality and gender discrimination.

We first validate the hypothesis of child mortality and gender discrimination for rural-urban differentials using age-specific Female-Male Ratio (FMR) and then move on to examine the same hypothesis using age-specific mortality rates. As argued earlier, the increase in urbanisation would prevent the FMR from declining. The observed decline in the overall FMR suggests that the pace of urbanisation is rather slow. It would, hence, imply that the decline in the overall FMR is largely the result of decline in FMR in rural areas. This proposition is validated here with empirical support.

At the aggregate level, it is found that the FMR declines in the rural area and increases in the urban area indicating thereby that the observed decline in overall FMR is largely a rural phenomenon (see Table 2.6). At the same time, the increase in FMR for urban area confirms the argument that FMR would increase as the pace of urbanisation advances. The increase in urban FMR, however, has not been reflected in the overall FMR because the urban FMR in terms of level is much lower than that of rural.

In order to get a better understanding of rural-urban differentials in FMR, we have examined the pattern of FMR by age groups. It is observed that there is a contrasting pattern in age-specific FMR as between rural and urban for all age groups except the old-age group (55

plus). In rural, the FMR declined during the study period. The decline in rural FMR is more pronounced since the 1980s. Moreover, the decline in rural FMR is found to be relatively more in the 0-4 age group followed by the younger (5-14) and middle-age (15-54) groups. On the contrary, the urban FMR has registered an increase during the 1970s but remained more or less at the same level during the 1980s. Within the age groups, the increase in urban FMR is pronounced only in the age group of (15-54). In case of the old-

Table 2.6

Female-Male Ratio by Age : India (Rural & Urban), 1971-1991

Age group	1971			1981			1991		
	R	U	C	R	U	C	R	U	C
0-4	0.945	0.897	0.935	0.947	0.909	0.936	0.925	0.910	0.920
5-14	0.929	0.885	0.920	0.929	0.902	0.920	0.919	0.894	0.907
15-54	0.957	0.830	0.930	0.941	0.860	0.935	0.939	0.876	0.925
55+	0.969	0.913	0.955	0.987	0.919	0.970	1.001	0.984	0.990
All	0.948	0.858	0.930	0.943	0.880	0.934	0.938	0.892	0.926

Note: R, U and C refer Rural, Urban and Combined respectively.
Source: same as Table 2.5.

age group, the trends in the pattern of FMR between rural and urban is quite striking. The rural FMR is increasing steadily while the urban FMR has been rising gradually. The pace at which the rural FMR in the old-age group is rising, is significant to the extent that it approached unity in 1991 (see Table 2.6). It means that the females live longer once they cross over the period of maternal risk (15-54). It follows thus that the decline in the overall FMR is contributed mostly by rural FMR specific to lower age groups.

The decline in rural FMR specific to lower age groups is examined here by analysing the trends in age-specific mortality in rural areas relative to that of urban. Like the all-India pattern, the mortality rates by age distribution for rural as well as urban areas show the distinct shape of "U" curve but for the difference in rates between rural and urban areas (see Appendix Tables 2.1 and 2.2). Interestingly, mortality across age groups, especially child mortality, has been declining over time. The rate of decline in child mortality is quite significant in case of rural areas during the 1980s (see Appendix Table 2.1). The rural-urban gap in mortality rate is, however, more pronounced in the child-age (0-4) group. Although the rural-urban gap in child mortality rate has begun to narrow down during the study period especially from 1981 onwards, it continues to persist with a sizeable margin of 13 children more dying in rural areas (see Table 2.7).

Table 2.7

Rural-Urban Difference in Mortality Rate by Age and Sex: India, 1971-1991

Age-group	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
0-4	22.10	26.00	24.02	23.10	27.10	20.05	12.70	13.60	13.14
5-14	1.68	1.89	1.78	1.31	1.86	1.56	0.80	1.31	1.04
15-54	1.73	2.19	1.94	1.05	2.02	1.51	0.66	1.39	1.00
55+	5.77	8.82	7.17	9.37	7.78	8.50	2.83	3.32	3.05
All*	6.44	7.31	6.86	5.27	6.35	5.79	3.20	3.77	3.46

Note: M, F and P refer to Male, Female and Person respectively.
Source: same as Table 2.6

It is found that rural area has higher female mortality than urban area. At the age group level, excess female mortality is found to be prevalent in the lower age groups for rural as

well as urban (see Table 2.8). In case of rural area, the excess female mortality in both child-age (0-4) and middle-age (15-54) groups has been declining while it has been on the rise for the younger-age group (5-14). With regard to urban area, it is observed that the female-male mortality ratio is closer to one although there is some degree of female discrimination in the lower age group, a phenomenon which tends to disappear over time. Nevertheless, the sign of trend reversal in excess female mortality in the child-age group since 1981 indicates that 'son preference' is gaining importance among urban population since the early 1980s (see Table 2.8).

Table 2.8

Ratio of Age-specific Female to Male Death Rates: India (Rural & Urban), 1971-1991

Age-group	1971		1981		1991	
	Rural	Urban	Rural	Urban	Rural	Urban
0-4	1.115	1.071	1.114	1.045	1.075	1.078
5-14	1.079	1.039	1.153	0.942	1.167	0.890
15-54	1.021	0.919	1.068	0.830	0.929	0.721
55+	0.920	0.844	0.875	0.886	0.851	0.829
All	1.049	0.990	1.046	0.941	0.979	0.896

Source: same as Table 2.7.

The foregoing analysis highlights two interesting observations: (i) the decline in excess female child mortality in rural area has been significant to the extent that it has approached the same level of excess female child mortality as that of urban area by 1991 and (ii) the chances of dying for the female child relative to those of the male child, in the younger-age group in rural area, have been worsening over time. The observed high incidence of (excess

female) mortality in the child-age (0-4) group, accompanied by the worsening excess female mortality in the younger-age (5-14) group, in rural area, calls for an enquiry into the causes of death in general and the neglect of female children below the age of 14 in particular (This issue is taken up in the next chapter).

In the light of the rural-urban differentials in mortality by age and sex, the issue of North-South differentials in mortality may now be evaluated using an urbanisation index. For the present exercise, we construct a crude index of urbanisation for the year 1991 by taking the ratio of urban population to total population. The index of urbanisation is computed for the North and the South as well as for the constituent states. Our attempt here is to examine whether urbanisation has a positive impact on health status through reduction in child mortality and gender bias. This issue is extensively discussed in the literature to identify the factors that contribute to the rural-urban differentials in mortality, particularly child mortality.[18] Different factors are assumed to have differential impact on rural-urban differentials in mortality. The concentration of trade and industry in the urban area leading to environmental pollution which adversely affects the health of workers and residents therein, is expected to worsen urban mortality relative to rural mortality. Yet another argument is that access to health infrastructure and quality of health care in urban area would result in low urban mortality as compared to that in rural area. The absence of mass starvation (following floods and famine) in urban areas due to entitlement of food through fair price shops would tend to keep urban mortality low. All these arguments amount to suggest that "the better-offs have access to a better environment and can afford better health

[18] For details, see Skeldon (1986), Bhat (1987), Basu (1990) and Crook (1996).

care".[19] The urban population have, by and large, higher real incomes than the rural population. Tendulkar and Jain (1991) provide supporting evidence to the argument that the proportion of urban poor is lower than that of the rural poor.

Moreover, it is often argued that the process of urbanisation in India which is largely the product of rural-urban migration and expansion of urban boundaries, retains the rural values and cultural practices. The rural environment in an urban setting has a tendency to influence the urban migrants and their children in such a way that the pattern of urbanisation would not change the life style of urban migrants, equalize the status of women with that of men and replace the age-old 'superstitious' health practices with more effective modern medicine.[20] In fact, this would undermine the positive effects of urbanisation on mortality and gender discrimination one expects theoretically. It follows that reduction in urban mortality relative to rural mortality depends as much on the change in life style of urban migrants as on the degree of urbanisation.

The foregoing discussion on rural-urban differentials in mortality, particularly child mortality, highlights that urbanisation without the attendant changes in the life style of urban population would tend to be as much male-biased as are the rural values and cultural practices in a patriarchal system to suit the interests of the male. By contrast, in a society where matrilineal system is in practice giving empowerment to women in terms of education and partnership in development processes, a sizeable reduction in child mortality with higher

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[19] Crook (1996), p.151.

[20] Ibid p.152.

valuation of female children is possible even at low levels of urbanisation. One may visualize four major alternative scenarios:

(i) higher degree of urbanisation with high female illiteracy may result in high child mortality with less female valuation;

(ii) higher degree of urbanisation with low female illiteracy may result in low child mortality with more female valuation;

(iii) lower degree of urbanisation with high female illiteracy may result in high child mortality with less female valuation; and

(iv) lower degree of urbanisation with low female illiteracy may lead to low child mortality with more female valuation

Against the above possible scenarios, we may try to appraise the relative importance of contributory factors for the north-south differentials in child mortality and female valuation. At the regional level, it may be seen from Table 2.9 that the southern region depicts the second scenario of higher degree of urbanisation with low female illiteracy leading to low child mortality with more female valuation whereas the northern region falls into the third scenario of lower degree of urbanisation with high female illiteracy resulting in high child mortality with less female valuation. Within the regions, there can be different scenarios at state level. In order to get more insights into the dynamics of child mortality and female valuation, we also attempt to appraise the state level mortality performance against the alternative scenarios.

At the outset, it may be noted that the northern states and southern states are treated as the respective constituents of northern and southern regions as there exists a marked difference in socio-cultural factors between the regions. For interpretative purpose, we use the

respective regional estimates as the threshold values to classify the respective constituent states into the above scenarios. Within the southern region, each state displays a different scenario. Tamil Nadu has experienced the second scenario of higher degree of urbanisation with low female illiteracy leading to low child mortality with more female valuation whereas Kerala has the fourth scenario of lower degree of urbanisation with low female illiteracy resulting in low child mortality with more female valuation. Although these two scenarios give rise to similar outcomes, the contributory factors are different. In fact, urbanisation seems to have played an important role in reducing child mortality with more female valuation in Tamil Nadu while female literacy appears to be the crucial variable in achieving the same outcome in Kerala (see Table 2.9). On the contrary, Karnataka presents the first scenario of higher degree of urbanisation with high female illiteracy resulting in high child mortality but with more female valuation while Andhra Pradesh experiences the third scenario of lower degree of urbanisation with high female illiteracy leading to high child mortality but with more female valuation. It is clear that although female illiteracy accounts for the higher incidence of child mortality in both Karnataka and Andhra Pradesh, it does not result in less female valuation.

Regarding the northern states, it is found that the BIMARU states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh share the same outcome of high child mortality with less female valuation although they do not depict the same scenario. Madhya Pradesh and Rajasthan have the same scenario of higher degree of urbanisation with high female illiteracy resulting in high child mortality with less female valuation whereas Uttar Pradesh falls into the scenario of lower degree of urbanisation with high female illiteracy resulting in high child mortality with less female valuation. Bihar, however, does not strictly fall into any one of

the scenarios but has lower degree of urbanisation with high female illiteracy resulting in low child mortality with less female valuation as compared to other BIMARU states. The other two northern states of Punjab and Haryana present the same scenario of higher degree of urbanisation with low female illiteracy resulting in low child mortality but with less female valuation. It may be inferred that in BIMARU states, the lower degree of urbanisation and high female illiteracy might have worsened child mortality while the converse is true in

Table 2.9

Index of Urbanisation, Female Illiteracy and Child Mortality by Region and States:1991

States	Urbanisation Index	Female Illiteracy		Child Mortality	
		Rural	Urban	Rate	Gender Bias
Northern Region	**19.98**	**80.26**	**45.00**	**32.1**	**1.150**
Punjab	29.55	56.15	33.88	17.0	1.179
Haryana	24.63	67.49	35.94	23.0	1.067
Madhya Pradesh	23.18	80.27	41.08	44.5	1.099
Rajasthan	22.88	88.41	49.76	30.9	1.190
Uttar Pradesh	19.84	80.98	49.62	35.6	1.157
Bihar	13.14	82.05	44.06	22.8	1.187
Southern Region	**29.81**	**59.14**	**32.67**	**18.2**	**0.940**
Tamil Nadu	34.15	58.16	30.39	16.1	0.905
Karnataka	30.92	65.24	34.26	23.6	1.021
Andhra Pradesh	26.89	76.08	43.59	21.3	0.906
Kerala	26.39	14.88	10.94	4.3	0.911

Source: Registrar General, India (1993; 1994).

achieving relatively low child mortality in both Punjab and Haryana. All northern states, however, have, less female valuation (more gender discrimination in mortality) as compared

to southern states. Besides, the process of urbanisation has not improved the status of women in the northern states. These two striking observations strengthen our argument that there exist perceptible differences in the socio-cultural practices, especially attitudes of men towards females, between the north and the south even after fifty years of independence.

Of the factors considered, female literacy emerges as the crucial determinant of the level of child mortality. Female literacy can be attained either through urbanisation or by social intervention. In a state like Kerala, urbanisation is not a contributory factor for the higher levels of female literacy and hence the low levels of child mortality. It does not mean that urbanisation is not an important contributory factor for low levels of child mortality. In states other than Kerala, it is found to have positive impact on child mortality, although at lower pace. The foregoing analysis suggests that the provision of education for all, especially for females in the northern states, through an appropriate educational policy, would possibly improve health status through higher female valuation and concomitant reduction in child mortality.

Section 4

Assessment of Health Status

In this section we make a modest attempt to assess the regional variations in health status using mortality transition. Generally, the regional variations in health status at national/sub-national level are assessed using life expectancy (e_0^o) at birth. It is believed that life expectancy (LE henceforth), as it is based on age structure and age-related mortality, is a more accurate indicator of relative health status than crude mortality rate. In recent years, however, the choice of LE as an indicator of health status has been increasingly questioned

in empirical analysis because it "is a non-empirical datum expressing a likely outcome if certain assumptions hold true".[21] At the same time, the crude mortality rate though empirically observable, suffers from the limitation of non-comparability of relative health status among nations/sub-nations due to non-standardisation in age structure. While attempting to explain the international variations in health status, Shepperdson (1995, p.9) points out the weakness of the choice of crude mortality rate thus: "without standardisation, it (*crude mortality rate*) does not allow for the large international differences in age structure, especially the much larger ratio of old persons in MDCs". It means that once we standardise the age-specific mortality of nations/sub-nations by some measure, the limitations of the crude mortality as an indicator of health status can be overcome.

We propose a measure that is capable of standardising the age structure of mortality in such a way that while measuring the regional variations in health status between the northern and the southern states, it allows for the process of mortality transition from child-age group (0-4) through old-age group (55 plus). In an ideal situation, a perfectly healthy population defined in terms of mortality is one in which all deaths occur only in the old-age group. Conceptually, there can exist two extreme situations: (i) regions that have mortality only in the child-age group and (ii) regions which have mortality only in the old-age group. It means that mortality patterns in regions at different levels of health would be different; the lowest health regions showing predominance of child mortality, and the highest health regions having most mortality episodes at the highest age groups, with middle level health regions strewn in between. It gives rise to an interesting hypothesis that all regions undergo mortality transition depending upon the levels of demographic transition. Mortality transition

[21] Shepperdson (1995), p.9.

is thus conceptualised to capture the dynamics of mortality transition from lower age intervals to upper age intervals during the course of demographic and health transition.

The very conceptualisation of mortality transition indicates that the regions which complete the process of mortality transition, would have normally higher life expectancy and hence better health status. Besides, if the mortality transition does not leave behind morbidity in a region, then the region can be said to have undergone health transition.[22] The assessment of morbidity is rather a cumbersome task since it is too complex a phenomenon even for conceptualisation. Therefore, we limit the scope of our analysis to the assessment of regional variations in health status which can be better assessed, other things being the same, through mortality transition across regions.

In the light of the foregoing analytical reasonings, a measure of health status based on mortality transition, $HS_{(q)}$, is designed as follows.

$$HS_{(q)} = \frac{1}{1 + \frac{q^{*}_{(\leq 4)}}{q^{*}_{(\geq 55)}}} \qquad \ldots (1)$$

where $q^*(\leq 4)$ is the proportion of mortality in the child-age (0-4) group and $q^*(\geq 55)$ is the proportion of mortality in the old-age (55 plus) group.

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22 For a lucid discussion on the subject in the light of Kerala's social sector development, see Sen (1996). For any further discusssion on this account, see Krishnan (1995; 1996), and Nair (1997).

As postulated earlier, the value of $q^*(\leq 4)$ will become zero when a region has completed mortality transition. Similarly, the value of $q^*(\geq 55)$ will be zero when a region has not begun mortality transition. The former depicts the ideal situation of everyone dying only in the old-age group whereas the latter presents the scenario of everyone dying in the child-age group itself. In other words, the former shows the end of the mortality transition whereas the latter indicates the state prior to mortality transition. These two extreme situations corresponding to the beginning and the end of mortality transition, become naturally the lower limit as well as the upper limit for the $HS_{(q)}$ which are non-empirical datum.

The advantage of the above functional form enables us to define empirically the limits for the $HS_{(q)}$. The $HS_{(q)}$ takes the value of unity when $q^*(\leq 4)$ is zero. Similarly, the $HS_{(q)}$ approaches zero when $q^*(\geq 55)$ is zero. Alternatively, the $HS_{(q)}$ is one when everyone dies only in the old-age group, $q^*(\geq 55)$, and it is zero when everyone dies within the child-age group, $q^*(\leq 4)$. It can be shown in an algebraic form as follows.

(i) *For* $q^*(\leq 4) = 0$

$$\frac{q^*_{(\leq 4)}}{q^*_{(\geq 55)}} = 0, \quad HS_{(q)} = 1 \qquad \ldots (2)$$

(ii) *For* $q^*(\geq 55) = 0$

$$\frac{q^*_{(\leq 4)}}{q^*_{(\geq 55)}} = \infty, \quad HS_{(q)} = 0 \qquad \ldots (3)$$

The above specification thus sets the lower limit as zero and the upper limit as one. It means that the $HS_{(q)}$ will take the value between zero and one.

In reality, mortality occurs in all age groups; but concentration would be found in particular age groups depending upon the existing levels of mortality transition. Then, the measure of $HS_{(q)}$ that we proposed in equation (1) becomes a special case of the mortality transition since it does not include the occurence of mortality in the intermediate age intervals. More specifically, it underlines that a society with little child mortality is the one having the highest health status. The above measure has indeed potentiality of assessing the relative health status in developing countries marked by a relatively high incidence of child mortality. India is not an exception to the prevalence of child mortality. Therefore, it may be expected that the above measure may possibly aid us to comprehend the north-south differences in health status of India. The estimates at discrete time points (1971, 1981 and 1991) also enable us to assess the improvements in health status among regions.

For a meaningful interpretation, the $HS_{(q)}$ is ranked into three levels of high, medium and low. A region has achieved high health status if the value of $HS_{(q)}$ is greater than or equal to 0.800. The medium level of health status refers to the value of $HS_{(q)}$ falling in between 0.500 and 0.800 while the value of $HS_{(q)}$ below 0.500 is treated as the low level of health status. Accordingly, the health status of the regions and states under study are assessed.

At the national level, India has made a reasonable achievement in health status within a span of twenty years (see Table 2.10). In 1971, India had a low level of health status (0.333) but it has moved up into the medium level of health status (0.521) by 1991. On the gender dimension, the achievement in health status is quite disappointing in the sense that the gender gap in health status continues to persist, keeping women in a disadvantageous position. At the regional level, the north-south divide in the levels of achievement in health status is

noteworthy. It is evident from Table 2.10 that the northern region lags behind the southern region in the attainment of health status by a considerable margin and a span of twenty years. In fact, the southern region has achieved medium level of health status (0.676) while the northern region continues to have low level of health status (0.432) despite improvement in its position.

Table 2.10

Health Status Index ($HS_{(q)}$) by Regions and India: 1971-1991

Region	Year	Male			Female			Person		
		q^* (≤ 4)	q^* (≥ 55)	$HS_{(q)}$	q^* (≤ 4)	q^* (≥ 55)	$HS_{(q)}$	q^* (≤ 4)	q^* (≥ 55)	$HS_{(q)}$
Southern Region	1971	40	31	0.437	42	30	0.417	41	31	0.431
	1981	33	37	0.529	33	38	0.535	33	38	0.535
	1991	22	47	0681	24	50	0.676	23	48	0.676
Northern Region	1971	56	22	0.282	61	18	0.228	58	20	0.256
	1981	48	29	0.377	52	25	0.325	50	27	0.351
	1991	40	34	0.459	45	30	0.400	42	32	0.432
India	1971	48	27	0.360	52	24	0.316	50	25	0.333
	1981	42	33	0.440	45	29	0.392	44	31	0.413
	1991	33	39	0.542	37	37	0.500	35	38	0.521

Source: same as Table 2.1.

Coming to the gender dimension of the health status, it is important to take note that the southern region does not show gender discrimination in the achievements of health status to the extent observed in the northern region. Whatever achievements in health status that the northern region has made have not improved the relative status of women in that region. The assessment of health status by regions reveals the existence of glaring north-south differentials.

The regional variations in health status are further examined at the disaggregated level to find out whether all the respective constituent states in a region do share the same level of health status. In other words, the state level analysis may enable us to examine whether the issue of north-south differentials in health status is a spatial phenomenon. It is important in the context of north-south debate to appraise the arguments that emphasise the distinction between the wheat growing (cow-belt) region and rice cultivating regions.[23]

Within the southern region, it is found that Kerala continues to outdistance other states in terms of achievements in health status while other states are competing each other to catch up with Kerala's health status (see Table 2.11). Tamil Nadu has made remarkable achievements in health status to the extent that it stands next to Kerala followed by Andhra Pradesh and Karnataka. In terms of increase in health status during the study period (1971-1991), Tamil Nadu has come closer to Kerala with a lag of 5 points whereas Andhra Pradesh and Karnataka fall far behind Kerala by a margin of 13 and 21 points respectively. A striking observation is that southern states follow a ladder process of improvements in health status without much gender bias where Kerala seems to be the pacesetter for other states to catch up.

The inter-state pattern of health status is quite different in the northern states. Punjab is the only state that has achieved health status comparable at least to that of Andhra Pradesh in the southern region (see Table 2.11). The improvements in health status of BIMARU states other than Bihar during 1971-1991 are quite impressive. Despite such improvements since the 1970s, Bihar has not made much advance in health status. This is true for Haryana as

[23] Bardhan (1974) and Krishnaji (1987).

Table 2.11

Health Status Index ($HS_{(q)}$) by Regions and States: 1971-1991

Regions/ States	Year	Male			Female			Person		
		q^* (≤ 4)	q^* (≥ 55)	$HS_{(q)}$	q^* (≤ 4)	q^* (≥ 55)	$HS_{(q)}$	q^* (≤ 4)	q^* (≥ 55)	$HS_{(q)}$
Southern	**1971**	**40**	**31**	**0.437**	**42**	**30**	**0.417**	**41**	**31**	**0.431**
	1981	**33**	**37**	**0.529**	**33**	**38**	**0.535**	**33**	**38**	**0.535**
	1991	**22**	**47**	**0.681**	**24**	**50**	**0.676**	**23**	**48**	**0.676**
Kerala	1971	34	40	0.541	35	42	0.545	35	41	0.539
	1981	21	51	0.708	22	54	0.711	21	52	0.712
	1991	7	66	0.904	8	73	0.901	7	69	0.908
Tamil Nadu	1971	41	30	0.423	41	29	0.414	41	29	0.414
	1981	32	39	0.549	33	37	0.529	33	38	0.535
	1991	17	48	0.738	19	51	0.729	18	49	0.731
Andhra Pradesh	1971	40	28	0.412	42	30	0.417	41	29	0.414
	1981	40	29	0.420	36	36	0.500	38	33	0.465
	1991	24	46	0.657	26	47	0.644	25	46	0.648
Karnataka	1971	43	33	0.434	44	27	0.380	43	30	0.411
	1981	33	38	0.535	34	38	0.528	33	38	0.535
	1991	30	42	0.583	33	42	0.560	32	42	0.568
Northern	**1971**	**56**	**22**	**0.282**	**61**	**18**	**0.228**	**58**	**20**	**0.256**
	1981	**48**	**29**	**0.377**	**52**	**25**	**0.325**	**50**	**27**	**0.351**
	1991	**40**	**34**	**0.459**	**45**	**30**	**0.400**	**42**	**32**	**0.432**
Punjab	1971	41	37	0.474	55	27	0.329	48	32	0.400
	1981	29	48	0.623	40	38	0.487	34	43	0.558
	1991	21	49	0.700	32	42	0.568	26	46	0.639
Bihar	1971	--	--	--	--	--	--	--	--	--
	1981	45	29	0.392	43	29	0.403	44	29	0.397
	1991	35	37	0.514	37	32	0.464	36	34	0.486
Haryana	1971	44	37	0.457	54	22	0.289	49	30	0.380
	1981	42	38	0.475	50	26	0.338	46	32	0.410
	1991	37	35	0.486	43	35	0.449	40	35	0.467
Rajasthan	1971	--	--	--	--	--	--	--	--	--
	1981	45	28	0.384	52	24	0.316	49	26	0.347
	1991	39	36	0.480	46	30	0.395	42	33	0.440
Uttar Pradesh	1971	59	21	0.263	64	17	0.210	61	19	0.238
	1981	51	27	0.346	58	21	0.266	54	24	0.308
	1991	43	31	0.419	48	28	0.368	45	30	0.400
Madhya Pradesh	1971	54	19	0.260	54	19	0.260	54	19	0.260
	1981	50	30	0.375	51	26	0.338	51	28	0.354
	1991	45	31	0.408	48	29	0.377	46	30	0.395

Source: same as in Table 2.10.

well. Nevertheless, an emerging pattern is that while the states with lower levels of health status in the early 1970s have improved their health status by the turn of the 1990s, the states with relatively higher levels of health status have not experienced much improvements. It would mean that there is a tendency for decline in the inter-state disparities in health status among northern states over time. With regard to the gender dimension, the northern states present a mixed pattern in health status. Gender bias in health status continues to persist in all northern states other than Bihar and Haryana. In Bihar, the health status of women relative to that of men has kept worsening over time whereas in Haryana it has improved remarkably (see Table 2.11).

On the whole, it may be inferred that Kerala, the southern most state, is the only state that has achieved the high level of health status with the lowest level of gender bias. All other southern states have medium level of health status and relatively low gender bias. Punjab is the only state in the north that has achieved medium level of health status; but this achievement is associated with a rising degree of gender bias. The other northern states have low levels of health status and high degree of gender bias. In fact, the BIMARU states account for the low level of health status in the northern region as a whole. And Kerala is the state that has pulled up the level of health status of the southern region.

A comparison of Kerala's health status with that of the Scandinavian countries is made to highlight the period in which the Scandinavian countries experienced what Kerala has achieved in 1991. It is seen from Table 2.12 that in 1991, Kerala has achieved what the Scandinavian countries had achieved four to five decades ago. For instance, the present health status of Kerala corresponds to the attainments of Sweden and Denmark in 1960 and

Table 2.12

Comparison of Kerala with Scandinavian Countries in Health Status: 1950-1991

Year	Norway	Sweden	Denmark	India	Kerala
1950	0.911	0.805	0.747	---	---
1960	0.952	0.964	0.951	---	---
1970	0.964	0.976	0.988	0.333	0.539
1980	0.988	0.989	0.988	0.413	0.712
1990	0.989	0.989	0.988	0.521	0.908

Note: estimates for India and Kerala refer to 1971, 1981 and 1991 respectively.
Source: United Nations (1951; 1972; 1981 & 1992) and Tables 2.10 & 2.11 for India and Kerala respectively.

that of Norway in 1950. Kerala thus lags behind the Scandinavian countries in health status by 30 to 40 years. India, however, lags behind Kerala in health status by 30 years.

Conclusion

The analysis of mortality differentials among age intervals indicates that it follows a typical 'U' shape in 1970s with gradual transformation towards 'J' in 1990s. This is mainly attributed to a steady decline in childhood mortality. The FMR shows a secular declining trend from 1901 to 1991. This is owing to age-specific excess female mortality in all age groups except 55 plus. The ratio of female to male mortality (FMMR) clearly shows that child-age (0-4) group and younger-age (5-14) group continue to have excess female mortality. The FMMR in the age group (15-54) has come down from 1.014 in 1971 to 0.890 in 1991. The regional inequality in health status is examined in terms of regions (northern and southern) as well as location (rural and urban). Higher mortalty rate among females is observed in the north and in the rural areas. It is also found that, higher levels of

urbanisation are accompanied by lower levels of mortality in general and female mortality in particular. This finding at the aggregate level is also valid for different age groups.

In order to examine health transition by gender and region, a health status index is constructed based on the proportion of mortality in the child-age and old-age. The index reveals that the achievement in health status is quite disappointing at the national level in the sense that the gender gap in health status continues to persist, keeping women in a disadvantageous position. On the other hand, at the regional level, the north-south divide in the levels of achievement in health status has become wider. Coming to the gender dimension of the health status, it is found that the southern region does not show gender discrimination in the achievements of health status to the extent shown by the northern region. In the inter-state analysis, Kerala, the southern most state, has achieved the highest level of health status with the least gender bias. A comparison of Kerala's health status with that of the Scandinavian countries highlights that Kerala has achieved what the Scandinavian countries had achieved four to five decades ago. Kerala thus lags behind the Scandinavian countries in health status by 30 to 40 years. India, however, lags behind Kerala in health status by 30 years.

Chapter 3

Causes of Death and Gender Discrimination

Mortality differentials by age group, gender and spatial dimension were discussed in the previous chapter. The striking finding which emerged from the analysis was that female mortality rate is higher than male mortality rate in all age groups, right from childhood upwards. Dandekar (1975) also observed a similar pattern and argued that " it is only India that has its females dying at a higher rate than its males after the first month of age".[1] This disparate tendency peculiar to India is observed in all age groups except in the old-age group (55 plus) where male mortality is reported to be higher. In old-age, gender discrimination is presumably non-existent and the natural superiority of the females for survival asserts itself. Reference was made in the previous chapter to this aspect of switching advantage between the sexes across age groups. Females in India enter the phase of relative advantage over males even from the age of 30 years (see Appendix Table 2.3). It would follow, therefore, that the observed adverse Female-Male Ratio (FMR) is due mainly to higher rates of death among females during the earlier period of their lives namely upto the age of 30 years. However, Kerala is an exception where females outnumber males at all age intervals.[2] According to Sen (1992), there are a number of factors that have been blamed for this mournful situation at the all-India level namely, the neglect of female health, malnutrition during childhood, differential access for females to health care and less attention to female education. However, these factors are mostly attributes rather than causes. The causes of

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[1] Dandekar (1975), p. 1663.

[2] In Kerala, female-male ratio shows more than unity, 1.04, as is comparable to that of Europe and North America. For further clarifications, refer Dreze and Sen (1995), p.142.

death have seldom formed the subject of research in social sciences. In this chapter a modest attempt is made to analyse the causes of excess female mortality in India.

The discussion is presented as follows: section 1 deals with the data base and its limitations; in section 2, the causes of death according to various diseases are examined; some of the major causes by age-specific mortality and by sex are discussed in section 3; the major causes of death specifically unfavourable to females are examined in section 4. The last section also highlights some of the social dimensions of this phenomenon.

Section 1

Data

The study uses mortality data collected as part of vital statistics system in India. The causes of death can be accurately ascertained only through medical certification. In urban areas, a well-developed hospital management system keeps medical records, more scientifically and systematically than in rural areas, on causes of death; in rural areas owing to non-existence of medical and health care institutions in adequate number and with good management system, the hospital data on causes of death are scant and unreliable. In order to overcome this difficulty, the Registrar General of India initiated an annual survey of causes of death since 1965 through "Lay Diagnosis Reporting" method.[3]

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[3] This method was recommended at the 'Conference on Improvement of Vital Statistics' held at New Delhi in April 1961.

To begin with, the Director of Health Services, Rajasthan in collaboration with the Registrar General of India conducted a pilot survey in two Development Blocks consisting of 173 villages in the state. It was a landmark in the history of 'survey of cause of death'. The Registrar General of India collected and published data on mortality by causes in India since 1965 through a scheme called 'Model Registration System' (MRS). Later, in 1982, the system was renamed "Survey of Causes of Death". The survey is confined to rural areas. It started operating in ten major states in 1966 and was extended to six more states in the following year.[4] The survey covers at least two Primary Health Centre (PHC) villages per million rural population in every state. The allocation of PHC villages in each region is made on the basis of the proportion of rural to total population.[5]

The coverage of the survey on causes of death (rural) has steadily increased since 1965. In 1991, 1303 PHCs accounting for about 6.35 per cent of the total PHCs in the country and spreading over 23 states and 2 union territories[6], were covered. In almost all the states, the implementing agencies are the State Directorates of Health and Family Welfare and the Directorates of Economics and Statistics.

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[4] The major states covered in the initial stages are Andhra Pradesh, Assam, Bihar, Gujarat, Kerala, Orissa, Punjab, Rajasthan, Tamil Nadu and West Bengal. Later, the survey was extended to Haryana, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra and Uttar Pradesh.

[5] Regions refer to the 77 natural regions adopted by the National Sample Survey Organisation (NSSO).

[6] For further details, see Registrar General, India (1992), statement 1, page 2.

The increase in coverage of the survey on causes of death (rural) since 1965 poses a problem of comparability across time. Data on causes of death for urban areas are also collected by the Office of the Registrar General of India in selected cities of the country. They are not published, however, on account of delays in getting the data, inconsistency in reported disease-groups as between cities and non-comparability over time.[7]

Given the nature of data collected for both the rural and the urban area, it is difficult to make a comparative study of rural and urban areas on the causes of death. On evaluating the relative merits of the data sources for both rural and urban areas, it is found that the survey data on causes of death for the rural area are the more reliable. Further, the data on causes of death in urban areas are not available for research although the Registrar General of India collects and compiles them on a continuous basis. In this situation, we are forced to limit our analysis to rural India. As the rural population accounts for nearly three-fourths of the total population in the country, an analysis of the causes of death in rural area would throw light on the nature of causes of death of the majority of Indians. Besides, there is also a danger in using the rural and the urban data for comparison or aggregation; there is the possibility of double counting. For instance, persons belonging to rural areas who undergo treatment and die at urban hospitals are likely to be included in both rural survey data and urban medical records. Since much of the rural population still depend upon urban hospitals, the possibility of double counting in comparing rural and urban data, treating them as independent of each other, is not negligible. Therefore, we confine our analysis of the causes of death to rural India.

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[7] Based on personal communication received from the Registrar General of India.

1.1 Quality of the Survey Data

Unlike other socio-economic surveys, the survey on causes of death would require the services of a team of specialists who have the expertise to identify and classify diseases based on causes and symptoms of the death reported by respondents. Keeping this point in view, we make an attempt to assess the quality of the survey data in terms of the method followed for their collection and collation.

The survey is conducted with the help of 'trained' para-medical staff of each primary health centre who acts as Field Agent. The Field Agent contacts local informants for information on the occurrence of deaths in the specified area. He visits the households where deaths were reported to have occurred and investigates the 'symptoms and conditions' of the deceased prior to death. He has training in the investigational procedures and classification of diseases based on a non-medical list of causes of death prepared by the Registrar General of India.

The non-medical list of causes of death contains a list also of familiar and identifiable diseases arranged in cause-groups according to similar 'symptoms and associations'. This system is called "Lay Diagnosis Reporting". Once the Field Agent arranges the probable causes of death under major and sub-groups, a staff member of the primary health centre, called the Recorder, conducts first a baseline survey and subsequently half-yearly surveys. He visits the households in which death had occurred as per the reports of the Field Agent. As a follow-up, the Medical Officer in-charge of the primary health centre further scrutinises the death register and re-investigates independently at random at least one-tenth of the total deaths reported by the Field Agent. Finally, the collated information is forwarded to the

State headquarters for state level consolidation and transmission to the Office of the Registrar General of India for consolidation of statistics at the all-India level. The consolidated information regarding causes of death by age and sex forms the survey data on Causes of Death (Rural) published annually by the Registrar General of India. To quote the Registrar General of India, the 1971, "survey of causes of death fills an important gap in the health statistics system in the country by providing valuable data on the causes of death for rural areas".

The foregoing discussion on the mode of collection and compilation suggests that the reliability of the data depends as much on the informant's report as on the classification of the causes of death into major cause-groups.[8] The follow-up visits and investigation of the Recorder help the Medical Officer in-charge of the Primary Health Centre to correct misclassification of the causes and misreporting of death. The elaborate arrangements made in the collection, verification and rechecking of data lend a degree of authenticity to the causes of death reported by the survey which one would not expect from large, one-time surveys conducted by ill-trained and inexperienced field investigators.

Yet, the survey is not free of limitations: it does not go into the history of illness that the deceased had. This limitation gives room for doubt on the exactness of the classified causes of death. As the Field Agent is advised to classify the causes of death according to the non-medical list of causes provided by the Registrar General of India, there is a possibility of the

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[8] The informant being an important person in the community having access to vital information, might distort the actual cause of death while reporting to the Field Agent for a variety of reasons.

Field Agent classifying these diseases which do not find a place in the list, in one of the listed diseases. The survey being the routine work of the staffs at the PHCs whose professional background and understanding are likely to be limited to locally prevalent ideas of diseases causing death, is likely to suffer from errors of ignorance and biases of several types. For instance, the cause reported for a significant proportion of deaths is 'Senility'; and for a large proportion, the disease is left "ill-defined or unclassifiable". However, in the absence of other data on causes of death, the survey, with all its limitations, provides reasonably good information on a broad list of diseases causing death. This information may be taken, therefore, as the second best data base, for comprehending the kinds of diseases that cause the majority of deaths in rural India.

Section 2

2.1 Major Cause-groups: an aggregate analysis

The causes of death that are reported in the survey are examined to see whether there is any perceptible shift in the pattern of diseases over time. This exercise would enable us to understand the direction of the shift in the pattern of diseases - from preventable to curable or *vice versa*. Although the surveys at the three time points, 1971, 1981 and 1991 are not strictly comparable in terms of individual diseases, we believe that a comparison at the level of broad disease-groups might provide some insights into the changes in the pattern of disease-groups in recent decades.

For our comparative analysis across the three time points, we arrange the disease-groups reported in 1971 and 1981 surveys to conform with the classification in 1991 survey.

Ranking method is used to identify the relative importance of ten disease-groups at the three time points; see Table 3.1. Ranking is made in the descending order based on the data for 1971.

Table 3.1

Ranking of Major Disease-groups: India, 1971-1991

Disease Groups	Period of Study		
	1971	1981	1991
Senility	1	1	1
Coughs	2	2	2
Fevers	3	5	7
Causes peculiar to Infancy	4	3	4
Digestive Disorders	5	7	8
Other Clear Symptoms	6	6	6
Accidents and Injuries	7	8	5
Disorders of Circulatory System	8	4	3
Disorders of Central Nervous System	9	9	9
Child birth and Pregnancy	10	10	10

Source: Registrar General, India (1971; 1983 and 1992).

It may be seen from Table 3.1 that of the ten major cause-groups, five have maintained the same rank during the period. They are 'Senility',' Coughs', 'Other Clear Symptoms', 'Disorders of Central Nervous System', and 'Child birth and Pregnancy'. 'Senility' accounts for the highest incidence of death followed by 'Coughs'. 'Disorders of Central Nervous System' and 'Child birth & Pregnancy' are at the bottom in ranking. The disease groups like 'Fevers' and 'Digestive Disorders' appear to have come under better control since 1971 as may be seen from the steady decline in their respective ranks. However, the rise observed

in the rank of the 'Disorders of Circulatory System' indicates that the death due to strokes, and heart diseases are steadily on the increase.

Deaths reportedly caused by 'Senility' top the list. No break-up is available on the specific causes of such deaths. It is therefore unknown to what extent were they preventable, curable or postponable. Similarly, deaths in the disease-group 'Child birth & Pregnancy' being specific to certain age-groups as well as being sex-specific, cannot be grouped with the common disease-groups causing death occurring in all age intervals. There is yet another category of unclassifiable diseases in every group, a category which also affects the order of ranking. Therefore, these special case groups and the unclassifiables in all groups were excluded from the analysis. The percentage shares of the major disease-groups and their rankings are given in Table 3.2.

Table 3.2

Percentage Distribution of Major Causes of Diseases: India, 1971-1991

Major Cause Groups	Year		
	1971	1981	1991
Coughs	36.37 (1)	38.02 (1)	33.03 (1)
Other Clear Symptoms	14.47 (2)	8.13 (5)	5.69 (8)
Digestive Disorders	10.95 (3)	5.42 (7)	6.06 (7)
Fevers	10.20 (4)	11.43 (3)	6.96 (6)
Causes peculiar to Infancy	9.45 (5)	12.67 (2)	12.88 (4)
Accidents and Injuries	6.61 (6)	7.99 (6)	13.33 (3)
Disorders of Circulatory System	6.25 (7)	10.43 (4)	14.68 (2)
Disorders of Central Nervous System	5.71 (8)	5.90 (8)	7.37 (5)
All	100.00	100.00	100.00

Note: Figures are arranged in their descending order of magnitude as in 1971.
Figures in brackets show ranks.
Source: Appendix Tables 3.1A-3.1C, Col. 16.

It is interesting to note that the rankings of the disease-groups have undergone changes (see Table 3.2). The change in the relative ranking of some of the disease-groups is possibly the result of the exclusion of the item 'unclassifiable' from all the groups. The disease-groups in which this item was important are seen to have risen in ranking. They are the groups of 'Fevers' and 'Causes peculiar to Infancy'. At the same time, groups such as 'Other Clear Symptoms' and 'Digestive Disorders' have declined in terms of ranking.

As far as the changes in the pattern of disease-groups are concerned, it may be noted that 'Coughs' continues to top the rank but the 'Disorders of Circulatory System' have steadily risen to the second position in 1991 from the position of last-but-one in 1971. Similarly, the cause-group of 'Accidents and Injuries' has emerged as a dominant killer group in the 1980s. The disease-group of 'Other Clear Symptoms' seems to have lost its importance, probably because of the inclusion of several diseases in the group under other well-defined cause-groups. 'Coughs' and Disorders of Circulatory System have emerged as the major causes of death in more recent years.

The observed pattern of disease-group causing death may be examined also in relation to the gender dimension. The proportion of deaths due to disease-groups like 'Fevers', 'Digestive Disorders' and 'Other Clear Symptoms', has been declining over time for the population as a whole; but it is relatively unfavourable for females. The proportion of deaths due to disease-groups like 'Disorders of Circulatory System', 'Accidents & Injuries' have been increasing over time, but relatively less unfavourably for females (see Table 3.3). In case of 'Causes peculiar to Infancy' and 'Coughs', the percentage of male mortality increased during the 'seventies but declined in the 'eighties while that of female mortality is steadily

Table 3.3

Gender-wise Distribution of Major Causes of Death: India, 1971-1991

Major Cause Groups	Male			Female		
	1971	1981	1991	1971	1981	1991
Coughs	36.51	39.12	34.46	36.18	36.46	30.95
Other Clear Symptoms	14.32	7.62	5.83	14.67	8.85	5.48
Digestive Disorders	10.28	4.63	5.15	11.79	6.53	7.38
Fever	9.46	9.80	6.17	11.12	13.73	8.11
Causes peculiar to Infancy	9.33	12.14	11.37	9.59	13.42	15.09
Accidents and Injuries	7.27	8.52	13.63	5.77	7.25	12.90
Disorders of Circulatory System	6.53	12.29	16.40	5.91	7.82	12.17
Disorders of Central Nervous System	6.30	5.88	6.99	4.96	5.94	7.93
All	100	100	100	100	100	100

Source: Appendix Tables 3.1A-3.1C, Cols 14 & 15.

rising since 1971. Unlike other groups, death due to 'Disorders of Central Nervous System' shows a distinct pattern of sex-differentials in mortality during the study period. In fact the proportion of male mortality declined during the 1970s but reversed itself since 1981. The proportion of female mortality has been, on the other hand, steadily increasing since 1971. It may be inferred that in all disease-groups except 'Disorders of Circulatory System' and 'Accidents & Injuries', the trends in mortality are relatively unfavourable for females.

Nevertheless, the aggregate analysis conceals more than what it can reveal regarding the identification of the diseases that actually cause death in the respective groups. For instance, the disease-group of 'Coughs' conceals the changing proportion of certain types of Coughs for which treatments are now available due to the advancement of medical science.

Likewise, 'Disorders of Circulatory System' are of different types of which the most threatening is the cardiac disorders. It is arguable, therefore, that a disaggregated analysis of disease-group causing death would enable us to understand the severity of the disease so that the policy intervention in the health sector could be effectively targeted. For the disaggregated analysis, we move on to the next section.

2.2 Pattern of Major Causes: a disaggregate analysis

The pattern of major causes of death is examined at a disaggregated level to identify the disease that causes more deaths in each disease-group. The analysis of changes in the pattern of diseases within each group would bring out the relative dominance of diseases causing death over time. The cause-groups which were considered for aggregate analysis, are the only ones examined at the disaggregate level also. As a result, the number of identifiable causes of death are reduced to 34 individual causes from 58 individual causes.[9] For a better understanding, the analysis is carried out group-wise. While doing so, the gender dimension is also looked into.

Coughs

'Coughs', the major killer, comprise Tuberculosis of Lungs, Bronchitis and Asthma, and Pneumonia. Table 3.4 furnishes information on the performance of individual diseases by gender. Bronchitis and Asthma is the major killer group. In 1971, it claimed 55.98 per cent

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[9] The available data on 10 cause-groups provide information on 58 individual causes in the 1991 survey. For purposes of comparison, the causes that are similar in nature between 1971 and 1981 only are considered. As a result, we could consider only 34 individual causes for our analysis.

of the total deaths, followed by Tuberculosis of Lungs (33.32%) and Pneumonia (10.70%). However, the proportion of deaths due to Bronchitis and Asthma declined significantly by

Table 3.4

Gender-wise Distribution of Causes of Death by Diseases of 'Coughs'

Major Diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Bronchitis and Asthma	53.76	58.80	55.98	45.41	42.11	44.10	46.09	43.79	45.21
Tuberculosis of Lungs	36.31	29.51	33.32	29.78	23.07	27.11	31.69	25.24	29.23
Pneumonia	9.92	11.69	10.70	24.81	34.82	28.80	22.22	30.98	25.56
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Appendix Tables 3.2A-3.2C.

1981 to 44.10 per cent but went up marginally to 45.21 per cent during 1991. During the entire period, the proportion of deaths due to Pneumonia has been more among the females. This is possibly due to the lack of health care and of timely medical intervention for female patients.

Fevers

Even though the share of 'Fevers' in the aggregate of causes is coming down, some of the diseases within the group have gone up. It is evident from Table 3.5 that the proportion of deaths due to Typhoid is the maximum followed by Malaria and Influenza. The share of Typhoid and Influenza are seen to have increased in the 1980s and declined in 1991. The share of Malaria tremendously increased by 1991 after a decline in 1981.

Table 3.5

Gender-wise Distribution of Causes of Death by Diseases of 'Fevers'

Major Diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Typhoid	47.94	50.98	49.40	53.64	51.88	52.76	41.54	46.23	43.76
Malaria	46.33	44.59	45.49	16.26	21.05	18.65	36.26	32.12	34.30
Influenza	5.73	4.43	5.10	30.09	27.07	28.58	22.20	21.65	21.94
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: same as Table 3.4.

Though there are variations between the sexes, the proportion of female deaths is found to be higher due to Typhoid except during 1981. The gender differential in this regard has since then widened.

Causes peculiar to Infancy

'Causes peculiar to Infancy' also comes out as a major category at the disaggregated level. Prematurity is the major reported cause of death, followed by Respiratory Infections. In the case of females its share was high in 1971, declined in 1981 and has stabilised in 1991. But the difference in the proportion of respiratory infections as between the sexes does not show any significant trend during the period. An interesting observation is that Malformations even though small show an increasing trend for females, a phenomenon for which no explanation is available in medical science. For identifying the reasons for this observed gender bias, further enquiries are called for (see Table 3.6).

Table 3.6

Gender-wise Distribution of Causes of Death by Diseases of 'Causes peculiar to Infancy'

Major Diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Prematurity	63.34	67.13	65.04	65.46	63.65	64.67	69.96	69.41	69.70
Respiratory Infections	21.69	19.21	20.58	27.15	28.27	27.64	23.96	20.39	22.26
Malformations*	2.60	4.40	3.41	3.92	4.81	4.31	4.05	8.63	6.23
Birth Injury	12.36	9.26	10.97	3.47	3.27	3.38	2.03	1.57	1.81
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: * malformations including congenital malformations.
Source: same as Table 3.5.

Digestive Disorders

Dysentery is the major disease in this category that has taken high death tolls: 90.58 per cent during 1991 as against 95.06 per cent in 1981 and 88.59 per cent in 1971. It has a gender aspect since it is seen to have caused a higher proportion of deaths for females than for males. The gender differences in the proportions are not, however, large. Do women consume more unhygienic food and drinking water than men do? The other individual causes

Table 3.7

Gender-wise Distribution of Causes of Death by Diseases of 'Digestive Disorders'

Major Diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Dysentery	88.13	89.10	88.59	94.47	95.65	95.06	89.47	91.71	90.58
Food poisoning	7.24	4.21	5.80	3.95	3.16	3.56	9.21	5.35	7.29
Cholera	4.64	6.69	5.61	1.58	1.19	1.38	1.32	2.94	2.12
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: same as in Table 3.6.

of death in this group are Food Poisoning followed by Cholera. Though we claim that Cholera has been completely eradicated from the country, its existence is reported in some parts of the country. In these two causes, females do not seem to be in a more unfavourable situation than that of males (see Table 3.7).

Other Clear Symptoms

As is evident from Table 3.8, the major diseases under this cause-group are Cirrhosis and Liver diseases, Measles, and Tetanus. The proportion of Cirrhosis and Liver diseases has increased considerably in 1991 from their levels in 1971. The reason for this increase is difficult to explain unless one is able to get information at more disaggregate levels. The share of Tetanus and Measles shows a declining trend which may be attributable to the

Table 3.8

Gender-wise Distribution of Causes of Death by Diseases of 'Other Clear Symptoms'

Major Diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Cirrhosis & Liver diseases*	34.47	35.63	34.99	38.46	41.11	39.66	58.14	56.12	57.34
Diseases of Urinary tract	9.26	1.79	5.92	7.93	--	4.35	21.16	11.51	17.37
Tetanus	33.59	31.45	32.63	39.18	41.40	40.18	11.40	14.75	12.71
Measles	17.93	25.94	21.51	12.02	14.87	13.31	5.35	15.83	9.46
Poliomyelitis	4.75	5.19	4.95	2.40	2.62	2.50	3.95	1.80	3.11
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: * Cirrhosis and Chronic Liver Diseases including Atrophy of Liver.
-- data not available.
Source: same as Table 3.7.

increase in the preventive care against these diseases. The proportion of females dying from Measles is higher than that of males.

Accidents and injuries

Table 3.9 shows that 'Accidents and Injuries' in 1991 comprise a variety of categories out of which the most prominent are Vehicular Accidents, Suicides, Burns, Drowning and Animal Bite. In all categories except Vehicular Accidents, the proportion of deaths is higher for females. The higher proportions of deaths among females due to Burns is indicative of the continuance of the traditional roles of women and girl children in the kitchen and the relative neglect that females receive in medical treatment for fire accidents.

Table 3.9

Gender-wise Distribution of Causes of Death by Diseases of 'Accidents and Injuries'

Major diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Vehicular Accidents	22.81	9.07	17.52	29.89	8.90	21.98	34.49	13.91	26.39
Suicide	9.66	11.83	10.50	9.89	11.03	10.32	18.59	20.49	19.34
Burns	7.11	24.11	13.66	4.09	22.06	10.86	8.65	28.29	16.39
Drowning	22.50	25.47	23.65	21.72	30.25	24.93	12.72	14.83	13.55
Animal Bite etc.	8.84	10.44	9.46	12.04	11.39	11.80	8.95	11.77	10.06
Fall from Height	12.82	10.90	12.08	10.32	8.54	9.65	6.76	5.96	6.45
Homicide	7.42	5.00	6.49	7.10	4.27	6.03	7.75	2.45	5.66
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: same as Table 3.8.

Disorders of Circulatory System

Congestive and other Heart Diseases including Heart Attack is the only major individual disease of this cause-group. The reported number of deaths from this cause in the sample is seen to have risen three-fold from 540 in 1971 to 1827 in 1991. It is also worth

mentioning that the incidence of heart disease is very low among females compared to males.[10]

Disorders of Central Nervous System

Deaths due to 'Disorders of Central Nervous System' mainly consists of Paralysis and Convulsions including Cerebral Haemorrhage and Meningitis (see Table 3.10). Paralysis and Convulsions are responsible for the majority of the fatalities which affect males more than females. But in the case of Meningitis a higher proportion of females dies as is shown in Table 3.10. The observed differentials could be attributed perhaps to discrimination against women, in health care. No assertion can be made however in the absence of more information.

Table 3.10

Gender-wise Distribution of Causes of Death by Diseases of 'Disorders of Central Nervous System'

Major Diseases	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
Paralysis and convulsions*	78.30	72.44	76.05	82.55	77.83	80.58	88.76	87.06	88.02
Meningitis	21.70	27.56	23.95	17.45	22.17	19.42	11.24	12.94	11.98
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: * including Cerebral Haemorrhage
Source: same as Table 3.9.

The disaggregate analysis throws some interesting insights into the dominant causes of death, changing pattern of causes over time and gender biases. Of the 34 individual causes of death, seven individual diseases are found to be the dominant ones. In fact each disease-

[10] For details see Appendix Tables 3.2A-3.2C.

group has one dominant cause of death. They are 'Bronchitis & Asthma (Coughs)', 'Typhoid (Fevers)', 'Prematurity (Causes Peculiar to Infancy)', 'Dysentery (Digestive Disorders)', 'Cirrhosis and Chronic Liver Diseases (Other Clear Symptoms)',' Congestive and other Heart Diseases (Disorders of Circulatory System)' and 'Paralysis & Convulsions (Disorders of Central Nervous System)'. In case of 'Accidents & Injuries', prominent causes of death include Burns, Suicide, Vehicular Accidents and Drowning.

Over time, some diseases are seen to be emerging as dominant ones causing death. This category of diseases includes 'Pneumonia (Coughs)', 'Influenza (Fevers)', and 'Malformations and Prematurity (Causes peculiar to Infancy)'. These diseases are also turning increasingly unfavourable for females. The tendency of these fatal diseases to turn increasingly unfavourable for women needs further inquiry in terms of age intervals so as to validate the hypothesis of gender discrimination in health care. This issue is taken up for a detailed analysis in the following section.

Section 3

Major Cause-groups by Age-group

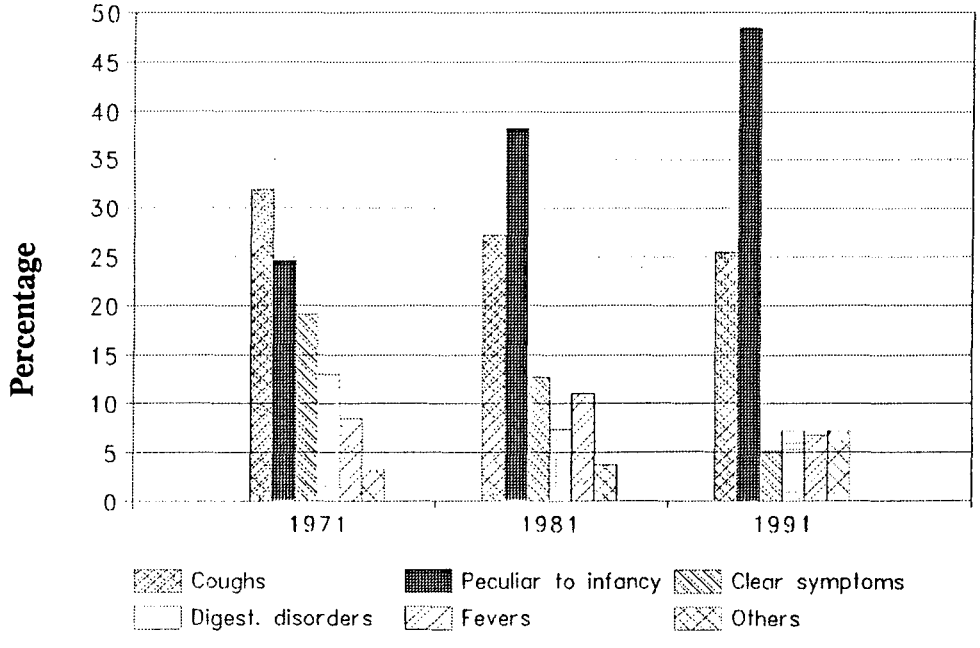
In this section, we bring the major causes of death attributed to the mortality differentials among certain age-groups over the study period. For our analysis, we have broadly classified the age distribution into major age-groups namely (i) child-age (0-4); (ii) younger-age (5-14); (iii) middle-age (15-54); and (iv) old-age (55 plus). This classification would facilitate us to capture meaningfully the likely prevalence of major disease-groups causing death among age intervals. In order to understand the temporal shifts in the pattern of

disease-groups attributed to deaths among age-intervals during the study period, we make use of a graphical analysis that has the capability of highlighting the relative dominance of disease-groups over time. However, this exercise is carried out at age group level to identify the persistence of age-specific major disease-groups, if any.

Child-age (0-4) mortality

This section explains some of the major disease groups which could be expected to strike the hardest blow to the child-age category. For a lucid exposition, we have grouped the least important disease-groups '(Accidents and Injuries', 'Disorders of Central Nervous System' and 'Disorders of Circulatory System') into the category, 'Others'. To bring out the relative importance of disease-groups, they are arranged in descending order of the percentage of

Chart 3.1
Percentage Distribution of Major Causes of Death in the 0-4 Age-group: 1971-1991



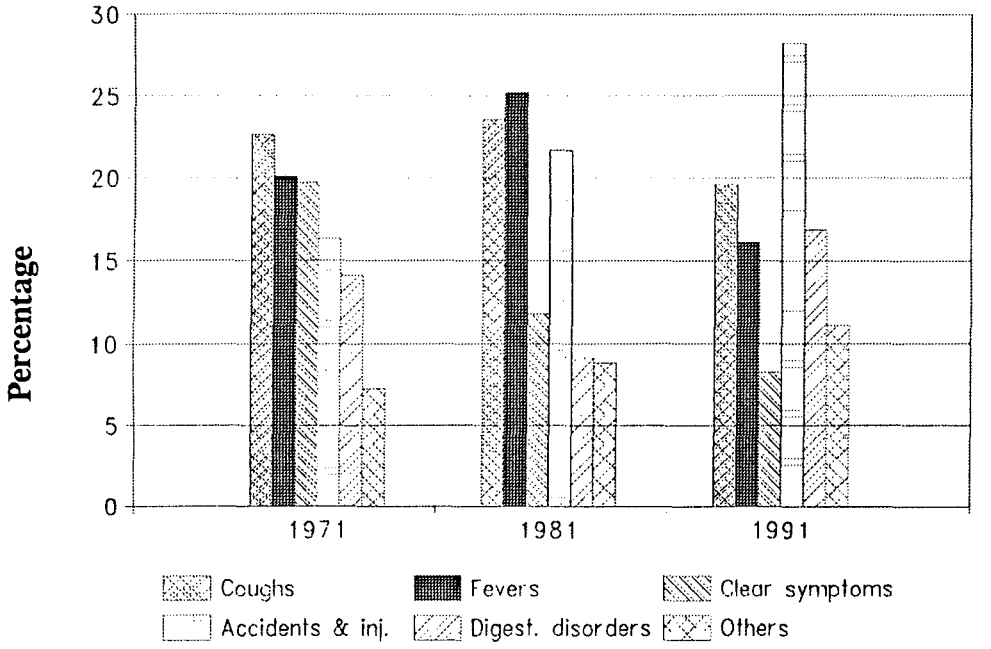
deaths attributed to each of them in 1971. In 1971, the most dominant disease-groups that caused child mortality, were 'Coughs' followed by 'Diseases peculiar to Infancy' and 'Other Clear Symptoms' (see Chart 3.1) These three disease-groups together accounted for over three-fourths of child mortality in 1971. It may be seen from that in the early 1980s, the relative importance of disease-groups attributed to child mortality had changed to 'Diseases peculiar to Infancy' from 'Coughs'. However, 'Coughs' remained dominant, coming next to 'Causes peculiar to Infancy'. By the early 1990s, 'Causes peculiar to Infancy has become the deadliest disease-group during childhood (0-4) (see Chart 3.1).

By looking at the incidence of disease-groups causing child mortality over the study period, we find that all disease-groups except 'Causes peculiar to Infancy' have been, relatively speaking, controlled. From the policy intervention point of view, it may be argued that the attempt at reducing the incidence of major disease-groups other than 'Causes peculiar to Infancy' attributed to child mortality, appears to have been effective only in the 1970s.

Younger-age (5-14) mortality

Unlike in the child-age group, mortality in the younger-age group is caused mostly by 'Accidents and Injuries'. In fact this category of mortality is found to have been increasing at an alarming rate, during the 1980s (see Chart 3.2). The other disease-groups causing mortality in this age group are 'Coughs' and 'Fevers', see Chart 3.2. The proportion of deaths caused by these latter two disease-groups which had been increasing during the 1970s seem to have declined during the 1980s. The proportion of deaths due to 'Digestive Disorders' in this age-group also show a similar pattern, declining from 1971 to 1981 and

Chart 3.2
Percentage Distribution of Major Causes of Death in the 5-14 Age-group: 1971-1991



increasing thereafter. 'Disorders of Central Nervous System' and 'Diseases of the Circulatory System' accounted for increasing proportion of deaths during the 1980s.

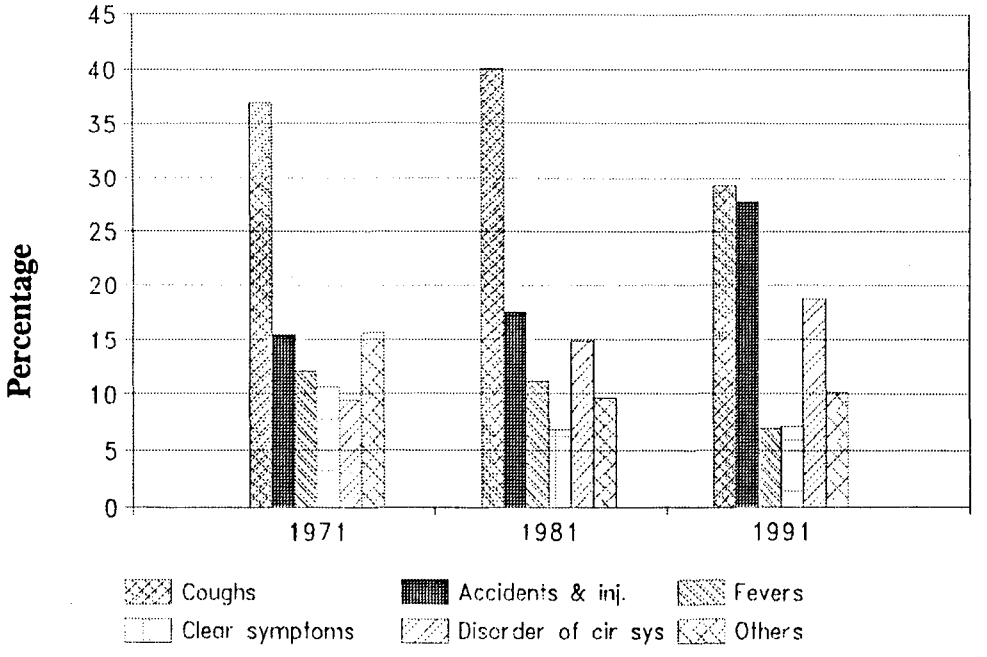
Middle-age (15-54)

The middle-age group consisting of the adult population die more due to 'Coughs' than from any other cause-group. The proportion of deaths due to 'Accidents and Injuries' has been rising since 1971 although 'Coughs' continues to be the dominant cause of death (see Chart 3.3).

The proportion of deaths due to 'Accidents and Injuries' may be attributed to the growing consumerism since the 1980s triggered by the so-called consumer durables-led growth. Apart

from the changes in the life-style conditioned by the direction of economic development that India is heading, this able population is caught up with the disease-group 'Coughs'.

Chart 3.3
Percentage Distribution of Major Causes of Death in the 15-54 Age-group: 1971-1991



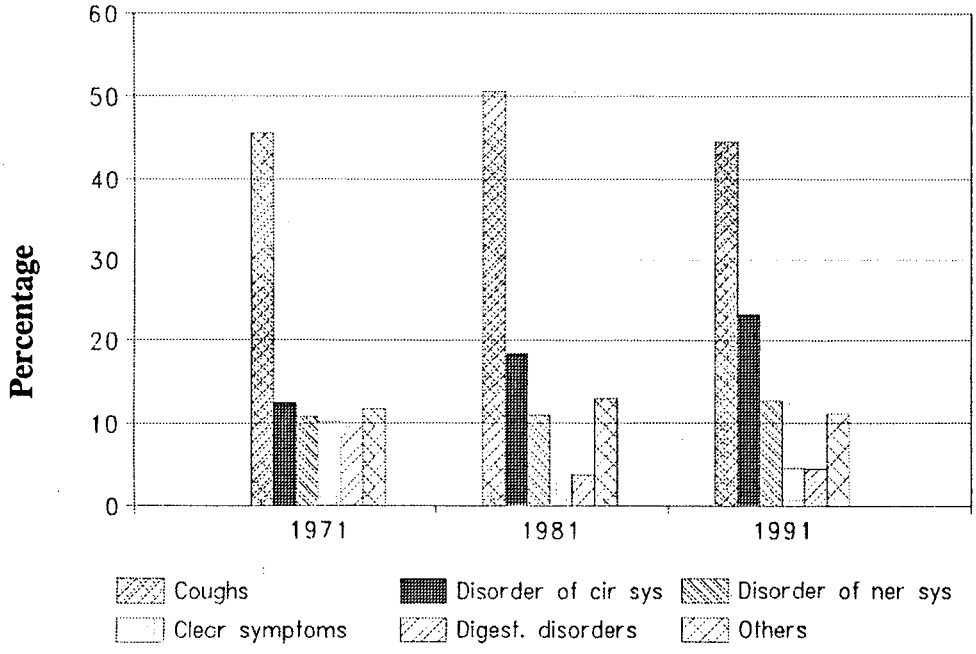
Although it is preventable, it has the high risk of prolonging morbidity among the rural population. The most threatening disease for the able population is the 'Disorder of Circulatory System' which is on the rise since 1971 (see Chart 3.3).

Old-age (55 plus) mortality

With the improvement in life expectancy at birth, the percentage of mortality in the old-age group becomes increasingly large. Increase in the proportion of the aged has economic implications because most of the population belonging to this group in rural India is

dependent on the earning population belonging to the middle-age group . It may be seen from Chart 3.4 that the dominant disease-group causing death in the old-age is 'Coughs' followed by 'Disorders of Circulatory System'. The rise in the proportion of deaths caused

Chart 3.4
Percentage Distribution of Major Causes of Death in the 55 plus Age-group: 1971-1991



by 'Coughs' indicates that levels of morbidity in this age-group are also rising, since 'Coughs' are not instant killers. 'Coughs' cause mortality usually after prolonged morbidity condition. This evidence also suggests that life expectancy data without adjustment for morbidity may not reflect the well being of a population. The subsequent section tries to examine whether the causes of death have to do with sex selectivity in mortality.

Section 4

Causes of Death Unfavourable for Females

The female-male imbalance in the population of the country has been for long a great concern of researchers in various disciplines such as demography, sociology and economics.[11] The major reason behind such an imbalance is generally attributed to excess female mortality in early childhood. As a result, most of the studies in this area have focused attention on child mortality and its implication for sex ratio (FMR). A pioneering attempt in this area was by Visaria (1961) who went one step beyond social, cultural and economic factors to recognise the role of disease in accentuating the female-male imbalance. While analysing Tuberculosis mortality with regard to sex differentials in India, he found that age group is a decisive factor in determining the sex differentials in mortality. However, this issue did not receive much attention among the scholars. At the same time, a great deal of interest is seen to have been evinced in recent years in understanding the causes of sex-selective mortality and its variations under different age intervals. For example, Kishor (1995) has attempted to examine whether gender differentials are observed in childhood mortality. She attributes gender discrimination in allocation of food and medicine to the sex-selective differentials in childhood mortality.[12]

Here we look at sex-selective differentials in mortality in the different age groups on the lines of Visaria (1961) by examining the major diseases. It is often noticed that the analysis

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[11] See Visaria (1961), Sen (1987 & 1992) and Kishor (1993).

[12] For an excellent survey of the literature, see D'Souza and Chen (1980), Chen (1981) and Dasgupta (1987).

of sex-selective differentials has failed to recognise the gender parity in female-male ratio. For instance, the female-male ratio has an in-built assumption of gender gap in parity because it is conceived as number of female population per thousand male population. What we mean by gender gap in parity is the difference between female and male population. This gives rise to under-estimation of sex-selective differentials in mortality. This issue has not been addressed in the studies on sex-selective differentials in mortality. The present study, however, makes an attempt in this direction.

We correct first the gender gap in parity of female-male ratio using a normalisation procedure and then move on to examine the sensitivity of sex-selective differentials in mortality to the female-male ratio adjusted for gender gap in parity. As the observed female-male ratio under-estimates the female mortality, the following normalisation procedure is employed to adjust the female-male ratio for gender gap in parity.

$$AFD_{ij} = \frac{OFD_{ij}}{\left(\frac{F_j}{M_j}\right)}$$

where AFD_{ij} = Adjusted Female Death due to ith disease/cause in jth age group

OFD_{ij} = Observed Female Death due to ith disease/cause in the jth age group

F_j = No of females in the jth age group and

M_j = No of males in the jth age group.

i = 1...n; j = 1...4; and i # j

The above formula enables us to estimate the actual female mortality due to ith disease/cause in the jth age group. The estimated female mortality is used to compute the sex-selective differentials in mortality. A disease causing death is taken as unfavourable to female if the ratio of female-male mortality is greater than one. Similarly, a disease is seen as favourable to female if the ratio is less than one. If the ratio turns out to be one, a disease causing death is sex-neutral.

This exercise is limited to the 1991 survey data on causes of death because this survey gives a detailed account of diseases causing death as compared to the earlier surveys. It also requires female-male ratio by age group for the year 1991 which we have estimated using both percentage distribution of rural population by age and sex (1991 SRS Report) and total rural population (1991 Census). The estimated female-male ratio by age group is given in Table 3.11.

Table 3.11

Female-Male Ratio (Rural), India - 1991

Age group	FMR
0-4	0.925
5-14	0.919
15-54	0.939
55+	1.001

Source: Registrar General, India (1994).

Using the estimated female-male ratio, we have normalised the age-specific female mortality for gender gap in parity with regard to various types of causes leading to death. The 1991 Report on Causes of Death (Rural) has enlisted 58 major classifiable causes and classified them under 10 major cause-groups. Of the 10 groups, 'Child birth & Pregnancy' and 'Senility' are excluded in our analysis on account of two reasons: (i) Child birth & Pregnancy

belongs to sex-specific mortality; and (ii) 'Senility' is disorder occurring at old age. Therefore, we are left with eight groups comprising 51 major classifiable causes of death.

We have estimated adjusted female-male mortality for all these 51 major classifiable causes of death (see Appendix Table 3.3). The cases in which the female-male mortality ratio is not greater than one, are not considered for detailed discussion. The reason is simple. They do not fall into the scope of our inquiry. The cases where the female-male mortality ratio is greater than one, are 34 major classifiable causes leading to death.

It may be seen from Table 3.12 that the sex-selective mortality differentials are sensitive to age distribution. In fact, most of the causes leading to death are found to be unfavourable to females in the age-group (0-14). In other words, the girl child (relative to male child) upto the age of 14 appears to be vulnerable to the major causes of death (see Table 3.12). In case of age group (15-54) also, causes leading to death are observed to be sex-selective. They are Gastro-enteritis, Typhoid, Pneumonia, Meningitis, Anaemia, Measles, Tetanus and Cancer in addition to some of the causes of 'Accidents and Injuries'. The female-male mortality differential in the age group of 55 plus has been largely caused by 'Accidents and Injuries' like Snake Bite, Rabies, Burns, Natural Calamity and 'Disorders of Central Nervous Systems' like Convulsions (see Table 3.12). It is thus observed that mortality in the age group (0-14) is particularly unfavourable to females. By looking at the nature of the causes, it may be argued that the causes of death, particularly preventable causes, in the age group of (0-14) are not being medically or clinically attended for females relative to males. It implies that son preference can be possibly one of the decisive factors in accentuating female-

Table 3.12

Ratio of Female-Male Death by Causes - 1991

Probable Cause of Death	Age-group			
	0-4	5-14	15-54	55+
ACCIDENTS AND INJURIES	--	--	--	--
Snake Bite	--	--	--	1.855
Scorpion Bite and others	2.162	--	7.455	--
Rabies	--	--	--	4.995
Drowning	1.145	--	--	--
Burns	--	3.700	2.879	1.230
Suicide	--	1.088	--	--
Homicide	2.162	1.088	--	--
Excessive Cold	--	--	1.065	--
Natural Calamity	--	1.572	1.917	1.374
FEVERS	1.393	1.219	--	--
Malaria	1.667	--	--	--
Influenza	1.325	1.583	--	--
Typhoid	1.287	1.465	1.175	--
DIGESTIVE DISORDERS	1.238	1.267	--	--
Gastro-enteritis	--	1.114	1.369	
Dysentery	1.679	2.720	--	--
Peptic Ulcer	--	1.632	--	--
Acute Abdomen	1.390	1.088	--	--
COUGHS	--	1.190	--	--
Tuberculosis of Lungs	--	1.088	--	--
Bronchitis and Asthma	1.081	--	--	--
Pneumonia	--	1.377	1.180	--

Probable Cause of Death	Age-group			
	0-4	5-14	15-54	55+
Whooping Cough	1.514	--	--	--
DISORDERS OF CENTRAL NERVOUS SYSTEM	1.081	1.138	--	--
Paralysis	2.703	1.088	--	--
Meningitis	--	1.632	1.171	--
Convulsions	1.240	--	--	3.330
DISEASES OF CIRCULATORY SYSTEM	1.445	1.088	--	--
Anaemia	1.516	1.197	1.477	--
Heart Attack	--	1.360	--	--
Congestive and other Heart Diseases	1.153	--	--	--
OTHER CLEAR SYMPTOMS	1.207	1.176	--	--
Cirrhosis & Chronic Liver Diseases	1.236	4.353	--	--
Jaundice	1.351	--	--	--
Chicken Pox	2.162	--	--	--
Measles	2.162	2.176	1.065	--
Tetanus	--	2.176	1.154	--
Cancer	--	1.088	1.169	--
CAUSES PECULIAR TO INFANCY	--	--	--	--
Diarrhoea of new born	1.166	**	**	**
ALL CAUSES	1.003	1.076	--	--

Note: -- not greater than one; ** certain causes are not applicable.
Source: Appendix Table 3.3.

male mortality differentials unfavourable to females.[13] It may be, therefore, inferred that there is a need for effective policy intervention to create awareness among rural population towards treating girl children on par with boy children in every respect - health care, medical treatment, food & nutrition, clothing, and education.

4.1 Social Dimensions

Table 3.12 hints at several social dimensions which have policy implications. Even though earlier studies have brought out economic, social, demographic and anthropological factors affecting sex discrimination, none of them has examined the specific form in which such imbalance is created, namely resource allocation among members within the household. In this regard we would like to provide additional evidence regarding three major reasons for the imbalance: (i) discrimination in food allocation (ii) differential access and provision of health care and (iii) lower valuation of females.

The evidence on the inequality in allocation of food is substantiated by the higher ratio of anaemic deaths among the females in all age groups except the 55 plus. Inadequate food provisioning reduces resistance against infectious diseases and tends to more deaths such as Influenza, Typhoid, Pneumonia and Measles as was observed in Table 3.12. Inadequate medical treatment given to females may have also contributed to the observed higher mortality rate. A further piece of evidence in support of this proposition is the higher death rate of females from preventable diseases such as Paralysis. It may be noted that Paralysis caused the highest death rate in the age group of (0-4). Female deaths from this disability

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[13] For a detailed discussion on this, see Dasgupta (1987) and D'Souza and Chen (1980).

could have been reduced substantially had they been vaccinated in time against Poliomyelitis. Such negligence, also seen in the higher death rate among females due to Whooping Cough, Tuberculosis and Measles, may be attributed to cost factors, both direct and indirect, involved in medical care in rural areas. Direct costs refer to the money expenses required for treatment of disease. Under indirect costs, we include mainly opportunity costs which may be reckoned in terms of time and income foregone.

The most important component in direct costs is expense on drugs and clinical tests. Had direct costs been the major cause, deaths could have been avoided by timely preventive measures. Therefore, indirect costs should have been the more serious factor.

These observations have definite implications for social restructuring, education and health care policies and provisioning of basic facilities such as potable drinking water in the rural areas of India.

Chapter 4

Economics of the North-South Divide in Sex Ratio

The Beckerian Approach

In this chapter we put forward an explanation based on an economic approach to family due to Becker (1965) for explaining the spatial differences in the valuation of female children relative to male children as observed but left unexplained by Kishor (1993). In her cross-sectional study, based on 1981 census data, she examined child mortality in 350 districts in the country.[1] Her estimates show higher mortality among female children in the northern region compared to the south. This may be the main reason for lower female-male ratio in the north relative to the south. Although, the study was purely sociological in nature, it brings out institutional, social, cultural and economic factors explaining the causes of gender differences in child mortality. In another study, Kishor (1995) illustrates various factors that are responsible for the gender differences in mortality among children in the age group of (0-5). However, she could not interpret analytically the north-south dimension of excess female child mortality within the framework of household decision making. At this juncture, we provide an analytical model based on household behaviour for explaining spatial

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According to Kishor (1993), the study area is divided into three broad regions such as north, south and east. Since her focus was mainly on north-south differentials in child mortality, she considered the north-west region of the country too. It is observed that the north-west region falls into the category of northern region showing similar features to that of north. The states which come under northern region include all the districts of Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh. The southern region, on the other hand, comprises all the districts of Andhra Pradesh, Goa, Daman and Diu, Karnataka, Kerala, Maharashtra, Pondicherry and Tamil Nadu. It may be noted that she considered small states as well as union territories as a single district. In the present study, we follow the same division mentioned in Chapter 2.

differentials in female-male ratio. The explanation is based on the allocation of time between market and non-market activities at the household level formulated by Becker.[2]

This chapter is organised into four sections. Section 1 presents the stylised facts on female-male ratio (FMR) and related variables between northern and southern regions in India. Section 2 deals with Becker's Model and its interpretation. In section 3, the stylised facts are explained using Becker's Model. The last section contains the summary and conclusions of the chapter.

Section 1

Stylised Facts

The stylised facts include our major concern, female-male ratio and its related factors such as average family size, female literacy rate and female participation rate which affect it directly or indirectly as elaborated below. The estimates on FMR are reproduced in Table 4.1 which reaffirm the higher sex imbalance ratio in the north. Let us examine the seriousness of this problem in terms of 'missing females'. Such an effort is possible now due to availability of state-wise estimates of missing females provided by Agnihotri (1995). According to his estimates, a total of 318.49 lakh females are missing in India in 1991 of which the share of northern region is about 62.45 per cent and that of the south only 8.19 per cent. This would mean that the northern region's missing number of females is almost 8 times that of the south.[3] The missing numbers are attributed to the relatively much lower valuation of females in the northern region.

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[2] For more details, see Becker (1965) and chapter 1 of (1981).

[3] For further details, see Agnihotri (1995).

Table 4.1

Stylised-facts: 1991

Regions	Average Family Size	Female-Male Ratio	Female Literacy Rate	Female Participation Rate
North (Mean)	**6.05**	**0.896**	**31.40**	**8.16**
Bihar	6.16	0.911	22.89	3.91
Haryana	6.30	0.865	40.47	4.65
Madhya Pradesh	5.65	0.931	28.85	20.38
Punjab	5.92	0.882	50.41	1.65
Rajasthan	6.04	0.910	20.44	11.64
Uttar Pradesh	6.22	0.879	25.31	6.72
South (Mean)	**5.01**	**0.986**	**53.78**	**16.73**
Andhra Pradesh	4.77	0.972	32.72	24.98
Karnataka	5.52	0.960	44.34	17.29
Kerala	5.28	1.036	86.74	5.33
Tamil Nadu	4.45	0.974	51.33	19.30
All-India	5.52	0.927	39.29	----

Source: Cols 2 & 4, CMIE (1996); Col 3, Dreze and Sen (1995) and Col 5 is estimated from Registrar General, India (1991).

One way of valuing the females in a reliable manner is to look at their economic worth as reflected in the prevailing real wage rate in the region. Higher real wage rate leads to higher income which in turn increases female participation rate and thereby valuation of females. If this argument is valid one would expect higher participation rates in the southern region because of its higher real wage rate. The estimated female participation rate for the regions clearly validates this hypothesis. It will be shown later that this link is very important in the explanation of the sex imbalance between north and south. It has also implication for the

average family size since higher female valuation would lead to lower mortality and hence average household size. If this proposition is valid one would expect a higher household size in the northern region. In other words one would observe a negative association between household size and female-male ratio. This is also validated in Table 4.1.

Higher female valuation has implication for higher literacy rates in the region. This indicates a positive correlation between literacy rate and female-male ratio. The estimate given in Table 4.1 also supports this hypothesis. These findings have to be explained within the framework of household decision making. For this purpose, we analyse the household production model of Becker (1965).

Section 2

Theory of Allocation of Time

This theory is based on the generalisation of the traditional consumer behaviour incorporating non-market activities and time of household members in the allocation of resources within the household. Becker (1981) develops this theory in three stages. First he examines the traditional single-person household behaviour on the allocation of income among market goods only. In the extended version, he brings in time as well as money and property income in the allocation of both market and non-market goods. In the general model, he integrates consumer theory with production theory by treating households as a 'mini factory'. In this model, household produces commodities like quality children, good health, self esteem with the inputs of time and goods that derive utility for it. The development of such a model is reviewed below.

2.1 Traditional Model

In a single-person household the choices are made by an individual only. In this model choice is based on maximisation of utility function, U(.), subject to the income constraint mainly from work. Note that, in such a situation the choice becomes:

$$Max \quad U=f(x_1, \ . \ . \ . \ . \ . \ , \ x_n) \qquad \ldots (1)$$

subject to $\sum_{i=1}^{n} p_i x_i \leq I$, where $x_1,\ldots, x_n$ are the market goods; and I, income from labour in the form of wages. The Lagrangean function of the optimisation problem is given by

$$\underset{x_1,\ldots,x_n}{Max} \quad L(.) = U(.)+\lambda(I-\sum_{i=1}^{n} p_i x_i) \qquad \ldots (2)$$

where λ , Lagrangean multiplier, is the marginal utility of income.

The first order condition from (2) is

$$\frac{\partial U}{\partial x_i} = MU_i = \lambda p_i \qquad i=1,\ldots,n \qquad \ldots (3)$$

$$\sum_{i=1}^{n} p_i x_i = I \qquad \ldots (4)$$

These equilibrium conditions form the basis of the theory of demand. Specifically, a compensated price change induces quantity demanded in the opposite direction. This is the universal law of demand. Differentiating the budget constraint with respect to income and expressing in terms of income elasticity, we have

$$\sum_{i=1}^{n} s_i \eta_i = 1 \qquad \ldots (5)$$

This predicts that the weighted average of income elasticities must be equal to one. Equation (5) forms the basis of classification of goods into luxuries and necessities in the consumption of various market goods. Income elasticity is greater than one for luxuries and less than one for necessities. So that the weighted average of income elasticity becomes one. The traditional model includes only the time spent at work leaving a substantial proportion of a person's time unaccounted in the allocation process. For example an employed person usually spends only eight hours at work and the remaining two-thirds of his time in a day is allocated for activities such as reading, eating, sleeping, watching television, socialising, etc. This is not included in the traditional model. In order to overcome this limitation, the extended version of the model is employed.

2.2 Extended Model

In the extended model, utility depends not only on market goods but also on the time allocated to non-market activities such as eating, sleeping, watching television, gardening etc. As a result, a time-budget constraint joins the money-income constraint in the optimisation. In such a situation the optimisation problem becomes:

$$\text{Max} \quad U = f(x_1, \ldots, x_n, t_{h_1}, \ldots, t_{h_r}) \qquad \ldots (6)$$

subject to constraints:

$$\sum_{i=1}^{n} p_i x_i \leq I \qquad \text{(income constraint)} \qquad \ldots (7)$$

$$\sum_{j=1}^{r} t_{h_j} + t_w = t \quad \text{(time constraint)} \qquad \ldots (8)$$

where t_{h_j} is the time spent on the j^{th} (non-market) activity, t_w is the time allocated for market activities (wage earning) and t is the total time available. If the consumer has the property income, v, it has to be added to the income from work. In such a case, the income of the consumer is full or potential income. Since time and budget constraints are not independent, it can be combined into a single constraint for optimisation as follows.

$$\sum_{i=1}^{n} p_i x_i = I = wt_w + v = w(t - \sum_{j=1}^{r} t_{h_j}) + v \qquad \ldots (9)$$

$$\sum_{i=1}^{n} p_i x_i + w\sum_{j=1}^{r} t_{h_j} = wt + v = S \qquad \ldots (10)$$

The optimisation problem now becomes,

$$\underset{x_1,\ldots,x_n \; t_{h_1},\ldots,t_{h_r}}{Max} L(.) = U(.) + \lambda(S - \sum_{i=1}^{n} p_i x_i + w\sum_{j=1}^{r} t_{h_j}) \qquad \ldots (11)$$

The first order condition from equation (11) gives,

$$\frac{MU_{t_{h_k}}}{MU_{t_{h_j}}} = 1, \quad \text{and} \quad \frac{MU_{t_{h_j}}}{MU_{x_i}} = \frac{w}{p_i} \qquad \ldots (12)$$

It is observed from the equilibrium conditions that the marginal utility derived from the time spent on good k is equal to marginal utility derived from good j, since both the goods are available at price w. This second condition emphasises that the marginal rate of substitution

between time and good[4] equals the real wage rate (w/p_i), where the price deflator is the prices of that good.

The comparative statics analysis of the equilibrium condition has the following impact on the commodity market and labour market. For example, a compensated rise in the price of a good reduces its demand and increases the demand for all other commodities. Since the real wage rate has declined in terms of goods there is a reduction in the hours at work and thereby increase in the time spent at household activities. But in the case of a compensated wage rate increase, it will have the opposite effect: more time at work and less time for household or non-market activities. In this situation, one would expect less time for child care, shopping, and other such activities. A growth in full income without any change in the wage rate reduces working time and increases the demand for most goods and household time. In this case a lower participation rate can be observed.

This extended model has the following limitations. It cannot model or explain the co-operation and conflict within the household decision-making. Moreover, it is not possible to bring out the substitutability between market goods and time. To overcome this difficulty, Becker introduces a general model which integrates both consumer and producer behaviour among the members of the household.

2.3 General Model

In this model, Becker assumes that commodities are produced with inputs such as time, market goods and other environmental variables. The commodities include quality children,

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[4]. For further discussion see Becker (1965) pp.512-516.

prestige and esteem, health, altruism, envy, sensual pleasures etc. Note that these commodities are not purchased from the market hence have no market prices. The noteworthy feature is that the output is smaller in number compared to the number of inputs consumed. The utility function now becomes:

$$U = f(Z_1, \ . \ . \ . \ , \ Z_m) \qquad \ldots (13)$$

where $Z_1,\ldots.Z_m$ are the various commodities consumed and each commodity is self-produced with the help of the following production function.

$$Z_i = f_i(x_i, \ t_{h_i}; \ E_i), \quad i=1,\ldots..,m \qquad \ldots (14)$$

where x_i and t_{h_i} are the inputs of various goods and the time spent on producing the i^{th} commodity and E_i represents shift parameters such as household ability, human capital, social and physical climate, technology and other environmental variables.

Since the commodities do not have markets, implicit prices are calculated using cost of production. The price of the ith commodity can be defined as:

$$\pi_i = p_i\frac{x_i}{Z_i} + w\frac{t_{h_i}}{Z_i} \qquad \ldots (15)$$

Combining budget constraints (10) and (15) and optimising (13) subject to the combined budget constraint, we have the following equilibrium condition:

$$\frac{\partial U/\partial Z_i}{\partial U/\partial Z_k} = \frac{MU_i}{MU_k} = \frac{\pi_i}{\pi_k}, \quad \text{for all i and k.} \qquad \ldots (16)$$

$$\sum_{i=1}^{n} p_i x_i + w \sum_{j=1}^{r} t_{h_j} \equiv \sum_{i=1}^{m} \Pi_i Z_i = S \qquad \ldots (17)$$

The equilibrium conditions imply that a decrease in the relative price of Z_k increases the demand for Z_k and for the goods and time used to produce it. A compensated increase in the wage rate cannot rule out the possibility of increase in the time spent on household activities unlike the extended model. Moreover, special substitutability and complementarity of goods and time can be accommodated in the general model. For example, an increase in the property income during harvest season is likely to increase the demand for all the commodities which in turn increases time for household activities. In such situations a commodity like food produced at home can be substituted with ready made packed foods or the time-saving household devices can be introduced for the preparation of food within the household itself. It also creates the need for reducing time for household activities such as the emergence of super markets, nursery schools, etc. The substitutability of time allocated for market activities and household activities becomes complicated if the market activities are traditional industries such as spinning and weaving, beedi production, etc and modern industries like assembling of electronic devices. In such conditions, the impact of real wage change on household activities is very weak since the time allocation taken place within the household itself.

Put more technically, the utility function given by equation (9) is separable in the goods and in time used to produce the same commodity:

$$\frac{\partial U/\partial x_i}{\partial U/\partial t_{h_i}} \equiv \frac{(\partial U/\partial Z_i) \cdot (\partial Z_i/\partial x_i)}{(\partial U/\partial Z_i) \cdot (\partial Z_i/\partial t_{h_i})} = \frac{(\partial Z_i/\partial x_i)}{(\partial Z_i/\partial t_{h_i})} = \frac{MP_{x_i}}{MPt_h} \qquad \ldots (18)$$

$$= \phi(x_i, t_{h_i}), \qquad i=1, \ldots\ldots, m.$$

This separability property implies, for example, that an increase in the wage rate necessarily decreases the ratio of time to goods spent on each commodity, and that it tends also to decrease the output of time-intensive commodities relative to goods-intensive commodities. This model can be used to provide an explanation for the stylised-facts between the northern and the southern region in India observed in the earlier section.

Section 3

Application of the Model

The stylised facts are explained in terms of comparative statics of the general model. A higher valuation of market time usually reflects in higher real wage rate in a region. If this is the case, more time will be allocated for market activities which naturally increases, other things remaining the same, female participation rate. This signifies a reduction in the production of time-intensive commodities including quality of children, health care etc. Since the quality of children becomes important, adequate care will be provided in terms of food, health care, etc. In such a situation, mortality in general and female child mortality in particular have a strong tendency to culminate in a higher female-male ratio (FMR). This line of reasoning can be put forward as an explanation for the lower FMR in the north. But this logic is inconsistent with the higher real wage observed in Punjab in the north and Kerala in the south. In this connection, it is interesting to observe that the highest real wage rate in

the country is in Punjab followed by Kerala. This apparent anomaly requires further interpretation.

The case of Punjab, which has the lowest female participation rate, goes against the prediction of the model. This is mainly attributable to low levels of female labour arising from (i) low female-male ratio and (ii) high property income. Historically, it is known that Punjab had the lowest FMR as far back as in 1891, a tragic state of affairs which was instrumental for the appointment of the Royal Commission in Punjab to study its causes (Visaria 1961).[5] The Royal Commission and the studies which ensued attribute several socio-economic and cultural factors for explaining this peculiar sex imbalance in Punjab (Visaria 1961; Dasgupta 1987). Dasgupta attributes son preferences as the major reason for low female-male ratio in Punjab. In her study she found that mortality is higher for males during neo-natal period and that afterwards it is found that females are dying more. This gives enough evidence to show that social, cultural and environmental and care-related factors systematically eliminate the biological advantage of females over males to survive. The lower FMR leads to lower female labour supply since it depends on female population. Female labour supply is further reduced due to the income effect on supply arising from the large property income of the households. The effect of property income is to increase demand for all commodities and time for household consumption. Since time spent on household activities and at work are inversely related, participation rates of females are reduced further. This is an alternative interpretation of backward bending supply curve. The lower supply of female labour force induces capital-using and labour-saving technical change

[5] See Visaria (1961), Table 2.4, p.6.

in the agricultural sector. The combined effect of these above factors explains the phenomena of higher real wage rate and lower female participation rate.

In Kerala, on the other hand, lower female participation rate is mainly due to equal opportunity given to both sexes in education at all stages. Those females who do higher studies are not, even by definition, part of the labour force. Labour supply from educated women is highly job-specific. The combined effect of both tends to lower female participation rate despite the prevalence of high real wage rate. Higher valuation of females resulting from higher real wage rate also explains the other two stylised facts namely, lower household size and higher literacy rate in the south as will be shown presently.

Higher valuation of females naturally increases allocation of food and health care facilities provided to them which in turn helps reducing the mortality rate among them. It is a well-accepted proposition in demography that mortality decline precedes fertility decline.[6] Fertility decline reduces family size. Thus higher real wage rate is associated with lower household size. This hypothesis is found valid.

Higher valuation of females involves higher investment in improvement of their quality and thereby production of larger human capital.[7] In such a situation it is quite likely that female education gets priority which would enhance women's literacy levels. Therefore, one finds a positive relationship between real wage rate and literacy rate. This hypothesis is also thus validated.

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[6] Krishnan (1976), Mahadevan (1993), Bhat (1996), and Kulkarni (1996).

[7] For the details about investment in human capital, see Becker (1964).

Hence the comparative static analysis of Becker's general model incorporating time and non-market goods provides an explanation for the differences observed as between the northern and the southern regions of India.

Section 4

Conclusion

In this chapter, we estimate the difference in female-male ratio, average household size, literacy rate and participation rate between the northern and the southern states in India. No analytical explanation for these stylised facts exists in the literature. Since the micro-unit of decision making of these stylised facts is the household, their explanation should be sought in decision-making within the household. For this purpose, we have taken the economic approach to family developed by Becker. The comparative statics of the optimality condition in household production model demonstrates that differential in real wage rate explains the differential in FMR ratio. The same model also explains the lower household size and higher literacy rate observed in the southern states. In other words, the observed spatial difference in female-male ratio, participation rate, household size and literacy rate is explained in economic terms.

Chapter 5

Summary and Conclusion

The present study makes an assessment of health status in India using mortality indicators. Low mortality rate, especially child mortality rate, in a particular region or nation reflects its attainment of fairly high socio-economic and health status. A review of mortality studies suggests that higher rates of mortality - particularly at childhood and among females in the rural population- is a major feature characteristic of developing societies. India is a typical case in point. It would, therefore, imply that health transition in a society depends as much on the reduction of sex- and region-specific mortality rates at the earlier age groups as on the overall decline in mortality. These two inter-linked aspects of health transition form the main focus of the present study.

An attempt was first made to review critically the existing mortality studies, both theoretical and empirical, and to contextualise the dimensions of health status within the perspective of inequality. The review suggested that much of the inequality in health in India is of gender and regional dimensions.

We then passed on to examining the gender and regional dimensions of health inequality using mortality differentials among age intervals over time. It was observed that both the ends of the age distribution have very high rates of mortality, representing a typical 'U' shape curve normally observed for all developing countries. However, though the typical 'U 'shape of the age-specific mortality curve has ramained in tact, a tendency was seen to have set in since 1971 for a gradual transformation towards the 'J' shape, resulting from a steady mortality decline during childhood (0-4).

The question of gender dimension in health inequality derives its strength from the biological advantage that females enjoy over males in the average life expectancy at birth, *ceteris paribus*, which would normally produce a female-male ratio (FMR) of at least one, i.e., equal number of males and females in the population, unless there exists in the society some form of discrimination against females. In fact, the declining FMR observed over time strengthens the hypothesis of 'missing females'. It is found that the 'missing females', the fall out of the secular decline in FMR, observed in India is not the result of sex inequality at birth but because of excess female mortality in the child age group.

The analysis was extended to the inter-connected issue of regional inequality in health status. The regional aspect assumes importance in the context of the prevalence of excess child mortality with gender bias as between the northern and the southern as well as rural and urban areas in India. The discussion on spatial differentials in child mortality has shown clearly that there exists a divide in the levels of child mortality between the northern and the southern region. It is observed that excess female child mortality is due to the neglect of female children in the north and that the female child is not discriminated against to the same extent in the southern region. This fact is reflected more clearly in the ratio of child mortality gap which contues to persist between these regions. It is noted that gender bias is predominant in the northern region although, even in this region there are signs of decline taking place in gender bias along with decline in child mortality. In case of the southern region, the decline in child mortality is found to be, in general, gender-neutral. It means that the southern region does not discriminate against female child as much as the northern region does. What is striking, however, is that the gender discrimination may perhaps be a phenomenon associated with higher mortality.

The disaggregate level analysis within these regions gives evidence about the persistence of intra-regional disparity in child mortality. There are two exceptions: (i) Kerala in the south and (ii) Punjab in the north. The northern states lag behind Punjab more than twenty years. Uttar Pradesh and Madhya Pradesh are the states in the region which show the highest incidence of child mortality. In the south, Andhra Pradesh and Karnataka are also lagging behind Kerala by about twenty years. Tamil Nadu has achieved the level of improvements in child survival comparable to those of Punjab in the north. The ratio of female-male child mortality shows that all the southern states have achieved improvement in child survival without aggravating the gender bias. In the case of the northern states, the decline in child mortality is not much associated by decline in excess female child mortality.

Inter-local disparities in child mortality within a state are reflected in the overall child mortality in that state. Therefore we looked into differentials in child mortality and gender bias between rural and urban areas. It was observed that increase in urbanisation would prevent the FMR from declining. The observed decline in the overall FMR is largely the result of decline in FMR in rural areas and that too in the lower age population. With regard to urban area, female-male mortality ratio was found to be closer to unity although some degree of female discrimination in the lower age group persists, a phenomenon which would disappear only over longer periods of time. It is only urbanisation that has a positive impact on health status through reduction in child mortality and gender bias. This proposition is not validated for Kerala. In fact, urbanisation with higher female valuation seems to have played an important role in reducing child mortality in Tamil Nadu while female literacy appears to be the crucial variable in achieving the same outcome in Kerala.

We then developed a measure that is capable of standardising the age structure of mortality in such a way that while measuring the regional variations in health status between the northern and the southern states, it allows for the process of mortality transition from child-age group (0-4) through old-age group (55 plus). The measure has potentiality of assessing the relative health status in developing countries marked by a relatively high incidence of child mortality. At the national level, the achievement in health status is found quite disappointing in the sense that the gender gap in health status continues to persist, keeping women in a disadvantageous position. On the other hand, at the regional level, the north-south divide in the levels of achievement in health status is glaring. The northern region lags behind the southern region in the attainment of health status by a considerable margin and a span of twenty years. The estimates show that the southern region has achieved medium level of health status (0.676) while the northern region continues to have low level of health status (0.432) despite improvement in its position in recent decades. The southern region does not show gender inequality in health status to the extent observed in the northern region. The inter-state pattern of health status is quite different in the northern states. Kerala, the southern most state, is the only state that has achieved high level of health status with the lowest level of gender bias. A comparison of Kerala's health status with that of the Scandinavian countries highlights that Kerala has achieved what the Scandinavian countries had achieved four to five decades ago. Kerala thus lags behind the Scandinavian countries in health status by 30 to 40 years. India, however, lags behind Kerala in health status by 30 years.

We have then made a modest attempt to analyse the causes of excess female mortality in India. The disperate tendency that we found peculiar to India is that in all age groups except

in the old-age group (55 plus), female mortality is reported to be higher. In old-age, gender discrimination is presumably non-existent and the natural superiority of the females for survival asserts itself. The statistical exercises done in this chapter helped us to understand the direction of the shift in the pattern of diseases - from preventable to curable or *vice versa*.

The disease groups like 'Fevers' and 'Digestive Disorders' appear to have come under better control since 1971 as was seen from the steady decline in their respective ranks. However, deaths due to 'Disorders of Circulatory System' such as strokes and heart diseases have been steadily on the increase. The rankings of the disease-groups have undergone changes over time. 'Coughs' continues to top the rank but 'Disorders of Circulatory System' has steadily risen to the second position in 1991 from the position of last-but-one in 1971. Similarly, the cause-group of 'Accidents and Injuries' has emerged as a dominant killer group in the 1980s. The disease-group of 'Other Clear Symptoms' seems to have lost its importance, probably because of the inclusion of several diseases in the group under other well-defined cause-groups. 'Coughs' and Disorders of Circulatory System have emerged as the major causes of death in more recent years.

The observed pattern of disease-group causing death was examined also in relation to the gender dimension. The proportion of deaths due to disease-groups like 'Fevers', 'Digestive Disorders' and 'Other Clear Symptoms', has been declining over time for the population as a whole; but it is relatively unfavourable for females. It is to be pointed out that in all disease-groups except 'Disorders of Circulatory System' and 'Accidents & Injuries', the trends in mortality are relatively unfavourable for them.

A disaggregated analysis of the disease-groups causing death was attempted with a view to understanding the severity of each disease so that the policy intervention in the health sector could be effectively targeted. The disaggregate analysis has thrown some interesting insights into the dominant causes of death, their changing pattern over time and gender biases. Of the 34 individual causes of death, seven individual diseases are found to be the dominant ones. In fact each disease-group has one dominant cause of death. They are 'Bronchitis & Asthma (Coughs)', 'Typhoid (Fevers)', 'Prematurity (Causes Peculiar to Infancy)', 'Dysentery (Digestive Disorders)', 'Cirrhosis and Chronic Liver Diseases (Other Clear Symptoms)',' Congestive and other Heart Diseases (Disorders of Circulatory System)' and 'Paralysis & Convulsions (Disorders of Central Nervous System)'. In case of 'Accidents & Injuries', prominent causes of death include Burns, Suicide, Vehicular Accidents and Drowning.

Over time, some diseases are seen to be emerging as dominant ones causing death. This category of diseases includes 'Pneumonia (Coughs)', 'Influenza (Fevers)', and 'Malformations and Prematurity (Causes peculiar to Infancy)'. These diseases are also turning increasingly unfavourable for females. It is visualised that some of the diseases are commonly found in certain age groups. This factor led us into an enquiry into the aspects of age-specfic causes of death.

Analysis of sex-selective differentials in causes of death has failed to recognise the gender parity in the female-male ratio. For instance, the female-male ratio has an in-built assumption of gender gap in parity because it is conceived as number of female population per thousand male population. What we mean by gender gap in parity is the difference between female

and male population. This shortcoming has given rise to under-estimation of sex-selective differentials in mortality. This issue has not received attention in the studies on sex-selective differentials in mortality. The present study has therefore made an attempt in this direction. Sex discrimination against females in the causes of death can be identified if the ratio of female-male mortality is greater than one. Similarly, a disease is favourable to females if the ratio is less than one. If the ratio turns out to be one, a disease causing death is sex-neutral. In the present exercise, the cases in which the female-male mortality ratio is not greater than one, were not considered for detailed discussion. We observed that the sex-selective mortality differentials are sensitive to age distribution. In fact, most of the causes leading to death are found to be unfavourable for females in the age-group (0-14). It implies that son preference is possibly one of the decisive factors in accentuating female-male mortality differentials unfavourable to females. It may be inferred, therefore, that effective policy intervention is needed to create awareness among the rural population for giving the girl children equal treatment in all respects- health care, medical treatment, food & nutrition, clothing, and education.

Even though earlier studies have brought out economic, social, demographic and anthropological factors affecting sex discrimination, none of them has examined the specific form in which such imbalance is created, namely resource allocation among members within the household. In this regard we have attempted to provide some additional evidence regarding three major reasons for the imbalance: (i) discrimination in food allocation (ii) differential access and provision of health care and (iii) lower valuation of females.

The evidence on the inequality in allocation of food is substantiated by the higher ratio of anaemic deaths among the females in all age groups except the 55 plus. Inadequate food provisioning reduces resistance against infectious diseases and tends to more deaths such as Influenza, Typhoid, Pneumonia and Measles. Inadequate medical treatment given to females may have also contributed to the observed higher mortality rate. A further piece of evidence in support of this proposition is the higher death rate of females from preventable diseases such as Paralysis. Paralysis caused the highest death rate in the age group of (0-4). Female deaths from this disability could have been reduced substantially had they been vaccinated in time against Poliomyelitis. Such negligence seen also in the higher death rate among females due to Whooping Cough, Tuberculosis and Measles, may be attributed to cost factors, both direct and indirect, involved in medical care in rural areas. Direct costs refer to the money expenses required for treatment of disease. Under indirect costs, we include mainly opportunity costs which may be reckoned in terms of time and income foregone. The most important component in direct costs is expense on drugs and clinical tests. Had direct costs been the major cause, deaths could have been avoided by timely preventive measures. Therefore, indirect costs should have been the more serious factor. These observations have definite implications for social restructuring, education and health care policies and provisioning of basic facilities such as potable drinking water in the rural areas of India.

Higher female mortality implies that females are not valued much in economic terms. Therefore, there exists a great divide in the valuation of females as between the northern and the southern regions. The reasons for this divide were examined with the help of the economic approach to the family of Gary Becker. The explanation is based on the allocation of time between market and non-market activities at the household level.

One way of valuing the females in a reliable manner is to look at their economic worth as reflected in the prevailing real wage rate in the region. Higher real wage rate leads to higher income which in turn increases female participation rate and thereby valuation of females. If this argument is valid one would expect higher participation rates in the southern region because of its higher real wage rate. The estimated female participation rate for the regions clearly validates this hypothesis. This link is very important in the explanation of the sex imbalance between the north and the south. It has also implication for the average family size since higher female valuation would lead to lower mortality and hence average household size. If this proposition is valid one would expect a higher household size in the northern region. In other words one would observe a negative association between household size and female-male ratio. This hypothesis is also validated.

A higher valuation of market time usually reflects in higher real wage rate in a region. If this is the case, more time will be allocated for market activities which naturally increases, other things remaining the same, female participation rate. In such a situation, mortality in general and female child mortality in particular has a strong tendency to culminate in a higher female-male ratio (FMR). This line of reasoning can be put forward as an explanation for the lower FMR in the north.

Higher valuation of females naturally increases allocation of food and health care facilities provided to them which in turn helps reducing the mortality rate among them. Higher valuation of females involves higher investment for improvement of the quality of girl children which leads to the production of larger human capital. Hence the comparative static analysis of Becker's general model incorporating time and non-market goods provides an

explanation for the differences observed as between the northern and the southern regions of India.

In sum, we have estimated the difference in female-male ratio, average household size, literacy rate and participation rate as between the northern and the southern states and explained it using the economic approach to family developed by Becker. The comparative statics of the optimality condition in household production model demonstrates that differential in real wage rate explains the differential in FMR ratio. The same model also explains the lower household size and higher literacy rate observed in the southern states. In other words, the observed spatial difference in female-male ratio, participation rate, household size and literacy rate is explained in economic terms.

Appendix

Table 2.1

Age-specific Death Rates by Sex : India (Rural), 1971-1991

Age group	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
0-4	53.20	59.30	56.16	43.10	48.00	45.48	28.10	30.20	29.11
5-14	3.69	3.98	3.83	2.96	3.41	3.17	2.15	2.51	2.32
15-54	5.92	6.04	5.98	4.78	5.11	4.94	4.39	4.08	4.24
55+	51.76	47.63	49.73	49.98	43.75	46.89	44.64	37.98	41.31
All	16.05	16.83	16.43	13.32	13.93	13.62	10.72	10.50	10.61

Note: M, F and P refer Male, Female and Person respectively.
Source: Registrar General, India (1982; 1985 & 1993).

Table 2.2

Age-specific Death Rates by Sex : India (Urban), 1971-91

Age group	1971			1981			1991		
	M	F	P	M	F	P	M	F	P
0-4	31.10	33.30	32.14	20.00	20.90	20.43	15.40	16.60	15.97
5-14	2.01	2.09	2.05	1.65	1.55	1.61	1.35	1.20	1.28
15-54	4.19	3.85	4.04	3.73	3.09	3.43	3.73	2.69	3.24
55+	45.99	38.81	42.56	40.61	35.97	38.39	41.81	34.66	38.26
All*	9.61	9.52	9.57	8.05	7.58	7.83	7.52	6.73	7.15

Note: M, F and P refer Male, Female and Person respectively.
Source: same as Appendix Table 2.1.

Table 2.3

Ratio of Age-specific Female to Male Death Rates: India, 1971-1991

Age group	1971			1981			1991		
	R	U	C	R	U	C	R	U	C
0-4	1.115	1.071	1.114	1.114	1.045	1.105	1.075	1.078	1.074
5-9	1.080	1.208	1.089	1.220	1.000	1.189	1.143	0.937	1.115
10-14	1.045	0.750	1.000	1.000	0.875	0.944	1.200	0.818	1.143
15-19	1.571	1.538	1.579	1.737	1.000	1.579	1.474	1.000	1.389
20-24	1.382	1.556	1.433	1.556	1.714	1.583	1.259	1.167	1.240
25-29	1.469	1.318	1.433	1.607	1.571	1.600	1.161	0.920	1.138
30-34	1.357	1.000	1.333	1.125	1.000	1.135	0.914	0.840	0.879
35-39	1.123	0.913	1.091	0.979	0.800	0.935	0.907	0.725	0.857
40-44	0.818	0.708	0.811	0.821	0.667	0.800	0.759	0.673	0.765
45-49	0.800	0.849	0.810	0.816	0.631	0.789	0.667	0.452	0.626
50-54	0.758	0.699	0.753	0.731	0.614	0.712	0.696	0.628	0.679
55-59	0.723	0.641	0.711	0.738	0.606	0.714	0.643	0.688	0.651
60-64	0.906	0.754	0.884	0.804	0.865	0.815	0.752	0.631	0.727
65-69	0.815	0.696	0.797	0.798	0.801	0.779	0.821	0.800	0.817
70+	0.991	0.946	0.984	0.904	0.916	0.904	0.906	0.871	0.899
All	1.049	0.990	1.047	1.046	0.941	1.024	0.979	0.896	0.964

Note: R, U and C refer Rural, Urban and Combined respectively.
Source: same as Appendix Table 2.2.

Table 3.1A

Percentage Distribution of Deaths by Major Cause-groups by Gender: 1971

Probable Cause of Death	(0-4)			(5-14)			(15-54)			(55+)			Total		
	M	F	P	M	F	P	M	F	P	M	F	P	M	F	P
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
I. ACCIDENTS AND INJURIES															
Animal bite (incl. snake, scorpion etc)	0.06	0.06	0.06	1.73	2.14	1.93	1.75	1.17	1.50	0.19	0.42	0.28	0.64	0.60	0.62
Rabies	0.23	0.00	0.12	2.01	0.92	1.48	1.25	0.32	0.84	0.32	0.10	0.24	0.64	0.18	0.44
Drowning	0.70	0.57	0.63	8.65	3.36	6.08	2.16	3.22	2.63	0.71	0.62	0.67	1.64	1.47	1.56
Fall from height	0.12	0.06	0.09	3.44	1.22	2.36	2.00	1.39	1.73	0.45	0.62	0.52	0.93	0.63	0.80
Vehicular accidents	0.29	0.38	0.33	2.60	1.82	2.22	4.32	0.43	2.62	0.90	0.42	0.72	1.66	0.52	1.16
Burns	0.17	0.38	0.27	1.73	2.44	2.08	1.16	3.44	2.15	0.13	0.73	0.36	0.52	1.39	0.90
Suicide	0.00	0.00	0.00	0.00	0.00	0.00	2.57	2.58	2.58	0.19	0.21	0.20	0.70	0.68	0.69
Homicide	0.06	0.00	0.03	0.30	0.00	0.15	1.58	1.07	1.36	0.32	0.10	0.24	0.54	0.29	0.43
Total	1.62	1.45	1.54	20.46	11.89	16.30	16.80	13.63	15.41	3.23	3.21	3.22	7.27	5.77	6.61
II. FEVERS															
Malaria	3.48	3.91	3.69	5.81	8.82	7.27	5.17	5.04	5.12	4.46	5.29	4.78	4.38	4.96	4.64
Influenza	0.53	0.44	0.49	0.29	0.32	0.30	0.25	0.64	0.42	0.84	0.49	0.70	0.54	0.49	0.52
Typhoid	3.98	4.35	4.16	10.94	14.03	12.44	6.00	7.08	6.47	2.58	3.63	2.99	4.54	5.67	5.04
Total	7.99	8.71	8.34	17.04	23.17	20.02	11.41	12.77	12.01	7.89	9.41	8.47	9.46	11.12	10.20
III. DIGESTIVE DISORDERS															
Cholera	0.64	0.57	0.60	0.86	1.23	1.04	0.58	1.18	0.84	0.13	0.62	0.32	0.48	0.79	0.61
Food poisoning	0.28	0.38	0.33	1.72	0.91	1.33	1.25	0.53	0.94	0.64	0.52	0.60	0.74	0.50	0.63
Dysentery	11.53	12.44	11.97	11.81	11.59	11.70	6.08	8.05	6.94	8.00	9.32	8.51	9.06	10.51	9.70
Total	12.45	13.39	12.90	14.40	13.72	14.07	7.90	9.77	8.72	8.78	10.47	9.43	10.28	11.79	10.95
IV. COUGHS (Disorders of Respiratory system)															
Tuberculosis of lungs	0.75	0.56	0.66	2.59	6.39	4.44	26.60	22.44	24.78	19.25	17.45	18.56	13.26	10.68	12.12
Bronchitis & asthma	29.53	32.84	31.12	2.01	1.22	1.63	6.50	6.11	6.33	22.73	23.69	23.10	19.63	21.28	20.36
Pneumonia	0.06	0.07	0.07	16.14	17.08	16.60	5.08	6.86	5.86	3.66	4.17	3.86	3.62	4.23	3.89
Total	30.33	33.48	31.84	20.74	24.69	22.66	38.19	35.40	36.97	45.64	45.31	45.51	36.51	36.18	36.37
V. DISORDERS OF THE CENTRAL NERVOUS SYSTEM															
Paralysis & Convulsions incl. cerebral haemorrhag	0.18	0.19	0.18	0.86	0.30	0.59	5.57	4.61	5.15	10.64	9.33	10.14	4.93	3.59	4.34
Meningitis	1.51	1.02	1.27	3.73	3.06	3.41	1.33	2.26	1.74	0.70	0.50	0.63	1.37	1.37	1.37
Total	1.68	1.21	1.46	4.60	3.36	4.00	6.90	6.87	6.89	11.35	9.84	10.77	6.30	4.96	5.71
VI. DISORDERS OF CIRCULATORY SYSTEM															
Congestive and other heart diseases incl. heart attack	0.23	0.13	0.18	2.89	3.66	3.26	8.72	10.26	9.39	12.65	12.02	12.41	6.53	5.91	6.25
VII. OTHER CLEAR SYMPTOMS															
Cirrhosis and chronic liver diseases including-															
Atrophy of liver	3.36	3.40	3.38	5.77	7.02	6.37	6.24	6.06	6.16	5.50	6.83	6.01	4.94	5.23	5.06
Measles	5.56	7.43	6.46	6.90	7.29	7.09	0.17	0.10	0.14	0.12	0.22	0.16	2.57	3.80	3.11
Tetanus	10.13	7.36	8.80	6.34	4.27	5.33	2.25	3.75	2.90	0.52	1.04	0.72	4.81	4.61	4.72
Poliomyelitis	0.57	0.44	0.51	0.88	0.92	0.90	0.34	1.07	0.66	1.03	0.94	0.99	0.68	0.76	0.72
Diseases of urinary tract	0.00	0.00	0.00	0.00	0.00	0.00	1.08	0.32	0.75	3.29	0.73	2.31	0.00	0.00	0.00
Total	19.62	18.63	19.15	19.88	19.50	19.70	10.07	11.30	10.61	10.46	9.75	10.19	14.32	14.67	14.47
VIII. CAUSES PECULIAR TO INFANCY															
Prematurity	16.51	15.45	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.91	6.44	6.14
Malformations including congenital malformation	0.68	1.01	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.42	0.32
Birth injury	3.22	2.13	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.89	1.04
Respiratory infections of new born	5.66	4.42	5.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	26.07	23.01	24.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33	9.59	9.45
GRAND TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Registrar General, India (1971).

Table 3.1B

Percentage Distribution of Deaths by Major Cause-groups by Gender: 1981

Probable Cause of Death	(0-4)			(5-14)			(15-54)			(55+)			Total		
	M	F	P	M	F	P	M	F	P	M	F	P	M	F	P
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
I. ACCIDENTS AND INJURIES															
Animal bite (incl. snake, scorpion etc)	0.12	0.07	0.10	2.84	3.05	2.94	2.32	1.79	2.11	0.41	0.37	0.40	1.03	0.83	0.94
Rabies	0.12	0.00	0.06	3.41	0.68	2.16	0.45	0.30	0.39	0.10	0.46	0.23	0.42	0.26	0.35
Drowning	0.80	0.41	0.61	7.67	8.14	7.88	3.41	3.97	3.63	0.41	1.37	0.76	1.85	2.19	1.99
Fall from height	0.12	0.20	0.16	1.99	1.69	1.85	1.74	0.99	1.44	0.62	0.55	0.60	0.88	0.62	0.77
Vehicular accidents	0.18	0.14	0.16	7.10	1.69	4.64	6.11	1.29	4.21	0.83	0.46	0.70	2.55	0.65	1.76
Burns	0.18	0.41	0.29	1.14	1.69	1.39	0.77	4.07	2.07	0.00	0.92	0.33	0.35	1.60	0.87
Suicide	0.00	0.00	0.00	0.28	0.00	0.15	2.19	2.88	2.46	0.57	0.18	0.43	0.84	0.80	0.82
Homicide	0.18	0.07	0.13	0.85	0.34	0.62	1.41	0.79	1.17	0.26	0.18	0.23	0.60	0.31	0.48
Total	1.72	1.28	1.51	25.28	17.29	21.64	18.39	16.07	17.48	3.21	4.49	3.67	8.52	7.25	7.99
II. FEVERS															
Malaria	2.34	2.84	2.58	3.41	4.75	4.02	0.71	2.58	1.44	1.35	2.75	1.85	1.59	2.89	2.13
Influenza	2.59	4.32	3.41	7.95	7.46	7.73	2.25	3.27	2.65	2.90	2.29	2.68	2.95	3.72	3.27
Typhoid	4.62	5.41	4.99	10.51	16.95	13.45	6.37	8.13	7.06	3.94	5.86	4.63	5.26	7.12	6.03
Total	9.54	12.57	10.99	21.88	29.15	25.19	9.32	13.99	11.16	8.19	10.90	9.17	9.80	13.73	11.43
III. DIGESTIVE DISORDERS															
Cholera	0.00	0.00	0.00	0.28	0.00	0.15	0.13	0.20	0.16	0.05	0.09	0.07	0.07	0.08	0.07
Food poisoning	0.18	0.07	0.13	0.28	0.68	0.46	0.32	0.40	0.35	0.05	0.09	0.07	0.18	0.21	0.19
Dysentery	6.59	7.84	7.18	8.81	8.14	8.50	2.77	5.16	3.71	3.01	4.58	3.57	4.38	6.25	5.15
Total	6.77	7.91	7.31	9.38	8.81	9.12	3.22	5.75	4.21	3.11	4.76	3.71	4.63	6.53	5.42
IV. COUGHS (Disorders of Respiratory system)															
Tuberculosis of lungs	0.43	0.61	0.52	3.41	5.08	4.17	25.14	22.32	24.03	11.72	7.05	10.03	11.65	8.41	10.31
Bronchitis & asthma	2.03	2.70	2.35	4.26	4.41	4.33	12.80	13.89	13.23	37.48	36.81	37.24	17.77	15.35	16.76
Pneumonia	24.01	24.59	24.29	15.06	14.92	14.99	2.38	3.57	2.85	2.59	4.40	3.24	9.71	12.70	10.95
Total	26.48	27.91	27.16	22.73	24.41	23.49	40.32	39.78	40.11	51.79	48.26	50.51	39.12	36.46	38.02
V. DISORDERS OF THE CENTRAL NERVOUS SYSTEM															
Paralysis & Convulsions incl. cerebral haemorrhage	0.49	0.47	0.48	1.99	1.69	1.85	4.12	4.27	4.17	9.64	11.36	10.26	4.85	4.62	4.76
Meningitis	0.99	1.35	1.16	2.84	3.73	3.25	1.22	1.19	1.21	0.57	0.73	0.63	1.03	1.32	1.15
Total	1.48	1.82	1.64	4.83	5.42	5.10	5.34	5.46	5.38	10.21	12.09	10.89	5.88	5.94	5.90
VI. DISORDERS OF CIRCULATORY SYSTEM															
Congestive and other heart diseases incl. heart attack	0.74	0.41	0.58	4.55	2.71	3.71	17.43	10.71	14.79	19.28	16.58	18.31	12.29	7.82	10.43
VII. OTHER CLEAR SYMPTOMS															
Cirrhosis and chronic liver diseases including-Atrophy of liver	1.97	2.84	2.38	4.26	6.10	5.10	4.50	6.05	5.11	2.23	1.83	2.09	2.93	3.64	3.22
Measles	2.52	2.50	2.51	1.70	3.73	2.63	0.19	0.20	0.20	0.00	0.09	0.03	0.92	1.32	1.08
Tetanus	7.70	7.43	7.57	4.83	2.37	3.71	0.77	1.79	1.17	0.47	0.64	0.53	2.99	3.66	3.27
Poliomyelitis	0.25	0.20	0.23	0.57	0.00	0.31	0.13	0.20	0.16	0.10	0.37	0.20	0.18	0.23	0.20
Diseases of urinary tract	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.23	1.40	0.00	0.89	0.60	0.00	0.35
Total	12.44	12.97	12.69	11.36	12.20	11.75	5.98	8.23	6.87	4.20	2.93	3.74	7.62	8.85	8.13
VIII. CAUSES PECULIAR TO INFANCY															
Prematurity	26.72	22.36	24.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.95	8.54	8.19
Malformations including congenital malformation	1.60	1.69	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.65	0.55
Birth injury	1.42	1.15	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.44	0.43
Respiratory infections of new born	11.08	9.93	10.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.30	3.79	3.50
Total	40.83	35.14	38.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.14	13.42	12.67
GRAND TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Registrar General, India (1983).

Table 3.1C

Percentage Distribution of Deaths by Major Cause-groups by Gender: 1991

Probable Cause of Death	(0-4)			(5-14)			(15-54)			(55+)			Total		
	M	F	P	M	F	P	M	F	P	M	F	P	M	F	P
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
I. ACCIDENTS AND INJURIES															
Animal bite (incl. snake, scorpion etc)	0.29	0.25	0.27	5.96	3.16	4.57	2.12	3.00	2.46	0.35	0.97	0.57	1.22	1.52	1.34
Rabies	0.18	0.12	0.15	2.07	0.53	1.31	0.37	0.39	0.38	0.04	0.32	0.14	0.28	0.30	0.29
Drowning	1.00	1.12	1.06	9.33	5.79	7.57	2.53	3.00	2.71	0.46	0.71	0.55	1.73	1.91	1.81
Fall from height	0.47	0.25	0.36	3.63	1.84	2.74	1.27	0.91	1.13	0.53	0.90	0.66	0.92	0.77	0.86
Vehicular accidents	0.53	0.19	0.36	9.33	5.79	7.57	10.57	2.93	7.63	1.52	1.36	1.46	4.70	1.79	3.52
Burns	0.88	0.37	0.63	1.30	4.47	2.87	2.20	9.52	5.02	0.46	1.03	0.66	1.18	3.65	2.18
Suicide	0.00	0.06	0.03	1.04	1.05	1.04	6.16	7.76	6.78	1.13	0.65	0.96	2.53	2.64	2.58
Homicide	0.06	0.12	0.09	0.52	0.53	0.52	2.37	0.65	1.71	0.60	0.13	0.43	1.06	0.32	0.76
Total	3.40	2.49	2.96	33.16	23.16	28.20	27.59	28.16	27.81	5.08	6.07	5.43	13.63	12.90	13.33
II. FEVERS															
Malaria	1.41	2.30	1.84	5.44	3.68	4.57	2.12	2.48	2.26	2.40	2.78	2.53	2.24	2.60	2.39
Influenza	1.82	2.36	2.08	2.85	4.21	3.52	1.22	0.85	1.08	1.02	1.42	1.16	1.37	1.76	1.53
Typhoid	2.46	3.11	2.78	6.74	9.21	7.96	2.78	4.89	3.59	1.87	1.94	1.89	2.56	3.75	3.04
Total	5.69	7.78	6.70	15.03	17.11	16.06	6.12	8.21	6.93	5.29	6.13	5.59	6.17	8.11	6.96
III. DIGESTIVE DISORDERS															
Cholera	0.00	0.12	0.06	0.00	0.26	0.13	0.04	0.26	0.13	0.14	0.26	0.18	0.07	0.22	0.13
Food poisoning	0.00	0.00	0.00	1.55	0.53	1.04	1.06	1.04	1.05	0.11	0.13	0.11	0.47	0.39	0.44
Dysentery	6.51	7.78	7.12	13.47	17.89	15.67	3.02	4.76	3.69	3.63	4.97	4.10	4.61	6.77	5.49
Total	6.51	7.90	7.18	15.03	18.68	16.84	4.12	6.06	4.87	3.88	5.36	4.40	5.15	7.38	6.06
IV. COUGHS (Disorders of Respiratory system)															
Tuberculosis of lungs	0.29	0.25	0.27	3.11	3.16	3.13	19.59	15.91	18.17	10.89	8.78	10.15	10.92	7.81	9.66
Bronchitis & asthma	1.06	1.12	1.09	2.33	1.58	1.96	8.49	10.23	9.16	33.03	32.67	32.90	15.88	13.55	14.93
Pneumonia	25.26	22.90	24.12	12.69	16.32	14.49	1.51	2.67	1.96	1.69	0.97	1.44	7.66	9.59	8.44
Total	26.61	24.27	25.48	18.13	21.05	19.58	29.59	28.81	29.29	45.61	42.41	44.48	34.46	30.95	33.03
VI. DISORDERS OF THE CENTRAL NERVOUS SYSTEM															
Paralysis & Convulsions incl. cerebral haemorrhage	2.11	2.74	2.41	3.11	2.11	2.61	3.96	4.76	4.27	11.03	14.53	12.27	6.21	6.90	6.49
Meningitis	1.06	0.62	0.85	2.59	3.95	3.26	0.82	1.43	1.05	0.35	0.32	0.34	0.79	1.03	0.88
Total	3.17	3.36	3.26	5.70	6.05	5.87	4.78	6.19	5.32	11.39	14.85	12.61	6.99	7.93	7.37
V. DISORDERS OF CIRCULATORY SYSTEM															
Congestive and other heart diseases incl. heart attack	0.94	1.00	0.97	5.44	5.00	5.22	20.33	16.10	18.70	23.79	21.63	23.03	16.40	12.17	14.68
VI. OTHER CLEAR SYMPTOMS															
Cirrhosis and chronic liver diseases including-Atrophy of liver	1.58	2.05	1.81	4.40	4.74	4.57	5.47	4.56	5.12	2.54	2.26	2.44	3.39	3.08	3.26
Measles	0.94	1.99	1.45	1.30	2.63	1.96	0.04	0.07	0.05	0.04	0.06	0.05	0.31	0.87	0.54
Tetanus	1.52	1.31	1.42	0.52	1.05	0.78	0.49	0.85	0.63	0.32	0.19	0.27	0.66	0.81	0.72
Poliomyelitis	0.29	0.19	0.24	0.78	0.26	0.52	0.24	0.00	0.15	0.11	0.06	0.09	0.23	0.10	0.18
Diseases of urinary tract	0.18	0.06	0.12	0.52	0.26	0.39	1.22	0.98	1.13	1.97	0.97	1.62	0.00	0.00	0.00
Total	4.51	5.60	5.04	7.51	8.95	8.22	7.47	6.45	7.08	4.97	3.55	4.47	5.83	5.48	5.69
VII. CAUSES PECULIAR TO INFANCY															
Prematurity	34.41	33.04	33.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.96	10.47	8.98
Malformations including congenital malformation	1.99	4.11	3.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	1.30	0.80
Birth injury	1.00	0.75	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.24	0.23
Respiratory infections of new born	11.78	9.71	10.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	49.18	47.60	48.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.37	15.09	12.88
GRAND TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Registrar General, India (1992).

Table 3.2A

Percentage Distribution of Deaths by Individual Cause-groups by Gender: 1971

Probable Cause of Death	(0-4)			(5-14)			(15-54)			(55+)			Total		
	M	F	P	M	F	P	M	F	P	M	F	P	M	F	P
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
I. ACCIDENTS AND INJURIES															
Animal bite (incl. snake, scorpion etc)	3.54	4.35	3.90	8.47	17.97	11.84	10.42	8.61	9.72	5.96	12.96	8.64	8.84	10.44	9.46
Rabies	14.29	0.00	7.85	9.81	7.72	9.07	7.43	2.36	5.47	10.05	3.17	7.42	8.83	3.18	6.65
Drowning	42.89	39.13	41.20	42.25	28.22	37.28	12.86	23.66	17.03	21.96	19.31	20.95	22.50	25.47	23.65
Fall from height	7.19	4.35	5.91	16.83	10.25	14.50	11.89	10.23	11.25	14.02	19.31	16.05	12.82	10.90	12.08
Vehicular accidents	17.79	26.09	21.53	12.71	15.33	13.64	25.76	3.12	17.02	28.04	12.96	22.27	22.81	9.07	17.52
Burns	10.76	26.09	17.67	8.47	20.51	12.74	6.90	25.23	13.98	3.97	22.62	11.11	7.11	24.11	13.66
Suicide	0.00	0.00	0.00	0.00	0.00	0.00	15.32	18.91	16.71	5.96	6.48	6.16	9.66	11.83	10.50
Homicide	3.54	0.00	1.94	1.45	0.00	0.94	9.41	7.88	8.82	10.05	3.17	7.42	7.42	5.00	6.49
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
II. FEVERS															
Malaria	43.52	44.93	44.23	34.08	38.08	36.33	45.30	39.50	42.61	56.59	56.20	56.43	46.33	44.59	45.49
Influenza	6.63	5.10	5.86	1.70	1.37	1.52	2.17	5.02	3.50	10.64	5.19	8.32	5.73	4.43	5.10
Typhoid	49.85	49.97	49.91	64.21	60.55	62.15	52.52	55.48	53.90	32.76	38.61	35.26	47.94	50.98	49.40
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III. DIGESTIVE DISORDERS															
Cholera	5.12	4.22	4.68	5.99	8.95	7.39	7.32	12.12	9.67	1.50	5.97	3.40	4.64	6.69	5.61
Food poisoning	2.28	2.81	2.55	11.97	6.61	9.43	15.81	5.47	10.75	7.35	4.95	6.33	7.24	4.21	5.80
Dysentery	92.59	92.96	92.78	82.04	84.44	83.18	76.88	82.41	79.58	91.16	89.08	90.27	88.13	89.10	88.59
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
IV. COUGHS															
(Disorders of Respiratory system)															
Tuberculosis of lungs	2.46	1.67	2.06	12.49	25.89	19.58	69.67	63.38	67.04	42.18	38.52	40.78	36.31	29.51	33.32
Bronchitis & asthma	97.35	98.11	97.73	9.68	4.94	7.17	17.02	17.26	17.12	49.80	52.27	50.75	53.76	58.80	55.98
Pneumonia	0.19	0.22	0.21	77.83	69.17	73.25	13.32	19.37	15.85	8.02	9.21	8.47	9.92	11.69	10.70
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
V. DISORDERS OF THE CENTRAL NERVOUS SYSTEM															
Paralysis & Convulsions incl. cerebral haemorrhage	10.46	15.76	12.57	18.76	8.93	14.74	80.70	67.13	74.79	93.79	94.88	94.17	78.30	72.44	76.05
Meningitis	89.54	84.24	87.43	81.24	91.07	85.26	19.30	32.87	25.21	6.21	5.12	5.83	21.70	27.56	23.95
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
VII. OTHER CLEAR SYMPTOMS															
Cirrhosis and chronic liver diseases including-															
Atrophy of liver	17.10	18.23	17.63	29.00	35.99	32.37	61.95	53.60	58.06	52.62	70.09	59.03	34.47	35.63	34.99
Measles	28.37	39.90	33.75	34.69	37.39	35.99	1.68	0.85	1.29	1.12	2.21	1.52	17.93	25.94	21.51
Tetanus	51.64	39.49	45.97	31.87	21.90	27.08	22.31	33.22	27.39	4.99	10.64	7.06	33.59	31.45	32.63
Poliomyelitis	2.89	2.38	2.65	4.43	4.71	4.57	3.33	9.48	6.19	9.83	9.60	9.74	4.75	5.19	4.95
Diseases of urinary tract	0.00	0.00	0.00	0.00	0.00	0.00	10.74	2.85	7.07	31.45	7.46	22.64	9.26	1.79	5.92
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
IX. CAUSES PECULIAR TO INFANCY															
Prematurity	63.34	67.13	65.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.34	67.13	65.04
Malformations including congenital malformation	2.60	4.40	3.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60	4.40	3.41
Birth injury	12.36	9.26	10.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.36	9.26	10.97
Respiratory infections of new born	21.69	19.21	20.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.69	19.21	20.58
Total	100.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00

Source: Registrar General, India (1971).

Table 3.2B

Percentage Distribution of Deaths by Individual Cause-groups by Gender: 1981

Probable Cause of Death	(0-4)			(5-14)			(15-54)			(55+)			Total		
	M	F	P	M	F	P	M	F	P	M	F	P	M	F	P
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
I. ACCIDENTS AND INJURIES															
Animal bite (incl. snake, scorpion etc)	7.14	5.26	6.38	11.24	17.65	13.57	12.59	11.11	12.05	12.90	8.16	10.81	12.04	11.39	11.80
Rabies	7.14	0.00	4.26	13.48	3.92	10.00	2.45	1.85	2.23	3.23	10.20	6.31	4.95	3.56	4.42
Drowning	46.43	31.58	40.43	30.34	47.06	36.43	18.53	24.69	20.76	12.90	30.61	20.72	21.72	30.25	24.93
Fall from height	7.14	15.79	10.64	7.87	9.80	8.57	9.44	6.17	8.26	19.35	12.24	16.22	10.32	8.54	9.65
Vehicular accidents	10.71	10.53	10.64	28.09	9.80	21.43	33.22	8.02	24.11	25.81	10.20	18.92	29.89	8.90	21.98
Burns	10.71	31.58	19.15	4.49	9.80	6.43	4.20	25.31	11.83	0.00	20.41	9.01	4.09	22.06	10.86
Suicide	0.00	0.00	0.00	1.12	0.00	0.71	11.89	17.90	14.06	17.74	4.08	11.71	9.89	11.03	10.32
Homicide	10.71	5.26	8.51	3.37	1.96	2.86	7.69	4.94	6.70	8.06	4.08	6.31	7.10	4.27	6.03
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
II. FEVERS															
Malaria	24.52	22.58	23.46	15.58	16.28	15.95	7.59	18.44	12.94	16.46	25.21	20.22	16.26	21.05	18.65
Influenza	27.10	34.41	31.09	36.36	25.58	30.67	24.14	23.40	23.78	35.44	21.01	29.24	30.09	27.07	28.58
Typhoid	48.39	43.01	45.45	48.05	58.14	53.37	68.28	58.16	63.29	48.10	53.78	50.54	53.64	51.88	52.76
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III. DIGESTIVE DISORDERS															
Cholera	0.00	0.00	0.00	3.03	0.00	1.69	4.00	3.45	3.70	1.67	1.92	1.79	1.58	1.19	1.38
Food poisoning	2.73	0.85	1.76	3.03	7.69	5.08	10.00	6.90	8.33	1.67	1.92	1.79	3.95	3.16	3.56
Dysentery	97.27	99.15	98.24	93.94	92.31	93.22	86.00	89.66	87.96	96.67	96.15	96.43	94.47	95.65	95.06
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
IV. COUGHS (Disorders of Respiratory system)															
Tuberculosis of lungs	1.63	2.18	1.90	15.00	20.83	17.76	62.36	56.11	59.92	22.62	14.61	19.86	29.78	23.07	27.11
Bronchitis & asthma	7.67	9.69	8.66	18.75	18.06	18.42	31.74	34.91	32.98	72.37	76.28	73.72	45.41	42.11	44.10
Pneumonia	90.70	88.14	89.44	66.25	61.11	63.82	5.90	8.98	7.10	5.01	9.11	6.42	24.81	34.82	28.80
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
V. DISORDERS OF THE CENTRAL NERVOUS SYSTEM															
Paralysis & Convulsions incl. cerebral haemorrhage	33.33	25.93	29.41	41.18	31.25	36.36	77.11	78.18	77.54	94.42	93.94	94.22	82.55	77.83	80.58
Meningitis	66.67	74.07	70.59	58.82	68.75	63.64	22.89	21.82	22.46	5.58	6.06	5.78	17.45	22.17	19.42
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
VI. OTHER CLEAR SYMPTOMS															
Cirrhosis and chronic liver diseases including- Atrophy of liver	15.84	21.88	18.78	37.50	50.00	43.42	75.27	73.49	74.43	53.09	62.50	55.75	38.46	41.11	39.66
Measles	20.30	19.27	19.80	15.00	30.56	22.37	3.23	2.41	2.84	0.00	3.13	0.88	12.02	14.87	13.31
Tetanus	61.88	57.29	59.64	42.50	19.44	31.58	12.90	21.69	17.05	11.11	21.88	14.16	39.18	41.40	40.18
Poliomyelitis	1.98	1.56	1.78	5.00	0.00	2.63	2.15	2.41	2.27	2.47	12.50	5.31	2.40	2.62	2.50
Diseases of urinary tract	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	3.41	33.33	0.00	23.89	7.93	0.00	4.35
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
VII. CAUSES PECULIAR TO INFANCY															
Prematurity	65.46	63.65	64.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.46	63.65	64.67
Malformations including congenital malformation	3.92	4.81	4.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92	4.81	4.31
Birth injury	3.47	3.27	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.47	3.27	3.38
Respiratory infections of new born	27.15	28.27	27.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.15	28.27	27.64
Total	100.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00

Source: Registrar General, India (1983).

Table 3.2C

Percentage Distribution of Deaths by Individual Cause-groups by Gender: 1991

Probable Cause of Death	(0-4)			(5-14)			(15-54)			(55+)			Total		
	M	F	P	M	F	P	M	F	P	M	F	P	M	F	P
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
I. ACCIDENTS AND INJURIES															
Animal bite (incl. snake, scorpion etc)	8.62	10.00	9.18	17.97	13.64	16.20	7.69	10.65	8.84	6.94	15.96	10.50	8.95	11.77	10.06
Rabies	5.17	5.00	5.10	6.25	2.27	4.63	1.33	1.39	1.35	0.69	5.32	2.52	2.09	2.29	2.17
Drowning	29.31	45.00	35.71	28.13	25.00	26.85	9.17	10.65	9.75	9.03	11.70	10.08	12.72	14.83	13.55
Fall from height	13.79	10.00	12.24	10.94	7.95	9.72	4.59	3.24	4.06	10.42	14.89	12.18	6.76	5.96	6.45
Vehicular accidents	15.52	7.50	12.24	28.13	25.00	26.85	38.31	10.42	27.44	29.86	22.34	26.89	34.49	13.91	26.39
Burns	25.86	15.00	21.43	3.91	19.32	10.19	7.99	33.80	18.05	9.03	17.02	12.18	8.65	28.29	16.39
Suicide	0.00	2.50	1.02	3.13	4.55	3.70	22.34	27.55	24.37	22.22	10.64	17.65	18.59	20.49	19.34
Homicide	1.72	5.00	3.06	1.56	2.27	1.85	8.58	2.31	6.14	11.81	2.13	7.98	7.75	2.45	5.66
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
II. FEVERS															
Malaria	24.74	29.60	27.48	36.21	21.54	28.46	34.67	30.16	32.61	45.33	45.26	45.31	36.26	32.12	34.30
Influenza	31.96	30.40	31.08	18.97	24.62	21.95	20.00	10.32	15.58	19.33	23.16	20.82	22.20	21.65	21.94
Typhoid	43.30	40.00	41.44	44.83	53.85	49.59	45.33	59.52	51.81	35.33	31.58	33.88	41.54	46.23	43.76
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
III. DIGESTIVE DISORDERS															
Cholera	0.00	1.57	0.84	0.00	1.41	0.78	0.99	4.30	2.58	3.64	4.82	4.15	1.32	2.94	2.12
Food poisoning	0.00	0.00	0.00	10.34	2.82	6.20	25.74	17.20	21.65	2.73	2.41	2.59	9.21	5.35	7.29
Dysentery	100.00	98.43	99.16	89.66	95.77	93.02	73.27	78.49	75.77	93.64	92.77	93.26	89.47	91.71	90.58
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
IV. COUGHS (Disorders of Respiratory system)															
Tuberculosis of lungs	1.10	1.03	1.07	17.14	15.00	16.00	66.21	55.20	62.04	23.88	20.70	22.81	31.69	25.24	29.23
Bronchitis & asthma	3.96	4.62	4.27	12.86	7.50	10.00	28.69	35.52	31.28	72.41	77.02	73.96	46.09	43.79	45.21
Pneumonia	94.93	94.36	94.67	70.00	77.50	74.00	5.10	9.28	6.68	3.71	2.28	3.23	22.22	30.98	25.56
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
V. DISORDERS OF THE CENTRAL NERVOUS SYSTEM															
Paralysis & Convulsions incl. cerebral haemorrhage	66.67	81.48	74.07	54.55	34.78	44.44	82.91	76.84	80.19	96.90	97.83	97.29	88.76	87.06	88.02
Meningitis	33.33	18.52	25.93	45.45	65.22	55.56	17.09	23.16	19.81	3.10	2.17	2.71	11.24	12.94	11.98
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
VI. OTHER CLEAR SYMPTOMS															
Cirrhosis and chronic liver diseases including-Atrophy of liver	35.06	36.67	35.93	58.62	52.94	55.56	73.22	70.71	72.34	51.06	63.64	54.59	58.14	56.12	57.34
Measles	20.78	35.56	28.74	17.24	29.41	23.81	0.55	1.01	0.71	0.71	1.82	1.02	5.35	15.83	9.46
Tetanus	33.77	23.33	28.14	6.90	11.76	9.52	6.56	13.13	8.87	6.38	5.45	6.12	11.40	14.75	12.71
Poliomyelitis	6.49	3.33	4.79	10.34	2.94	6.35	3.28	0.00	2.13	2.13	1.82	2.04	3.95	1.80	3.11
Diseases of urinary tract	3.90	1.11	2.40	6.90	2.94	4.76	16.39	15.15	15.96	39.72	27.27	36.22	21.16	11.51	17.37
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
VII. CAUSES PECULIAR TO INFANCY															
Prematurity	69.96	69.41	69.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.96	69.41	69.70
Malformations including congenital malformation	4.05	8.63	6.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.05	8.63	6.23
Birth injury	2.03	1.57	1.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03	1.57	1.81
Respiratory infections of new born	23.96	20.39	22.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.96	20.39	22.26
Total	100.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00

Source: Registrar General, India (1992).

Appendix 3.3

Ratio of Female-Male Death by Causes - 1991

Probable Cause of Death	Age-group			
	0-4	5-14	15-54	55+
ACCIDENTS AND INJURIES				
Snake Bite	0.541	0.725	0.814	1.855
Scorpion Bite and others	2.162	--	7.455	0.666
Rabies	0.721	0.272	0.710	4.995
Drowning	1.145	0.665	0.790	0.845
Fall from Height	0.541	0.544	0.481	0.932
Vehicular Accidents	0.360	0.665	0.185	0.488
Burns	0.432	3.700	2.879	1.230
Suicide	--	1.088	0.839	0.312
Homicide	2.162	1.088	0.184	0.118
Excessive Heat	--	--	--	0.999
Excessive Cold	--	--	1.065	--
Natural Calamity	0.998	1.572	1.917	1.374
All	0.785	0.796	0.711	0.720
FEVERS				
Malaria	1.667	0.725	0.778	0.632
Influenza	1.325	1.583	0.461	0.758
Typhoid	1.287	1.465	1.175	0.565
All	1.393	1.219	0.895	0.633
DIGESTIVE DISORDERS				
Gastro-enteritis	0.977	1.114	1.369	0.892
Cholera	--	--	4.260	0.999
Food Poisoning	--	0.363	0.655	0.666
Dysentery	1.679	2.720	0.632	0.574

Probable Cause of Death	Age-group			
	0-4	5-14	15-54	55+
Peptic Ulcer	0.721	1.632	0.469	0.384
Acute Abdomen	1.390	1.088	0.782	0.926
All	1.238	1.267	0.798	0.709
COUGHS				
Tuberculosis of Lungs	0.865	1.088	0.541	0.440
Bronchitis and Asthma	1.081	0.725	0.804	0.539
Pneumonia	0.923	1.377	1.180	0.312
Whooping Cough	1.514	0.435	--	0.333
All	0.941	1.190	0.646	0.506
DISORDERS OF CENTRAL NERVOUS SYSTEM				
Paralysis	2.703	1.088	0.805	0.693
Meningitis	0.601	1.632	1.171	0.500
Convulsions	1.240	0.605	0.781	3.330
All	1.081	1.138	0.865	0.711
DISEASES OF CIRCULATORY SYSTEM				
Anaemia	1.516	1.197	1.477	0.946
Heart Attack	--	1.360	0.416	0.449
Congestive and other Heart Diseases	1.153	0.896	0.873	0.671
All	1.445	1.088	0.652	0.569
OTHER CLEAR SYMPTOMS				
Cirrhosis & Chronic Liver Diseases	1.236	4.353	0.249	0.363
Jaundice	1.351	0.725	0.972	0.678
Chicken Pox	2.162	--	--	--
Measles	2.162	2.176	1.065	0.999
Leprosy	--	--	0.799	0.727
Tetanus	0.873	2.176	1.154	0.333

Probable Cause of Death	Age-group			
	0-4	5-14	15-54	55+
Poliomyelitis	0.649	0.363	--	0.333
Mental Diseases	--	--	0.868	0.999
Cancer	0.721	1.088	1.169	0.612
Diabetes	--	--	0.586	0.637
Hyperplasia of Prostate	--	--	--	--
Uraemia	0.360	0.544	0.695	0.483
Obstructed Hernia	--	--	--	--
Total	1.207	1.176	0.832	0.549
CAUSES PECULIAR TO INFANCY				
Prematurity	0.978	**	**	**
Congenital Malformation	2.099	**	**	**
Birth Injury	0.763	**	**	**
Respiratory Infections of new born	0.839	**	**	**
Cord Infection	0.583	**	**	**
Diarrhoea of new born	1.166	**	**	**
All	0.969	**	**	**
SENILITY	**	**	**	0.946
ALL CAUSES	1.003	1.076	0.799	0.741

Note: -- data not available for both sexes, ** certain causes are not applicable.
Source: Registrar General, India (1992).

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