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Childhood Mortality and Health in India

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Abstract

Childhood is a significant stage of life and deprivation during this period can have a long-term adverse impact on the wellbeing of children. Reduction in infant and child morality is likely the most important of the millennium development goals, as children are the most important assets of a nation. The focus of this paper is to examine the determinants of childhood mortality and child health in India and the factors explaining the differential performance of the child immunization and treatment of childhood diseases. For this purpose data are taken from the three rounds of the National Family Health Survey of India (NFHS) conducted in 1992-93, 1998-99 and 2005-06. The analysis reveals that infant mortality continues to decline and that the decline in child mortality is even more pronounced. The situation regarding child immunization rates, however, is not as clear. By the time the new born is one year old, it is supposed to receive BCG vaccination against tuberculosis, measles vaccination, and three doses each of polio and DPT vaccine. But, there was only a small improvement in full vaccination coverage. Progress in vaccination coverage varies widely among the states. Treatment of childhood illnesses need to be improved, Diarrhoea continues to be a major health problem for many children. Although knowledge about Oral Rehydration Salts (ORS) for the treatment of diarrhoea is widespread among mothers, yet, less than half of children with diarrhoea received oral rehydration treatment or increased fluids, as recommended, and 26 percent received no treatment at all. Sixteen percent received antibiotics, which are not recommended for treating most childhood diarrhoea. These results have interesting social and policy implications and indicate several promising lines of research.

Key words: Infant mortality, Immunization, childhood diarrhoea, ORS.

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Childhood Mortality and Health in India

Introduction

Childhood mortality is one of the important indicators of a country's general medical and public health conditions, and consequently, the country's level of socio-economic development. Its decline is therefore not only desirable but also indicative of an improvement in general living standards. The history of childhood as a modern concept is embedded in the narrative of the modern, welfare state, and childhood as a protected and prolonged period of life owes its recognition to popular struggles for welfare waged by the working classes in the context of the sweeping changes brought into their lives by the industrial revolution during the eighteenth and the nineteenth centuries.

In India, 2.1 million children die before their fifth birthday. Half of these children die even before they are 28 days old, accounting for one-fourth global infant deaths. Of the 9.7 million child deaths worldwide annually, one-third occur in India. The statistics are equally shocking among neonates—children new born to a maximum age of 28 days old. While around 4 million children die within the first 28 days of life across the planet every year, India records around one million of these cases. Among the reasons cited for the poor state of infant and child health in India are inadequate neonatal care, insufficient breastfeeding, malnutrition, low immunity and high incidence of communicable diseases. Breastfeeding a baby within an hour of birth is said to markedly increase its change of survival since breast milk contains vital nutrients and antibodies that enhance a baby's immunity. Benefits accrue to the mother, too for breastfeeding helps her uterus contract post-delivery and burn calories and fat accumulated during pregnancy. It also releases beneficial hormones into the mother's baby. Of the 19 million infants in the developing world who have low birth (less than 2,500 gram), 8.3 million are in India. This means that approximately 43 per cent of all the world's infants who are born with a low birth weight are born in India.

The infant mortality rate (IMR)—probability of dying before one year of age expressed per 1000 live-births—and under-five mortality rate (U5MR)—probability of dying

between birth and age 5 expressed per 1000 live-births—have been used as measures of children's well-being for many years. The International Conference on Primary Health Care held in Alma Ata in 1978 was the first global forum to consider how child mortality could be reduced by systematic development of a primary health care system. Since then, the United Nations has been actively involved in reducing IMR and U5MR in developing countries. To this end, the plan of action adopted at the International Conference on Population and Development (ICPD) held in Cairo in 1994 incorporates the reduction of maternal and child mortality.

In India, during 1968–70, the level of IMR was stable at 130 deaths per 1000 live-births. Following the Alma Ata declaration of 1978, the Government of India envisaged a national goal for the attainment of an IMR of 60 by the year 2000. Since then, substantial resources have been put into the child survival programmes over the past 25 years. The Sixth and Seventh Five-Year Plans had aimed at nationwide programmes to realize this goal. The twenty-point programme included, as a key component, rapid improvement in the conditions of women and children. In 1979, the Expanded Programme of Immunization (EPI) was established to provide the tetanus toxoid (TT) vaccine to pregnant women, and BCG, DPT, polio and measles vaccine to children. The Universal Immunization Programme (UIP) and oral rehydration therapy (ORT) were both launched in 1985 and the Safe Motherhood Programme initiated during the Eighth Plan was among the prominent components of the Family Welfare Programme. In the early 1990s, these programmes were integrated and further strengthened to shape the Child Survival and Safe Motherhood (CSSM) Programme. In 1994, the CSSM Programme was further expanded to the Reproductive and Child Health (RCH) services. These programmes had the desired effect of reducing child mortality and improving child health as evidenced from the child mortality statistics of 1978–2002. The National Population Policy (2000) and National Health Policy (2002) addressed the issues of child survival and maternal health, and increased the outreach and coverage of the comprehensive package of RCH services through the government as well as the voluntary non–government sector together in partnership.

The objective of this paper is to examine the determinants of childhood mortality and child health in India and the factors explaining the differential performance of the child immunization and treatment of childhood diseases. It also looks into the levels of IMR and U5MR among socially and economically disadvantaged groups. The knowledge of these factors is important for policy formulation and implementation because it will enable policy makers to formulate appropriate policies for the reduction of childhood mortality by paying special attention to the disadvantaged sub-groups.

Data and methods

The NFH surveys have emerged as an important source of reliable information on demography, health and nutrition for India. In its first survey, NFHS-1, carried out in 1992-93, interviews were conducted on an all-India sample of 88,562 households and with 89,777 ever-married women the age group 13-49 from 24 states and the then national capital territory of Delhi. In the second survey, NFHS-2, carried out in 1998-99, interviews were conducted with a representative sample of around 91,000 ever-married women aged 15-49 from 26 states in India. The NFHS-3 of 2005-06 is the third national survey conducted by the Ministry of Health and Family Welfare, Government of India in partnership with the International Institute for Population Sciences, Mumbai. Having objectives similar to NFHS-2, interviews were conducted with more than 2, 30,000 women aged 15-49 and men aged 15-54 throughout India.

Data from India provide a unique opportunity to examine how changes in the under five mortality are related to changes in the risk factors under varying economic and social conditions in some detail. Virtually all of the analysis in this paper is based on two sets of national household surveys. First, unit record data from two rounds of the nationally-representative National Family Health Survey (NFHS) are used to analyze the correlates of infant mortality and child malnutrition (underweight) (IIPS 1995, 2001a). Second, record data from the two most recent quinquennial, 'thick' rounds of the National Sample Survey (NSS)—the 55th round conducted in 1999-2000—are used for two groups of states. Since the NSS data do not contain information on infant mortality or child weights, the NFHS data remained as the only alternative to analyze these indicators. In

addition, annual cross-state data over the time period 1980-99 on infant mortality rates, and sex-specific gross primary enrollment rates, are also used in this paper to analyze the correlates of changes in infant mortality over time and across states.

For two groups of states: poor states (i.e., those that have a monthly per capita consumption expenditure of Rs. 671 or less according to the National Sample Survey 1999-2000 round) and non poor states (those having a per capita consumption expenditure of more than Rs. 671). Defined in this manner; the poor states are Andhra Pradesh, Assam, Madhya Pradesh, Manipur, Orissa, Rajasthan, Sikkim, West Bengal, Uttar Pradesh and Tripura. Other (non-poor) states are: Goa, Gujarat, Haryana, Himachal Pradesh, Jammu, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Tamil Nadu, New Delhi and Arunachal Pradesh.

Results and Discussion

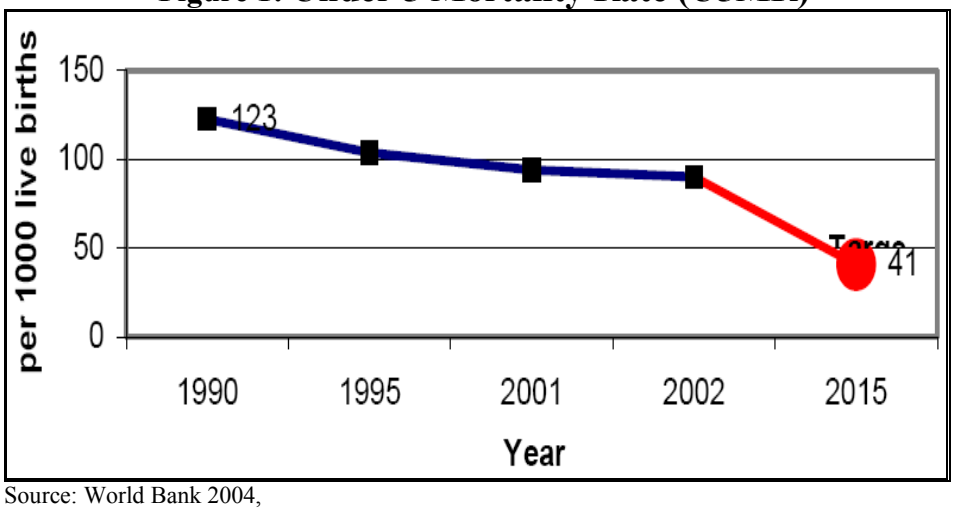
Status and Trends

The U5MR, including infant, neonatal and child mortality rates, started declining since the late 1970s and until 1993 the rate of decline was substantial. The decline was, however, slow during 1993–98. The country's goal to achieve a U5MR of less than 100 per 1000 live-births and reducing the IMR to less than 60 per 1000 live-births by the year 2000 could not be achieved despite improved interventions and an increase in the overall resources. In the present scenario of IMR (2002), 25 per 1000 newborns died within the first week of birth; 40 per 1000 newborns died before reaching the age of one year and 85 per 1000 newborns died before reaching the age of five years. The major uncertainty seems to be whether the IMR is approaching a limiting value. This value does not have an ultimate cap that will hold forever. Perhaps the progress in reducing mortality in early infancy is possible with innovative interventions for newborn care. Nevertheless, the IMR and U5MR have become increasingly important indicators that need to be monitored.

The estimates of under-five mortality from the 1998-99 survey range from a high of 138 in Madhya Pradesh to a low of 19 in Kerala. Six states have an under-five mortality of

over 150 and three states have an under- five mortality below 50. Fertility rate and socio-economic conditions also vary greatly from state to state in India. For example, the total fertility rate varies from 1.8 to 4.6, the illiteracy rate among women in reproductive ages ranges from 15 per cent to 65 per cent and coverage of childhood immunizations among one-year olds ranges from 11 per cent to 89 per cent. The large variations in fertility, mortality, and socio-economic conditions among states in India reflect the degree of autonomy of state governments vis-à-vis the federal government for most of the branches of government. In six years between the surveys, under-five mortality declined from 109.3 to 94.9, a 13 per cent decline. In five states, the decline was more than 25 per cent and they include both high-mortality states (Orissa) and low-mortality states (Himachal Pradesh and Delhi). In five states, the decline was less than 10 per cent and they also include some high-mortality states (Madhya Pradesh and Rajasthan) and low-mortality states (Goa). States with a large decline of under-five mortality also experienced a large decline in the total fertility rate (average decline of 1.1 children per woman), and an increase in coverage of childhood immunizations (average of 9.5 per cent increase). States with a small decline or no decline of under-five mortality experienced a small decline in the total fertility rate (average of 0.3 children per woman) and a small increase in the coverage of childhood immunizations (average of 4.2 per cent). Thus, the state-level variations in the decline of under-five mortality during the six-year period between 1992-93 and 1998-99 can be explained mostly by variations in the decline of fertility and increases in immunizations against childhood diseases.

Figure 1: Under 5 Mortality Rate (U5MR)

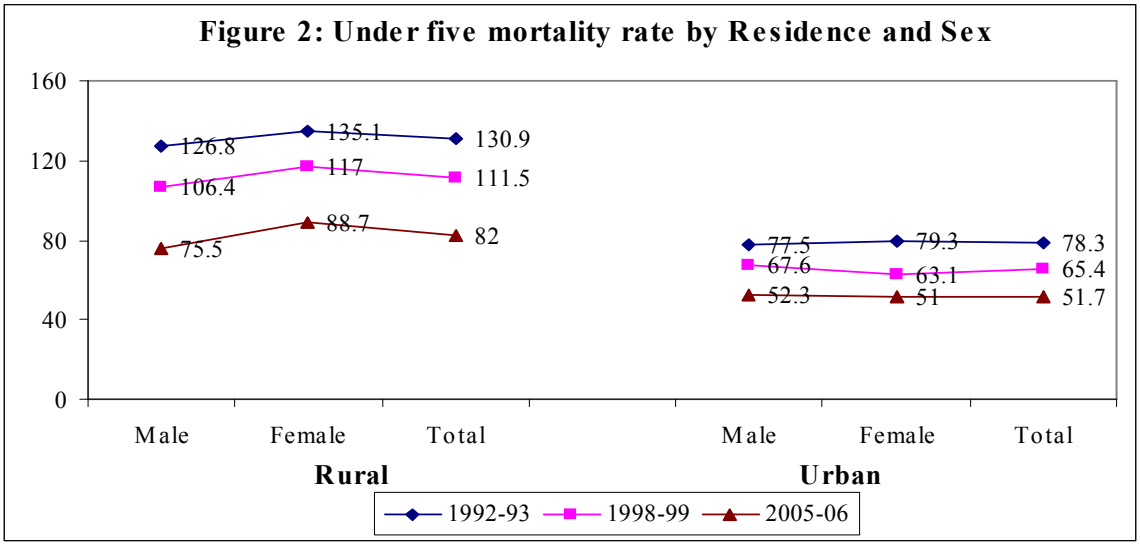


Source: World Bank 2004,

The health status of children is best evident from key indicators namely, the under five mortality rate and infant mortality rate (IMR). There have been considerable efforts to reduce under-five mortality rates in the country over the last three decades. In 2002, the average under-five mortality rate in India was 90 deaths per 1000 live births a considerable reduction as compared to 202 in 1970. The under-five mortality rate has been declining by 2.6 (compounded annually) per cent per annum in the 90s (Fig.1). The rate of decline in the 90s, however, is about half of the previous decades rate of decline, 4.7 per cent. At the current rate India would achieve an under five mortality of 64 per 1000 live births by 2015 which is well short of the MDG goal of 41.

The under-five mortality rate is the probability (expressed as a rate 1000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates. The under Five Mortality Rate (U5MR) at the national level has declined during the last decade. It has come down from 109.3 per thousand (1992-93) to 74.4 per thousand during the period 2005-06. More declines are noticed for males than female children. The U5MR has come down from during NFHS-1to NFHS-3 for males it declined from 126.8 per thousand to 75.5 per thousand while for females it declined from 135.1 per thousand to 88.7 per thousand in rural areas during the corresponding periods in Fig.2.

Figure 2: Under five mortality rate by Residence and Sex



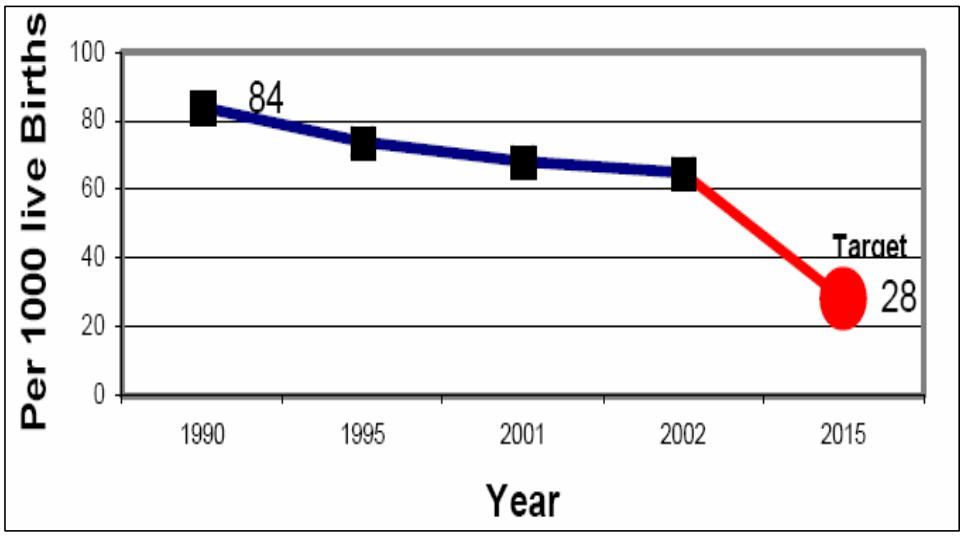
In the urban area declines are slow, for males it declined from 77.5 per thousand to 52.3 per thousand while female mortality also declined from 79.3 per thousand to 51.0 per

thousand in rural areas during the corresponding periods. Perceptible decline in the rate has taken place in rural areas as compared to the urban part of the country. This implies that the government's progremmes like Universal Immunization, IMNCI are being successfully implemented in the rural areas.

Infant Mortality Rate (IMR)

In India, approximately 1.72 million children die each year before reaching their first birthday. Infant mortality has declined significantly in India from 129 in 1970 to 68 in the year 2000 Fig.3. Though, the Infant Mortality Rate (IMR) is decreasing at an annual rate of 2.11 per cent from the early seventies, the decadal rate (compounded annually) is decreasing at a slower rate when compared between 1981-91 and 1991- 2001. The slow pace of education in the IMR is a major worry for the country's development. To that extent its performance when compared to other Southeast and East Asian countries is poor. While the expected fall in IMR is at 47 based on the current rate, it is still above the millennium development goal of 28 per 1000 live births by 2015.

Figure 3: Infant Mortality Rate (IMR)



Source: Source: World Bank 2004,

The country has observed a continuous decline in IMR. It stood at 192 during 1971, 114 in the year 1980 and 58 in 2005. The decline in IMR has been noticed both for the male and female child during the period. However, the rate of decline is more pronounced in the case of male as compared to female (Table 1).

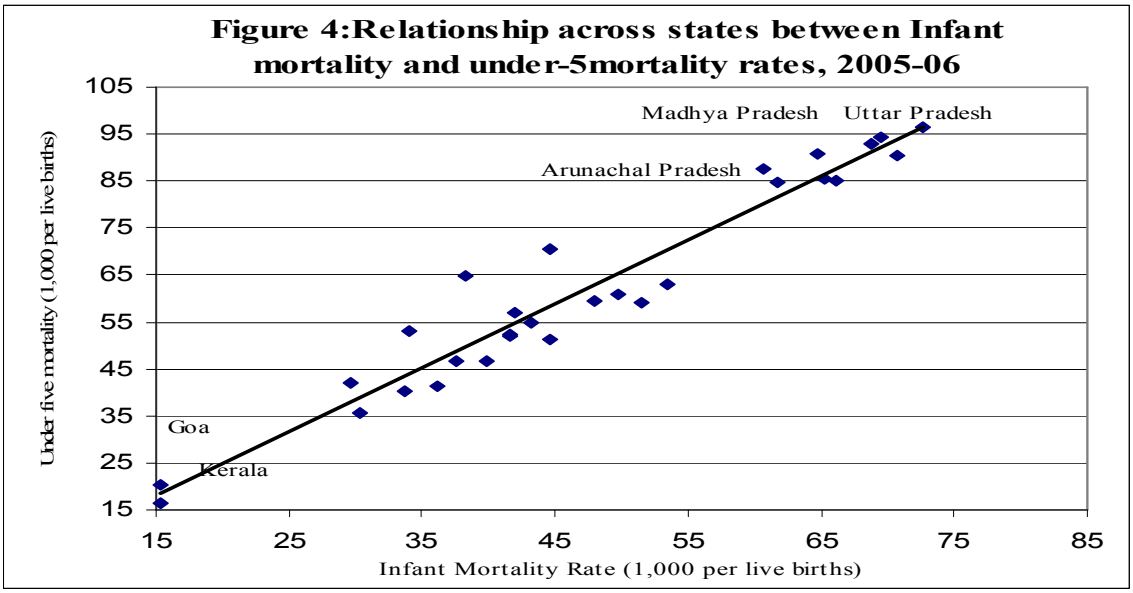
Table 1: Infant Mortality Rate by sex and by residence

YEAR	Infant Mortality Rate by Sex (Per 1000 live births)			Infant Mortality Rate by Rural-Urban (Per 1000 live births)		
	Male	Female	Total	Rural	Urban	Total
1980	113	115	114	124	65	114
1985	96	98	97	107	59	97
1990	78	81	80	86	50	80
1993	73	75	74	82	45	74
1996	71	73	72	77	46	72
2000	67	69	68	74	43	68
2003	57	64	60	66	38	60
2005	56	61	58	64	40	58
Source: Ministry of Health and Family Welfare, 2007.						

On account of child health interventions, the infant mortality rate in the country has gone down from 114 in 1980 to 58 in 2005. While looking at the IMR of the country, it is observed that there is a continuous decline both in rural as well as in urban areas although urban areas of the country are observing rapid decline in IMR as compared to rural areas attributing this change to better health care facilities easily accessible in urban areas.

Under –five Child Mortality by State

Data from the National Family Health Surveys indicate that the under-five child mortality (U5MR) rates were 109.3 per 1,000 live births in 1992-93, and declined to 94.9 by 1998-99, an almost identical rate of decline to that in the infant mortality rate. The patterns of inter-state disparities in the U5MR are very similar to those observed for the IMR. This is not surprising as infant deaths constitute more than 70 per cent of all under-five child deaths in India. Figure 4, which plots U5MR against IMR for 29 states, finds an almost perfect fit between the two variables. The only states that have a somewhat higher U5MR relative to their IMR are Arunachal Pradesh, Uttar Pradesh and Madhya Pradesh. Therefore, the analysis that follows will largely be limited to infant mortality, but most of the conclusions and results from the analysis apply equally well to under-five child mortality.



Source: NFHS-3

Table 2 presents various measures of infant and child mortality by residence for the three five-year periods preceding the survey. According to these estimates, infant mortality in India has declined from 77 deaths per 1,000 live births in 1991-95 (10-14 years before the survey) to 57 deaths per 1,000 live births in 2001-05 (0-4 years before the survey), thus implying an average rate of decline of 2 infant deaths per 1,000 live births per year. All other measures of infant and child mortality presented in Table 2 also show declining trends during the years before the survey. By comparing the estimates (for the period 10-14 years before the survey with the estimates for the period 0-4 years before the survey), it is seen that the neonatal mortality rate has decreased by 12 deaths per 1,000 live births (from 51 to 39); the postneonatal mortality rate has decreased by 7 deaths per 1,000 live births (from 25 to 18); and the child mortality rate (at age 1-4 years) has decreased by 14 deaths per 1,000 children age 1 (from 32 to 18). In spite of these impressive declines, one out of every 14 children born during the five years before NFHS-3 will die before reaching age five. Infant and child mortality rates are considerably higher in rural areas than in urban areas. In 2001-05, the infant mortality rate was 50 per cent higher in rural areas (62) than in urban areas (42).

Table 2: Early childhood mortality rates					
Years	Neonatal mortality[a] (NM)	Post neonatal mortality$_1$ (PNN)[b]	Infant mortality[c] (1q0)	Child mortality[d] (4q1)	Under-Five mortality[e] (5q0)
Urban					
0-4	28.5	13.0	41.5	10.6	51.7
5-9	35.9	18.8	54.7	14.8	68.7
10-14	34.6	18.1	52.7	17.7	69.5
Rural					
0-4	42.5	19.7	62.2	21.0	82.0
5-9	53.9	24.2	78.1	28.7	104.5
10-14	57.5	28.1	85.5	38.4	120.6
Total					
0-4	39.0	18.0	57.0	18.4	74.3
5-9	49.3	22.8	72.2	25.0	95.4
10-14	51.3	25.3	76.6	32.3	106.5
NFHS-1	48.6	29.9	78.5	33.4	109.3
NFHS-2	43.4	24.2	67.6	29.3	94.9
NFHS-3	39.0	18.0	57.0	18.4	74.3
$_1$ Computed as the difference between the infant and neonatal mortality rates.					

Source: NFHS-3

The rural-urban difference in mortality is especially large for children in the age interval 1- 4 years, for whom the rate in rural areas is twice as high as the rate in urban areas. In both the neonatal and postneonatal periods, mortality in rural areas is about 50 per cent higher than the mortality in urban areas. Infant and child mortality rates have declined slightly faster in rural areas than in urban areas. Between 1991-95 and 2001-05, infant mortality declined by 27 per cent in rural areas, compared with 21 per cent in urban areas. During the same period, the child mortality rate declined by 45 per cent in rural areas, compared with 40 per cent in urban areas. Even in the neonatal period, the decline in mortality was slightly faster in rural areas (26 per cent) than in urban areas (18 per cent). Rather than relying only on NFHS-3 data for the trend analysis, one can also use the estimates from NFHS-1 and NFHS-2 to discern the trends in infant and child mortality. For the period 0-4 years before the survey, NFHS-1 and NFHS-2 recorded infant mortality rates of 79 and 68, respectively. Comparison of these estimates with the NFHS-

[a] The probability of dying in the first month of life.
[b] The probability of dying after the first month of life but before the first birthday.
[c] The probability of dying before the first birthday.
[d] The probability of dying between the first and fifth birthdays.
[e] The probability of dying before the fifth birthday.

3 estimate of 57 indicates that the infant mortality rate declined by 22 deaths per 1,000 live births in approximately 13 years (with similar declines in the two periods). This implies an average reduction of 1.7 infant deaths per year, which is slightly slower than the reduction of 2 infant deaths per annum implied by the birth history data from NFHS-3. It should also be noted that the estimated infant mortality rate of 57 for 2001-05 from NFHS-3 is very close to the average Sample Registration System (SRS) estimate of 60 for the period 2002-05.

Table 3 show differentials in infant and child mortality rates for the five-year period preceding the survey by demographic characteristics, separately for rural, urban, and total areas of India.

Table 3: Childhood mortality rates by demographic characteristic

Demographic characteristic	IMR (per 1000)	CMR (per 1000)	U5M rate (per 1000)
Child's Sex			
Male	56	14	70
Female	58	23	79
Mother's age at birth			
<20	77	20	95
20-29	50	16	65
30-39	56	26	81
40-49	72	(37)	107
Birth order			
1	64	11	75
2-3	47	16	62
4-6	62	25	86
7 or more	80	39	116
Previous birth interval			
<2 years	86	32	115
2 years	50	20	69
3 years	30	15	44
4 years or more	37	9	45
Total	57	18	74
NFHS-1	86	35	119
NFHS-2	73	31	101

( ) Based on 250-499 unweighted children surviving to the beginning of the age interval.
* Rate not shown; based on fewer than 250 unweighted children surviving to the beginning of the age1 Computed as the difference between the infant and neonatal mortality rates.
2 Excludes first-order births. IMR= Infant mortality rate CMR=Child mortality rate (the probability of dying between first and fifth birthday). U5M rate= Under –five mortality rate (the probability of dying before the fifth birthday).

However, in the neonatal period, like elsewhere, mortality in India is lower for females (37) than for males (41). As children get older, females are exposed to higher mortality than males. Females have 36 per cent higher mortality than males in the post neonatal period, but a 61 per cent higher mortality than males at age 1-4 years. The maternal age at birth shows a U-shaped relationship with infant and child mortality rates. The infant mortality rate is lowest for mother's age 20-29 years (50) and is substantially higher for mother's age less than 20 years (77) and 40-49 years (72). Similar age differentials are seen in neonatal mortality, post neonatal mortality, and child mortality (at age 1-4 years). The birth order also shows a similar effect. The infant mortality rate is lowest for births of order 2 or 3 (47), and higher for first order births (64) and for births of later orders (62 or higher). Similar differentials by birth order are observed at age less than one month, but child mortality increases steadily with birth order. The interval between the previous birth and the current birth shows a strong negative effect on infant and child mortality rates. When a birth occurs less than two years after an earlier birth, the infant mortality rate is 86. If the interval is 24-35 months, the infant mortality rate is 50, and if the interval is 36-47 months, it is only 30. But when the interval is four years or more, the infant mortality rate is somewhat higher (37). This pattern is observed for both neonatal and post neonatal mortality rates. Child mortality, however, is negatively related to the previous birth interval throughout, with mortality being lowest for intervals of four years or more. In India, the weight of babies is not measured at birth in most cases. Taking the reported size of the baby at birth as a proxy for birth weight, one finds that birth weight has a substantial effect on infant and child mortality rates. The infant mortality rate is 49 for an average or large size baby, but it is 62 for a smaller than average baby and 129 for a very small baby. The risk of mortality is particularly high for small babies during the neonatal period. When compared with an average size baby, the neonatal mortality rate is 30 per cent higher for a smaller than average baby and 183 per cent higher for a very small baby. Similar demographic differentials are observed in infant and child mortality in rural and urban areas, with the exception of sex differentials. Infant and under-five mortality rates are higher for females in rural areas and are higher for males in urban areas. But even in urban areas, mortality is higher among females than males in the post neonatal period and at 1-4 years of age.

Children with low birth weights are more than two times as likely to die during infancy as children who weighed more than 2.5 kilograms at birth[f]. Medical attendance (i.e., doctor, nurse or skilled birth attendant present) at birth is associated with a large reduction in infant mortality, especially in the poor states. Interestingly, however, receipt of any antenatal care by a woman is even more strongly associated with infant survival than professional attendance at birth. In the poor states, the infant mortality rate for children whose mothers did not obtain any antenatal care is 83 per cent greater than that for children whose mothers obtained some care.

Table 5: Proximate cause of infant mortality in poor and non -poor states, 1996-98

Variables	Poor Sates	Other States	All States
Professional medical attendance at birth?			
No	73	49	68
Yes	51	38	44
Whether Mother obtained any antenatal care for this delivery?			
No	84	62	82
Yes	46	38	42
Whether mother received any tetanus shots during pregnancy?			
No	92	67	88
Yes	50	38	45
All	63	41	56
Birth Weight of child			
<=2.5Kgs	46	42	43
>2.5Kgs	22	18	20
All	33	28	29
per cent of Children 0-35 months old who had low birth weight (<2,500gms)			
Mother's Weight (kgs)	28	35	32
<35	28	23	25
35-49	18	14	15
>=50			
Infant Mortality Rates (per 1,000) live births)			
Mother's Weight (kgs)	79	43	69
<35	66	43	59
35-49	61	43	52
>=50			

Source: NFH-2

Thus, antenatal care and tetanus immunization of a pregnant woman appear to be more strongly associated with infant survival prospects than professional attendance at birth. A

[f] Note the data on birth weight were not available for all children in the NFHS-2 survey. Indeed the data suggest a strong selection bias in the women who reported their child's birth weight; the infant mortality rate for this group of children is significantly lower than IMR for children with missing birth weights.

child's birth weight is, in large part, influenced by the mother's nutritional status at delivery. This is observed in Table 5, which shows that while 32 per cent of children aged 0-35 months whose mother's weight was less than 35 kgs were likely to be of low birth weight, only 15 per cent had low birth weight when the mother's weight was 50 kgs or more. Since infant mortality is related to low birth weights, this implies that infant mortality is also determined in part by maternal weight. Table 7 indicates this to be the case, but only in the poor states of the country. In these states, infant mortality is nearly 30 per cent higher when the mother weighs less than 35 kgs than when she weighs 50 kgs or more. After the first month of life, child malnutrition becomes an important contributing factor to infant and child mortality in India. Malnutrition sets in early, often owing to improper feeding practices, such as early termination of exclusive breast-feeding and introduction of (inadequate) supplementary feeding. In addition, even during the exclusive breastfeeding period, infants may be malnourished owing to insufficient quantities of breast milk in turn the result of poor nutrition and heavy workload of poor women. Malnourished infants are more prone to diarrheal, respiratory and other infections, which, when untreated, can lead to infant death.

Gender disparity and birth order

Much has been written about sex differentials in infant mortality in India. India is said to be one of the few countries in the world where females have a higher infant mortality rate than males. The NFHS-2 data do not show a significant disparity in average male and female infant mortality rates, but this in itself is evidence of parental discrimination against female infants, as one would expect the infant mortality rate for males to be well above that for females in a non-discriminatory environment.

Further, the data show large gender differences in infant mortality for higher birth-order children (Table 6). Girls of birth order 4 or more experience significantly higher rates of infant mortality than boys of similar birth order (84 versus 75), with this difference being larger in the non-poor states than in the poor states. Child mortality between the ages of one and five is also significantly greater for females than for males. A girl in India is 40 per cent more likely to die between her first and fifth birthdays than is a boy. Thus, child

mortality would drop by 20 per cent if girls had the same mortality rate as boys between the ages of 1 month and 5 years (Victora et al. 2003).

Table 6: Infant mortality rates by child birth order, sex and by group of states

Birth Order of Child	Poor States			Other States			All States		
	Male	Female	All	Male	Female	All	Male	Female	All
1	91	76	84	50	41	46	76	63	70
2-3	65	65	65	45	44	45	58	58	58
4 & Above	79	88	83	59	71	65	75	84	80
Total	76	76	76	49	48	49	68	67	67

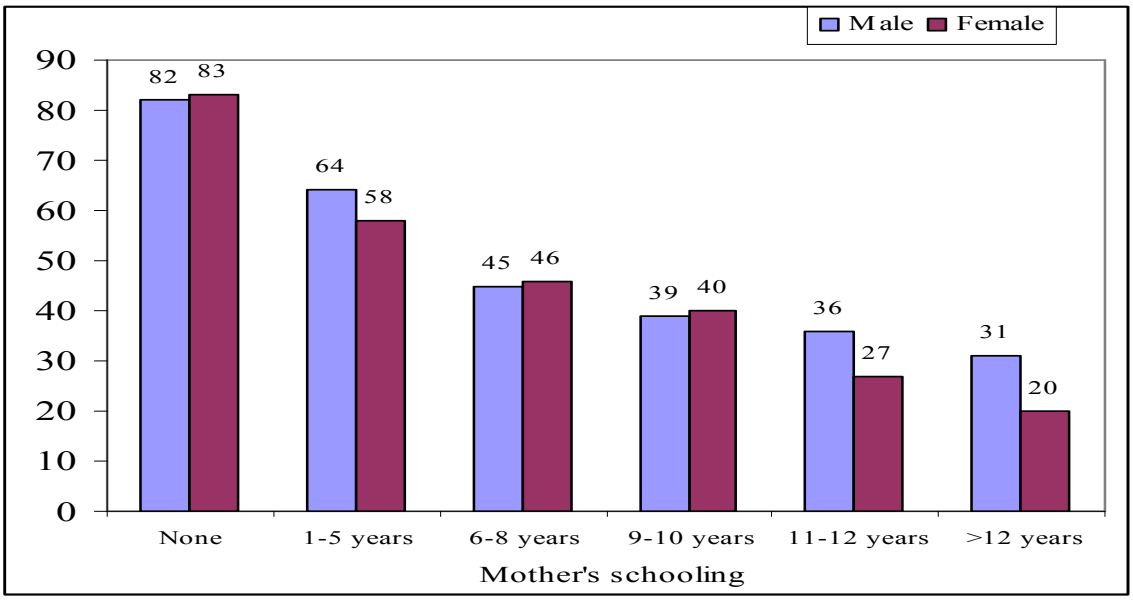
Source: NFHS-2

The mortality rate for children by sex (from the NFHS-2 data), indicates that while the probability of death is greater for males than for females until age one, the reverse is true from ages one to five. Parental neglect toward girls—symptomatic of the generally low social status of women—is an important cause of the gender disparity in child mortality. Girls are less likely to receive adequate food allocations and medical treatment for their illnesses than boys (Das Gupta 1987; Filmer *et al.* 1998).

Disparity across social groups

In India, social groups, such as scheduled castes (SCs), scheduled tribes (STs), and other backward castes (OBCs), have been historically under-privileged, and tend to have poorer socioeconomic indicators than the general population. The NFHS-2 data indicate that these groups have higher infant mortality rates than the general population, although there are differences among these groups as well (Table 7). Of the three groups, STs have the highest infant mortality, followed by SCs. Although SC/STs in the poor states have the highest absolute IMRs of any group in the country, the relative position of SC/STs vis-à- vis the non-SC/ST/OBC groups is worse in the non-poor states relative to the poor states. For instance, in the poor states, STs have an IMR that is 54 per cent greater than that of forward castes, but this differential is only about 37 per cent in the non-poor states. As is widely observed in many countries (including India), mother's schooling is strongly associated with infant mortality (Fig. 5).

Figure 5: Infant mortality by sex and by mother's schooling



Source: NFHS-2

What is interesting is that while both male and female infants benefit (in terms of significantly reduced risk of mortality) from having their mothers even slightly schooled (i.e., 1-5 years), female infants enjoy a significant (relative) survival advantage over their male counterparts only when the mother has 11 or more years of schooling

Rural infrastructure can have powerful influences on health outcomes. For instance, rural roads enable easier access to health centers and referral district hospitals, thereby reducing the risk of an infant dying because of neonatal and post-neonatal infections. Access to safe drinking water and sanitation are important environmental hygiene interventions that significantly reduce the exposure of an infant to water- and vector-borne diseases and increase the probability of his or her survival. Likewise, access to electricity can also improve infant survival probabilities by improving hygiene, cooking and health practices in the household as well as the health practices of local health providers. The NFHS-2 data show significant association between infant mortality and access to infrastructure (Table 7). The infant mortality rate is nearly 50 per cent greater among households without access to electricity as compared to households with electricity, although this difference is somewhat smaller in the poor states than in the non-poor states. It is not just the availability of electricity but also the regularity in its

supply that is associated with health outcomes. The regularity of electricity supply in a village is associated with significantly lower levels of infant mortality, although this relationship too is more predominant in the better-off states than in the poor ones. On the other hand, the presence of piped water and rural roads has a much stronger association with infant mortality reduction in the poor states than in the rich states (Table 7)

Table 7: Infant mortality rate, by various individual, household, child and community characteristics and by poor and non-poor states, 1994-98

Characteristics	Poor States	Other States	All States
Household has:			
No Electricity	85	66	82
Electricity	64	45	55
Electricity supply in village is			
Irregular	81	57	75
Regular	78	49	65
Household has:			
No piped water	80	54	75
Piped water	59	45	51
Household has:			
Some toilet assess	49	34	42
No toilet assess	84	60	78
per cent of villages in district having pucca			
road:	81	53	77
50 per cent or fewer	78	52	71
50-90 per cent	59	45	51
>90 per cent			
Social group of household:	84	58	77
Scheduled Caste	88	65	81
Scheduled Tribe	80	47	70
Other Backward Caste	83	53	74
SC, ST, or OBC	65	42	57
Forward Caste	76	49	67
All Group			

Source: NFHS-2

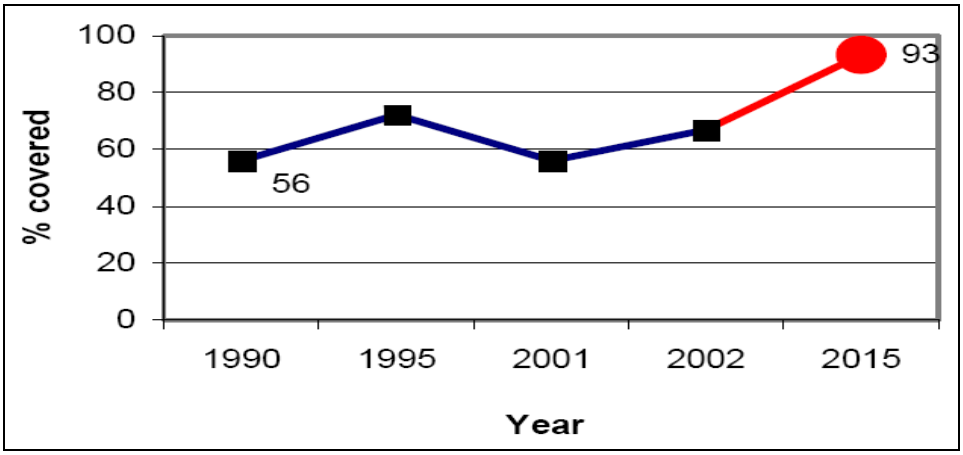
This suggests that the health 'appropriateness' of infrastructure differs across poor and non-poor states; in the former, drinking water and rural roads matter more than electricity. Access to sanitation is another infrastructural intervention that is observed to

have strong association with health outcomes. Households with no toilet access have an infant mortality rate that is nearly double that of households with toilet access. This pattern does not differ much across poor and non poor states.

Immunization

Among all the indicators, immunization is one, which lacks authentic information. The available figures vary according to different sources. While the Government of India statistic quote a higher level of measles coverage as compared with other survey figures such as NFHS. The NFHS indicates a coverage of 50.7 per cent of children aged 12 to 23 months for measles during 1998-99 and the same survey indicates a still lower coverage of 41.7 per cent for children below 12 months of age (Fig 6). However, there has been a considerable improvement when compared to NFHS I during 1992-93. The male female differences in the measles immunization have declined considerably (male 51.6 per cent, female 49.8 per cent). The urban areas have much higher coverage (69.2 per cent) than the rural areas (45.3 per cent).

Figure 6: Population of Children under 12 months immunized for measles



Source: World Bank 2004,

As shown in Table 8, there is an increase in the proportion of children fully immunized and a decline in the proportion of children who did not receive any vaccinations between NFHS-1 and NFHS-3. The coverage of BCG, three doses of polio and measles has also improved considerably since NFHS-1. Nevertheless, gains in full vaccination coverage and in the coverage of each individual vaccine were greater between NFHS-1 and NFHS-2, than between NFHS-2 and NFHS-3.

Table 8: Trends in Vaccination Coverage									
	Urban			Rural			Total		
	NFHS-3	NFHS-2	NFHS-1	NFHS-3	NFHS-2	NFHS-1	NFHS-3	NFHS-2	NFHS-1
BCG	86.9	86.8	77.6	75.1	67.1	57.6	78.1	71.6	62.2
DPT									
1	84.4	86.1	80.5	73.0	67.1	62.2	76.0	71.4	66.4
2	78.1	81.9	75.2	62.6	60.1	54.5	66.7	65.0	59.2
3	69.1	73.4	68.8	50.4	49.8	46.6	55.3	55.1	51.7
Polio1									
0	68.5	23.3	7.8	41.3	10.1	3.6	48.4	13.1	4.6
1	94.8	92.2	80.8	92.5	81.1	62.9	93.1	83.6	67.0
2	91.1	89.4	76.9	88.0	75.0	56.6	88.8	78.2	61.2
3	83.1	78.2	70.4	76.5	58.3	48.6	78.2	62.8	53.6
Measles	71.8	69.2	57.5	54.2	45.3	37.7	58.8	50.7	42.2
Number of children	2,723	2,282	2,715	7,696	7,795	9,138	10,419	10,076	11,853

The trends in vaccination coverage between NFHS-2 and NFHS-3 in urban and rural areas show that there is greater improvement in the coverage of full immunization, as well as in most vaccines, in rural areas than in urban areas. In fact, there is a nearly two percentage point decline in full immunization coverage in urban areas between NFHS-2 and NFHS-3. Further, coverage for each of the three doses of DPT also declined in urban areas between the two surveys. The proportion of children receiving three doses of DPT declined from 73 per cent in NFHS-2 to 69 per cent in NFHS-3. These data indicate that India still lags far behind the goal of universal immunization coverage for children.

There are considerable interstate differentials in the coverage rates for different vaccinations and for children receiving all vaccinations. The percentage of children who are fully vaccinated ranges from 21 per cent in Nagaland to 81 per cent in Tamil Nadu. Tamil Nadu, Goa, Kerala and Himachal Pradesh stand out in full immunization coverage as about three-fourths or more of children in each of these states are fully immunized. Among the more populous states, Uttar Pradesh (23 per cent), Rajasthan (27 per cent), Assam (31 per cent), Bihar (33 per cent), Jharkhand (34 per cent), and Madhya Pradesh (40 per cent) stand out as having a much lower percentage of children fully vaccinated than the national average of 44 per cent (Table 9). As these states account for nearly one-third of the total population of the country, their low vaccination coverage pulls down the coverage rate for the country as a whole. In addition to Nagaland and Assam, some of the

other northeastern states (Arunachal Pradesh and Meghalaya) also have a relatively poor record on vaccination coverage. A similar picture emerges with respect to individual vaccinations. In Tamil Nadu, Himachal Pradesh, Goa, Kerala, Sikkim, and Maharashtra, the coverage for BCG and at least the first doses of DPT and polio is generally in excess of 90 per cent and in some cases, nearly universal. In Tamil Nadu and Goa, measles coverage is also above 90 per cent.

Table 9: Vaccinations by state

State	BCG	DPT-3	Polio-3	Measles	Full Vaccinations
Andhra Pradesh	92.9	61.4	79.2	69.4	46.0
Arunachal Pradesh	57.7	39.3	55.8	38.3	28.4
Assam	62.4	44.9	59.0	37.4	31.4
Bihar	64.7	46.1	82.4	40.4	32.8
Chhattisgarh	84.6	62.8	85.1	62.5	48.7
Delhi	87.0	71.7	79.1	78.2	63.2
Goa	96.8	87.5	87.2	91.2	78.6
Gujarat	86.4	61.4	65.3	65.7	45.2
H.P	97.2	85.1	88.6	86.3	74.2
Haryana	84.9	74.2	82.8	75.5	65.3
J.K	90.9	84.5	82.2	78.3	66.7
Jharkhand	72.7	40.3	79.3	47.6	34.2
Karnataka	87.8	74.0	73.8	72.0	55.0
Kerala	96.3	84.0	83.1	82.1	75.3
M.P	80.5	49.8	75.6	61.4	40.3
Maharashtra	95.3	76.1	73.4	84.7	58.8
Manipur	80.0	61.2	77.5	52.8	46.8
Meghalaya	65.9	47.3	56.6	43.8	32.9
Mizoram	86.4	66.8	63.5	69.5	46.5
Nagaland	46.3	28.7	46.2	27.3	21.0
Orissa	83.6	67.9	65.1	66.5	51.8
Punjab	88.0	70.5	75.9	78.0	60.1
Rajasthan	68.5	38.7	65.2	42.7	26.5
Sikkim	95.9	84.3	85.6	83.1	69.6
Tamil Nadu	99.5	95.7	87.8	92.5	80.9
Tripura	81.1	60.2	65.3	59.9	49.7
Uttar Pradesh	61.0	30.0	87.6	37.7	23.0
Utarakhand	83.5	67.1	80.3	71.6	60.0
W.Bangal	90.1	71.5	80.7	74.7	64.3
India	**78.1**	**55.3**	**78.2**	**58.8**	**43.5**

Source: NFHS-3

However, in most states, there is a considerable drop from the second to the third dose for both DPT and polio, and in almost every state fewer children have received measles vaccine than any of the other vaccinations except polio 0.

Has the decline in childhood mortality rates slowed in India?

Several indicators of childhood mortality are used to measure levels and trends, including the neonatal and post neonatal mortality rates, the infant mortality rate, the child mortality rate, and the under-5 mortality rate. Over the 15-year period before the 1992–93 National Family Health Survey (NFHS), all measures of childhood mortality declined in India at rates slightly greater than the average for other low-income countries, excluding China[g]. The decline of several childhood mortality indicators measured in the NFHS. The decline in the under-5 mortality rate in India was comparable with those rates of 20 other countries with Demographic and Health Surveys (DHS) data[h]. A comparison of the under-5 rate for India with seven DHS countries is shown. Another source of infant mortality data is the Indian Sample Registration System (SRS), whose annual estimates are consistent with those of the NFHS[i]. The SRS was started in a few states in 1965, with coverage extended to all states in 1970, and it tracks births through the use of continuous enumeration and biannual surveys. Infant mortality rates and child deaths are published annually, but not child mortality rates. The continuous registration and survey results are matched and verified in the field to minimize duplication and omission. At the national level, the results are generally believed to be quite accurate. Improvements in the accuracy of the data are likely to have occurred in some states over time, which may underestimate the pace of decline; but this is not likely to affect the estimation of national trends. A 1980 survey into omissions of vital events found that death rates were underestimated by about 3 per cent nationally; by 1985, this had improved to 2.5 per cent. We have compared SRS estimates of the annual infant mortality rate for the most recent five-year period (1993–97) with retrospective data going back to 1981. Throughout this interval, the rate of decline in the infant mortality rate tended to stagnate for brief periods, and was often followed by a subsequent rapid decline. During the most recent five-year period, however, the marked reduction in the rate of decline has been sustained, and the observed estimates (with 95 per cent confidence intervals) are now significantly above the 1981–93 trend line. Based on the longerterm trend, the predicted value for the 1997

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infant mortality rate was 63.5 per 1000 live births, whereas the observed rate was 71 per 1000 live births. In terms of numbers, this means that about 200 000 more infants died in 1997 than would have been the case had the longer-term trend continued. As infant and child mortality rates fall, further gains become more difficult to achieve. However, childhood mortality rates in India are still at elevated levels, and the observed reduction in the decline is not readily explainable.

Why is the decline in child mortality rates slowing?

Child mortality trends, differentials, and determinants in India have been the subject of many studies. One of the studies attempted to account for the pace of decline in the infant mortality rate over the period 1968–78 and provided a framework for analysing factors that contributed to it (Jain A.K, and P.Visaria, 1988). These included proximate factors (such as nonmedical factors and medical care during the antenatal period, care at birth, and preventive and curative care in the postnatal period); maternal factors (age, parity, and birth intervals); and household- and community-level factors (water, sanitation and housing). Then, as now, opinions differed as to the relative importance of socioeconomic development and health services in reducing the infant mortality rate. The study concluded that a substantial decline in infant mortality rate is possible without significant improvement in economic development, even though the relative importance of various determinants could not be assessed. It made a case for increased access to a minimum package of essential services that would significantly reduce high infant mortality rates: reproductive health services; perinatal care; improved breastfeeding practices; immunization; home-based treatment of diarrhoea; and timely introduction of supplementary foods. Several other studies laid out intervention strategies and directions based on similar analyses and assumptions.

CHALLENGES

Sustaining the Past Performance

India's performance in reducing mortality rates, compared to similar Asian developing countries like China, Indonesia and Thailand, is poor. The level of IMR is much higher in India when compared even to some of the Southeast Asian countries like Bangladesh and

Sri Lanka. Though the long-term reduction in mortality rates is noteworthy, the concern is that the decline is slowing down during the recent decade. In other words, the tempo has not been sustained recently. There is an urgent need for new approaches and priorities in the overall strategy to reduce mortality rates among children.

Inter-State Variations

A wide inter-state disparity exists in infant mortality and under-five mortality rates. The IMR varies from as low as 14 (Kerala) to as high as 96 (Orissa). The figures indicate the widespread disparity and performance when compared to the national average. Weaker states like Uttar Pradesh, Rajasthan, Madhya Pradesh, Orissa and Assam have an IMR higher than the national average. There are substantial differences not only in the IMR but also in the neonatal and under-five mortality rates between the states. The measles immunization for children aged 12-23 months also shows similar disparities. The immunization coverage ranges from a high of 90 per cent in Tamil Nadu to a low of 16 per cent in Bihar. Performance of the weaker states like Uttar Pradesh, Bihar, Assam, Rajasthan, etc. is well below national average.

Causes of Child Mortality

It is estimated that under-nutrition and anemia are contributory factors in over 50 per cent of under-five deaths in the country. Malnutrition is an area to be tackled as studies have revealed a synergy between malnutrition and mortality. The major causes of infant mortality continue to be pre-maturity birth and low birth weight, poor intra-partum and newborn care, diarrhoeal diseases, acute respiratory infections and other infections.

Neonatal mortality

Neonatal mortality accounts for more than two-thirds of Infant Mortality Rate in India. Over the last decade, post-neonatal mortality has declined much faster than neonatal mortality. This is mainly due to increased programme interventions focused on post neonatal care such as immunization, management of diarrhoea and ARI, etc. Policies and programmes should an emphasis on interventions in perinatal and neonatal mortality. Antenatal care, safe delivery and quality of new born care are key requirements for reduction of all types of mortality.

Gender Disparity

There are gender differences in IMR and under five mortality rates. Though there is no biological reason for a higher mortality rate in females in the age group 0-4 years, it is the presence of social causes that adversely affect the mortality rate of girls, and this needs to be tackled. Girls have a higher mortality rate than boys during the post-neonatal period to five years. The risk of mortality is higher among girls than boys as their malnutrition levels are higher.

Urban-Rural Bias

Bridging the gap between urban and rural child mortality rates and immunization over age is another challenge to be tackled. There is a large urban-rural disparity in the infant, under-five mortality rates and immunization coverage for measles. One of the reasons is the lack of accessibility to services either by remoteness of the location and higher proportion of disadvantaged groups. Providing adequate services to specific vulnerable groups and those in the remote areas is the key to bring down the gap.

Table 10 reveals that only 44 per cent of children of 12-23 months were fully immunized in 2005-06 up from 42 per cent in 1998-99 and 36 per cent in 1992-93. Treatment was sought from a health facility or provider for 69 per cent of children with symptoms of ARI. Fifteen per cent of children under age five years had a fever during the two weeks before the survey. Children's access to certain critical components of treatment of childhood diseases has declined over the past seven year's (Table 10). For instance, the proportion of children with diarrhoea who received ORS in the two weeks preceding the survey had risen from 18 per cent in 1992-93 to 27 per cent in 1998- 99; but since then it has fallen to 26 per cent in 2005- 06. Three, critical public health message are simply not reaching the families with children. For example, in 2005-06, only 23 per cent of infants aged 0-5 months were being exclusively breastfed in 2005-06-up from 16 per cent in 1998-99, an increase of 7 percentage points over seven years, despite the importance of exclusive breastfeeding in the initial months of a child's life. Four, there are hug gaps in women's access to and reach of maternal health services. Improvements in women's access to safe delivery, for instance, have been minimal. Between 1998-99 and 2005-06, the proportion of births assisted by a doctor, nurse, LHV, ANM or other health personnel

went up marginally from 42 to 48 per cent and institutional births went up from 36 per cent to 41 per cent over the same period.

Table10 : Trend in Assess to and Reach of Basic Health Services (Percent)

	NFHS-3 (2005-06)	NFHS-2 (1998-99)	NFHS-1 (1992-93)
Child immunization vitamin A supplementation			
Children aged 12-23 months fully immunized (BCG, measles, and three doses each of polio/DPT)	44	42	36
Children aged 12-23 months who have received BCG	78	72	62
Children aged 12-23 months who have received three doses polio vaccine	78	63	54
Children aged 12-23 months who have received three doses polio DPT vaccine	55	55	52
Children aged 12-23 months who have received measles vaccine	59	51	42
*Treatment of childhood disease (children under five years)**			
Children with symptoms of ARI treatment sought from a health facility	69	64	66
Children with symptoms of fever treatment sought from a health facility	15	29	20
*Treatment of childhood disease (children under three years)**			
Children with diarrhea in the last two weeks who received ORS	26	27	18
Children with diarrhoea in the last two weeks taken to a health facility.	60	63	61
*Child feeding practices**			
Children under three years breastfed within one hour of birth	23	16	10
Maternity care (for births in the last three years)			
Mothers who had at least three antenatal care visits for their last birth	51	44	44
Birth assisted by a doctor/nurse/LHV/ANM/other health personnel*	48	42	33
Institutional births*	41	34	26

Note: * Based on the last two births in the three years before the survey.
Sources: NFHS-3

Conclusion

The improvement in childhood mortality is the result of a combination of factors. Amongst these are the expansion of health care facilities and services, disease-specific health interventions, changes in diets and health behaviour, and the success of developmental programmes such as the Water and Sanitation Programme. A significant improvement in Indian women's educational attainment must also have played an important role in reducing mortality.

The infant mortality rate in India is steadily declining. The NFHS-3 estimate of infant mortality is 57 deaths per 1,000 live births, compared with the NFHS-2 estimate of 68 deaths per 1,000 live births and the NFHS-1 estimate of 79. Still, more than one in 18 children die within the first year of life, and more than one in 13 die before reaching age five. Infant and child mortality rates are higher in rural areas. In 2001-05, the infant mortality rate was 50 per cent higher in rural areas (62 deaths per 1,000 births) than in urban areas (42 deaths per 1,000 births). Children whose mothers have no education are more than twice as likely to die before their first birthday as children whose mothers have completed at least 10 years of school. Also, children from scheduled castes and tribes are at greater risk of dying than other children. The infant mortality rate (deaths per 1,000 births) for births less than two years apart is 86, dropping to 50 for births 24-35 months apart, and to 30 for births 36-47 months apart. By state, infant mortality is highest in Uttar Pradesh (73) and lowest in both Kerala and Goa (15). Nationally, a girl child's disadvantage with regard to survival is most evident in the under-five mortality rate: 79 girls per 1,000 births die before their fifth birthday, compared with 70 boys per 1,000 births. The perinatal mortality rate, which includes stillbirths and very early infant deaths (in the first week of life), is estimated at 49 deaths per 1,000 pregnancies that lasted seven months or more for the 2001-05 period. The perinatal mortality rate for pregnancies within 15 months after a previous pregnancy is 71, compared with only 30 to 31 when the birth interval is 27 months or more. Perinatal mortality is also very high for very young mothers (67) and for first pregnancies (66). According to socio-economic characteristics, perinatal mortality is highest for rural mothers, mothers with no education and less than five years of education, and mothers in the lowest wealth quintile.

Children are considered fully immunized if they receive one BCG injection to protect against tuberculosis, three doses each of DPT (diphtheria, pertussis, tetanus) and polio vaccines, and one measles vaccine. Immunization coverage has improved substantially since NFHS-1, when only 36 per cent of children were fully vaccinated and 30 per cent had not been vaccinated at all. There is very little change, however, in full immunization coverage between NFHS-2 (42 per cent) and NFHS- 3 (44 per cent). Coverage of individual vaccines has increased considerably and is much higher than would appear

from information on full coverage alone. Coverage for BCG, DPT, and polio (except Polio 0) vaccinations is much higher than the coverage of all required vaccinations combined. BCG, the first dose of DPT, and all three doses of polio vaccine have each been received by at least 76 per cent of children. Fifty-five per cent of children have received three doses of DPT. The relatively low percentages of children vaccinated with the third dose of DPT and with the measles vaccine are mainly responsible for the low proportion of children fully vaccinated. Progress in vaccination coverage varies markedly among the states. In 11 states, there has been a substantial deterioration in full immunization coverage in the last seven years, due to a decline in vaccination coverage for both DPT and polio. Large declines were seen in Maharashtra, Mizoram, Andhra Pradesh, and Punjab. On the other hand, there was major improvement in full immunization coverage in Bihar, Chhattisgarh, Jharkhand, Sikkim, and West Bengal. Other states with marked improvements in full immunization coverage were Assam, Haryana, Jammu and Kashmir, Madhya Pradesh, Meghalaya, and Uttaranchal.

In the two weeks before the survey, six per cent of children under age five had symptoms of ARI (cough and short, rapid breathing that was chest-related and not due to a blocked or runny nose). Of these children, 69 per cent were taken to a health facility provider. Fifteen per cent of children under age five years had a fever during the two weeks before the survey; 71 per cent of these children were taken to a health facility or treatment, and 8 per cent received antimalarial durgs. Overall, 9 per cent of children under age five had diarrhoea in the two weeks preceding the survey. Among these children, sixty per cent of children with diarrhoea were taken to a health facility. Thirty-nine per cent were treated with some kind of oral rehydration therapy (ORT), including 26 per cent who were treated with a solution prepared from oral rehydration salt (ORS) packets 20 per cent who were given gruel. More than one quarter of children with diarrhoea did not receive any type of treatment at all.

Malnutrition continues to affect newborns and young children and has been found to be the underlying cause of to 50 per cent of under-five deaths. About 55 million, or one-third of the world's underweight children under age five, live in India with the worst

affected states being Madhya Pradesh, Jharkand, Bihar, Gujarat, Orissa, Chhattisgarh, Uttar Pradesh and Meghalaya.

Policy implications

To understand what other policy interventions might be needed to help India attain its infant mortality MDG; one needs an understanding of the proximate - or intermediate - causes of infant mortality in India. An answer to this question can be found in the data on timing of deaths, obtained from analysis of unit record data from the National Family Health Survey 1998-99 (NFHS-2).

The lessons learned for child survival in India is the need for state stratified strategies and the adoption of multisectoral approaches to achieve greater impact and accelerate progress towards the health MDGs. Policy options for child survival include:

• To strategize by state and area. States with high U5MRs and slow decline need to strengthen the health systems, prioritize essential elements of child health and nutrition services (high impact interventions) and develop and expand community participation for the prevention and treatment of childhood illnesses (care seeking, compliance and preventive practices at the household level).

• To adopt a multisectoral approach, the study "Reducing child mortality in India in the new millennium" suggested that for India to pick up and continue its earlier successful record in child survival, a multiprong approach would be an important option. A multisectoral approach would include female education and nutrition, increasing the use of health services during pregnancy and delivery, eliminating the gender gap in child health services and improving nutrition throughout the lifecycle.

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