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Public Health Priorities in India Insights from Changing Patterns of Death by Region, Gender and Age

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ABSTRACT

It is premature to talk about a health transition in India in terms of a significant passage to degenerative diseases since morbidity patterns continue to be dominated by infectious and chronic diseases. However, the increasing incidence of non-communicable diseases such as hypertension, diabetes and heart disease, particularly among adults and presumably associated with changing 'life styles', has been attracting a lot of attention. Whether this calls for a reordering of priorities for public health provisioning is a debatable issue. It is in this context that we examine here adult mortality trends and their variations by gender and across regions. In addition we refer in brief to infant and child survival rates to provide a concrete basis for further discussion of the question of priorities.

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1. Introduction

In his initial formulation, Abdel Omran posited an 'epidemiologic transition' – now celebrated as 'health transition' – as a final phase of mortality patterns that emerge from a hypothetical completion of the processes leading to very low rates of death. Just as a theory of demographic transition was constructed as a generalisation – a weak one as it later turned out to be - of the 19th century Western European patterns of change in mortality and fertility following industrialisation, urbanisation etc,, so was the supposedly universal theory of mortality transition formulated by Omran on the basis of changing disease patterns during the first half of the 20th century in the affluent West (Omran, 1971). By this theory infectious diseases gradually disappear and degenerative and manmade diseases emerge as the main cause of death. Even granting the concept of a hypothetical final phase, the wide variety in patterns of death and in the pace at which changes take place makes the theory almost vacuous. Indeed, Caldwell (2001) says that Omran's model "fails to grasp the global nature and the historical sequence of mortality transition as it spread. In truth, there are probably as many models as there are societies". But the attraction of the theory – especially for those concerned with public health – lies in the assumption that it is only a matter of time before the threat of infectious diseases could be eliminated through preventive and curative medicine; and if in addition manmade diseases could be controlled, there would remain only old age conditions as the predominant and unavoidable cause of death.

However, the crux of the matter is the variation across space and time in the structures of disease and death and their social determinants. If one does away with the imaginary final phase, all societies may be regarded as transitional and specific regional histories emerge as objects of study in their own right. There are many surveys of epidemiological studies, which provide a picture of the present state of health transition in India. Let us refer to a couple of them. A 'Country Profile' on India published in *The Lancet* in its 1998 edition, contains a discussion by a number of experts on the changing patterns of disease. In that survey, in a well-balanced presentation Nath et al. (1998) suggest that while increasing affluence and changing life styles are bringing in new health hazards, the broad picture is characterised still by elements of malnutrition and low immune status among the poor and the consequent high incidence of infectious and other types of diseases associated with poverty. Thus, for example, nutritional disorders, tuberculosis, and diarrhoeal disease (especially among children) continue to dominate morbidity patterns even as hypertension, cardiovascular disease and diabetes are on the rise among sections of the population. The authors of this survey refer also to the regional variation in the incidence of both the 'old' and the 'new' diseases; and to the inadequacy of health care in rural areas. In a more recent survey, Srinath Reddy et al. (2005) discuss the increasing threat of chronic diseases. Referring to hypertension, heart disease, diabetes and tobacco-related diseases, they draw our attention to the alarming rise in the burden of chronic disease in terms of both deaths and loss of disability-adjusted life years (DALYs) and call for integrated programmes for prevention and control of these diseases, and for corresponding increases and reallocations in resources for public spending on health care.

In some of such surveys there seems to be a concern about the possibility of manmade diseases (resulting from changing life styles) going out of control; hence the call for reallocations among the components of public spending on health care. Whether and how such reallocations are to be made through a rethinking about priorities is however not easy to settle. To explain**:** disease patterns have social and economic roots; they vary a lot

across regions, by rural or urban living, between males and females and among age groups. We need nation-wide morbidity studies to map these variations to work out region-specific policies suited best to the relevant socio-economic and related disease structures; a national policy can at best be laid in broad outline as a rough guide. Let us note in passing that countrywide surveys provide besides reliable estimates of the incidence (and prevalence) of different types of disease. This is sharply illustrated by the findings of the recent (2005-6) National Family Health Survey (NFHS-3), which gave us an all-India estimate of 2.47 million persons testing HIV positive, very much lower than 5.2 million as previously believed on the basis of a patchwork of small and non-random samples in the country (for details see NFHS-3, n.d.). The survey also provides valid statistical estimates across states, essential for meaningful policy. No doubt, we need similar estimates for other diseases – comparable across regions – such as diabetes, heart conditions and so on, to enable the assessment of their magnitudes in relation, for example, to childhood ailments or to tuberculosis that continue to be major public health issues. In the absence of required morbidity data we rely on mortality statistics in the rest of this paper.

2. Adult Survival and Death

The concern about the possibility of a rapid spread of the new diseases leads us to a study of adult mortality trends since the so-called life style diseases afflict adults mainly. The mortality rates we analyse here are based on the annual all-India surveys conducted through the Sample Registration System, available since the early 1970s on a continuing basis and enabling valid comparisons over space, time and by gender and age as well. Of course, mortality data do not tell us anything about causes of death by specific disease. But they can provide some insights into whether the old and the new diseases in combination have begun to influence rates of death (and survival to old age) among the adult population.

There is however another point of departure for the study of adult mortality. The Indian population Census of 2001 showed a marginal increase in the female-to-male sex ratio (FMR) during the preceding decade, from 927 in

1991 to 931 in 2001. This has happened despite a drastic fall in the sex ratio among children below the age of 6 years, practically all over the country; the data imply an improvement in the FMR among persons above the age 6, including adults. The decline in the sex ratio among children attracted a great deal of attention among not only scholars but also in the media and among the public. The consensus now - based on demographic research and journalistic investigation - is that increasing female foeticide (and, to some extent, female infanticide) is responsible for the looming loss of female children at birth. On the other hand, what perhaps did not receive the attention it deserved was the improvement in the sex ratio among adults. This improvement is presumably the result of declining levels of fertility all over India, although the starting point and the pace of decline varied a lot across regions, notably between rural and urban areas. It signifies the gradual emergence of the female life advantage at an age earlier than before in Indian history. For long female mortality rates were higher than for males up to age 45 or so (Visaria, 1971). This was the main reason for the persistence of female deficits in the Indian population, a result of the neglect (and much worse) of girls, pregnant women and lactating mothers in all respects including nutrition and health care. Fertility reduction has however not been an unmitigated blessing. The increasing acceptance of the small family norm combined with a deep-rooted cultural preference for sons is leading to female foeticide, altering sex ratios at birth everywhere, even in the southern states hitherto endowed with a better gender balance at all ages arising from factors not clearly understood so far. It may be noted that China and Korea, where also son preference prevails, have had a similar experience of declining female to male sex ratios at birth following the rapid emergence of small families. For further details of these negative aspects of declining levels of fertility, see Dasgupta and Mari Bhat (1997), Basu (1999) and Sudha and Rajan (1999).

Estimates of age-specific death rates based on the Sample Registration System (SRS) are being published from the 1970s. They are of course subject to sampling errors which, designed to be small at the all-India and state levels, can be large at lower levels of aggregation such as for a given

age group in the rural or urban part of a particular state. However, the quality of data under the system has been improving and demographers recognise the data as a useful means for making broad comparisons over space and time. A fuller discussion of the SRS data, especially on their reliability for analysis appears in Mari Bhat and Navaneetham (1991)

This paper is concerned with adult mortality. Accordingly, we begin with estimates derived for the age group (15-29), which for women covers the prime reproductive span, a period of high mortality risk. Thus the corresponding five-year age intervals in SRS data are collapsed here into fifteen-year groups, using appropriate population weights. Further, instead of the annual death rates as they are given, three-year moving averages are computed. For example, the data for 1981 presented below refer to the averages of the SRS estimates for 1980, 1981 and 1982. Both these procedures, collapsing age intervals and taking three-year averages, reduce sampling errors and make the data more reliable for statistical analysis.

Table 1: Age-Specific Mortality Rates: Age Group (15-29) - All-India

Year	Urban Male	Urban Female	Rural Male	Rural Female
1971	1.73	2.65	3.10	4.62
1981	1.61	2.06	2.40	3.75
1991	1.74	1.89	2.40	3.21
2001	1.60	1.50	2.33	2.71
% Decline 1971-2001	7.52	43.40	24.84	41.35

Note: The data are three-year averages. Thus the 1971 figures represent the average for the years 1970, 1971 and 1972; and so on.

Source: Sample Registration Bulletin, various issues.

Table 1 presents the SRS estimates of mortality rates for the age group (15-29) for India as a whole. They are given separately for urban males, urban females, rural males and rural females; and for the years 1971, 1981, 1991 and 2001. The contrasts in levels of mortality are sharp and easily seen. For this age group, death rates among urban males are the lowest and those among rural females the highest. This is not an unexpected finding. It signifies the double disadvantage rural women suffer from: being women and residing in rural areas. The first of these arises from gender discrimination in matters of nutrition and health care (especially in the case of pregnant women and nursing mothers) and the second from the fact that rural India is grossly neglected in the provision of health. However, for this age group, i.e. (15-29), the death rates have declined (over the period 1971-2001) impressively, more for women than for men, and more in rural than in urban areas. Death rates for urban males, the class with all the advantages, were already low in 1971, so they do not exhibit much change; for all other classes the declines have been quite prominent (over 40 per cent during the three decades for females in both rural and urban regions, by about 25 per cent for rural males but only by 7.5 per cent for urban males).

It should be noted that the gender gap and the rural-urban divide persist. Table 2 recasts the all-India data to exhibit this fact. For this (15-29) age class, it can be seen that mortality rates for females were still (in 2001) 17 per cent higher than for males in rural areas. In urban areas, however, the gender ratio in mortality has reduced remarkably from 1.53 in 1971 to 0.94 in 2001, assuming rough parity by 1991 and gaining an advantage thereafter. Table 2 tells us also that the rural-urban differences are far wider than gender differences. By far the sharpest contrast thus is the one between rural females and urban males. This double gap has also been narrowing, but it is still quite high: the 2001 death rates among rural women were 69 per cent higher than those for urban men.

Table 2: Mortality Differentials (Ratios): Age Group (15-29), All-India

Category	1971	1981	1991	2001
Female/Male (Rural)	1.49	1.56	1.34	1.17
Female/Male (Urban)	1.53	1.28	1.04	0.94
Rural/Urban (Female)	1.74	1.82	1.70	1.81
Rural/Urban (Male)	1.79	1.49	1.38	1.46
Rural Female/Urban Male	2.67	2.33	1.84	1.69

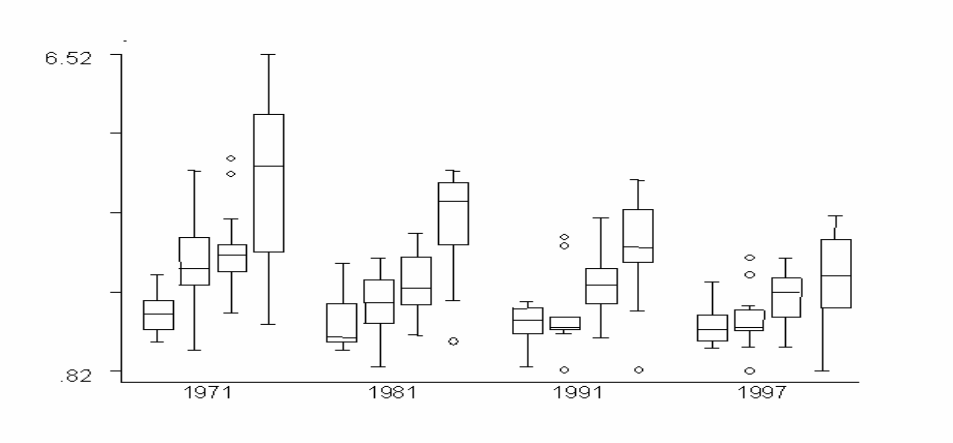
Note: Derived from Table 1.

That is how things stand in all-India terms. But the countrywide averages conceal much variation across regions. For example, Kerala, Punjab and Gujarat are far ahead of the laggards such as Bihar, Madhya Pradesh and Uttar Pradesh in the provision of health services. These stark differences are amply reflected in mortality variations across the 15 major states of the Indian Union. They are presented in the form of box-plots in Figure 1. The boxes in the figures mark the three quartiles, the median being the middle bar, that is the halfway mark with half of the cases each below and above. The height of the box is the inter-quartile range within which the middle half of the observations lie; this gives us a good idea about how spread out the death rates are about the median value. The box-plots clearly exhibit the contrast between urban males and rural females for the age group (15-29). Urban male death rates are not only among the lowest; they are also compactly spread across the states, unlike the widely scattered rural female death rates. Even in states with poorly developed health infrastructure, it is possible that urban males have the best access to medical facilities; this could explain the relative narrow variation in the corresponding mortality rates

A word about the factors underlying variations in death rates: apart from those responsible for the universal gender differences favouring males, there are state-specific factors that contribute to varying levels of improvement in health care (both in the public and the private domains) impinging on mortality

outcomes. Such state-specific factors account also for rural-urban differences. We should note in this context that in general the lower the death rates (for any category of the population, such as for urban adult males), the more difficult it is to lower them further. We may call this the 'level effect' on change, mainly in operation among adults and the old-aged. Finally, changing patterns of disease and the corresponding fatality rates have also to be considered, especially in the case of life style diseases.

Figure 1: Inter-State Variations in Mortality Rates, Age-Group 15-29



Note: The box plots of mortality rates across 15 major states are in the following order from left to right: urban males, urban females, rural males and rural females. The state level mortality rates are from the *Sample Registration Bulletin*, different issues.

To approach these changes from a different angle, we begin by looking in what follows at the trends in the probability of survival beyond the age 60 among those aged 30, that is, 30-year survival rates among adults. While the observed stagnation in the death rates among urban male adults is partly a reflection of the level effect, it may also be due to the increasing incidence of the diseases associated with affluence. If the emerging urban life styles are producing a significant reduction in adult survival to old age, then it would indeed be an alarming matter requiring urgent attention. Thus we expect these survival rates to provide additional insights into the dynamics of health transition.

Table 3 presents all-India estimates of the 30-year survival probabilities among adults aged 30. These are derived from life tables constructed from census data and from the Sample Registration System; they refer to rural/ urban and female/male populations. They exhibit patterns similar to those of death rates set out earlier with respect to both trends and differentials. First, rural-urban differences have clearly narrowed since the 1970s, with higher rates of improvement among rural populations, female and male. Second, as in the case of death rates, the improvements in rural areas have been higher among women than among men. These trends and differentials have led to levels of 30-year survival rates around 80 per cent among men and 86 per cent among women in urban India – the rates remaining fairly stable since the early 1990s.

Table 3: Probabilities of Survival Beyond Age 60 Among Persons at Age 30: All-India

Year	Rural Male	Rural Female	Urban Male	Urban Female
1970-75	0.681	0.721	0.725	0.789
1976-80	0.696	0.758	0.737	0.800
1989-93	0.751	0.807	0.779	0.857
1993-97	0.758	0.816	0.795	0.865
1997-2001	0.757	0.825	0.794	0.859
% Change 1970-97	11.2	14.4	9.5	8.9

Note: These are derived from life tables based on the sample registration system. See the reference to The Registrar General of India at the end of the paper.

The data are summarised in a different way in Table 4 that presents ratios of odds of survival, capturing rural-urban and gender differentials in all-India terms. These are computed from logistic regressions with dummy variables standing for differences by gender, residence (rural or urban), and for the different states as well. The regression equation employed is however not an explanatory or predictive one; it simply seeks to summarise the observed wide rural-urban and gender differentials in a manner that eliminates the

other types of interstate differences arising from numerous factors including the supply of health care. It can be seen (from Table 4) that once this elimination has been done the urban-to-rural odds ratios have not changed since the 1970s – with urban odds of 30-year survival about 20 to 22 percent higher than rural odds. On the other hand, the female/male odds ratios have significantly improved during the 1970s and the 1980s: odds of (30+) survival among female adults were about 28 percent higher than among men during the early 1970s; by 2001 the female advantage has improved to about 50 per cent.

To probe further into the remarkable improvement in the survival rates of adult women, we compile odds ratios in respect of 25-year survival rates at the age 15; for most women this (15 to 40) covers the entire reproductive period. The relevant odds ratios, compiled as in the case of the 30-year survival rates for 30+ adults, from logistic regressions with dummies to stand for interstate differences, are given in the right hand panel of Table 4. The estimates show that urban women had an advantage (in survival beyond the reproductive period) of about 60 per cent over their rural counterparts during the 1970s; the difference has narrowed down to 34 per cent by 2001. More importantly, the 25-year survival odds among the 15+ women were lower than for men during the 1970s – the ratio being about 80 per cent, but thereafter the ratio has moved in favour of the young women (114 per cent in 2001).

That however is an all-India summary that hides much regional variation. Calculations (not presented here) similar to those in Table 4 for the so-called BIMARU states – Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Orissa – relatively poor and otherwise backward in many respects – exhibit not only lower rates of survival but also wider rural-urban and gender differentials. However, there is clear-cut evidence that even in these regions adult survival rates are improving, the gaps narrowing and the fertility levels have begun to decline in the rural parts reflecting a late but sure beginning of the demographic transition in the poorest enclaves of the country.

Table 4: Odds Ratios for Survival Beyond Specified Ages

Year	30-Year Survival Rates at Age 30		25-Year Survival Rates at Age 15	
	Urban/Rural	Female/Male	Urban/Rural	Female/Male
1970-75	1.22	1.28	1.58	0.81
1976-80	1.20	1.37	1.63	0.78
1989-93	1.22	1.51	1.47	1.03
1993-97	1.26	1.47	1.37	1.05
1997-2001	1.21	1.49	1.34	1.14

Note: These are derived from logistic regressions with dummies for rural/urban, gender and interstate differences (all of them based on coefficients significant at 5% level.

Of the many factors behind the improvement in rates of survival and death among young women, the most important in our view is the gradual emergence of small families, combined with 'safe motherhood' practices – to the extent they prevail in the different parts of the country. Safe motherhood indices (SMI) computed on the basis of data in the National Family Health Surveys for 1992 and 1998 show much spatial variation. These indices encompass the proportion of pregnant women receiving antenatal care at least twice and of those who have had deliveries under medical attention; these have tended to be at around or below in the rural parts of the BIMARU states in contrast to far higher values (close to 100 in Kerala) in other states (for details see Krishnaji and James, 2002). It can be seen (from Table 5) that the rates of survival and death among young women are strongly correlated across states – both in rural and urban areas – with safe motherhood. Regions with better safe motherhood practice exhibit higher levels of 25-year survival among women at age 15, and lower death rates in the age group 15-29.

Table 5: Simple Correlation Coefficients – Across 15 Major States

Variable	Correlation with Safe Motherhood Index		
	Residence	Year 1991	Year 1998
25- Year Survival Rate for Women at Age 15	Rural	0.85	0.70
	Urban	0.67	0.78
Mortality Rate, Women in Age Group 15-29	Rural	-0.88	- 0.69
	Urban	-0.54	-0.67

Note: The correlations are all significant at the 5% level.

3. Discussion

The most significant aspect of changing patterns of death is the remarkable improvement in the chances of survival of young women beyond their reproductive span, clearly noticed from the 1970s, more in the urban than in the rural areas, less in general in the poorer parts of the country. No doubt, this trend will strengthen in the poorer and rural regions, where fertility levels are now on a downward course. However, because of the persistence of a strong preference for sons, this trend promotes female foeticide, a practice that is rapidly spreading to rural areas along with the needed technology. Adult male survival rates have improved in rural areas but tended to stagnate in urban regions. To what extent this is the result of a differential morbidity pattern associated with rapid changes in urban living styles is, however, difficult to say; on the other hand the prospects for further improvements among rural males surely depends on how rural health care systems expand in the coming years, especially in terms of access among the poor. All this must remain in the speculative domain in the absence of nationwide mappings of disease and treatment.

On the whole the trends in adult survival to old age are not alarming. It is against this fact that we may briefly refer to infant (and child) morbidity and mortality: available data (not presented here) paint a continuing grim picture in the related trends. Let us make a couple of comparisons of the relative magnitudes of child and adult deaths. The infant mortality rate (IMR) for

India as a whole is 57 per 1000 live births in 2006 and the maternal mortality ratio (MMR) is estimated at about 400 per 100,000 live births. These two estimates imply 14 infant deaths to every maternal death. Child mortality provides a similar contrast. The life table for 1997-2001 shows that among all deaths 70 per cent occur at ages over 60 years, 20 per cent among those between 5 and 60, and 10 per cent among children below 5. This means that if we exclude old age (60+) deaths; a third of all deaths consume children below 5 years of age. We should note in passing that the picture of child morbidity is equally grim. This is best illustrated by the experience of Kerala, where mortality rates at all ages have come down to remarkably low levels but morbidity rates, especially among children continue to be unacceptably high. The high prevalence of infectious diseases, particularly among children, is attributed to poverty, undernutrition and poor quality of drinking water and hygienic practice (Kannan et al., 1991; Thankappan, 2002).

Although the reference here to child health is brief, it is clear that a reasoned approach to public health priorities must pay adequate attention to variations across all age groups, apart from considerations of region, class and gender. In particular, even as the affluence-induced patterns of health transition call for intervention, old objectives like the provision of safe drinking water and sanitation must remain at the top of the public agenda.

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