Reducing Child Mortality in India
KEEPING UP THE PACE
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The reduction in child mortality globally has been a development success story, as rates have been halved over the last few decades. Progress has, however, been very uneven and some countries have experienced increases in mortality rates in recent years. Better access to basic health services, such as immunization, oral rehydration therapy and antibiotics for pneumonia, improved living standards, and smaller families, have been important factors in improving child survival.

This study was undertaken in response to a question raised by state level health managers in India: why are the declines in child mortality slowing down? Infant and child mortality rates in India have barely changed in the past few years, making it unlikely that India will achieve its child survival goals by the year 2000.

This study documents the stagnation in child mortality rates, showing the increasing departure of current rates from longer-term trends. It reviews some of major causes of child mortality and addresses factors responsible for the high number of child deaths. Most importantly, the paper proposes that different strategic approaches may be needed in different states of India depending on mortality levels and the rate of progress made. It also suggests health policy options for reducing barriers to child survival.

Improving child survival remains a major development task in India. The slowing down in India’s child mortality reduction rates calls for new approaches to child mortality that goes beyond disease-, program-, and sector-specific approaches. We hope that this paper will provide some answers to the questions raised by health policymakers and implementers, and provide useful input in the current health policy debates, leading to enhanced actions that will result in a resumption, and hopefully an acceleration, of declines in child mortality.
Acknowledgements

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Key Terms and Acronyms

Child mortality: the probability of dying between the first and fifth birthday
Infant mortality: the probability of dying before the first birthday
Neonatal mortality: the probability of dying in the first month of life
Perinatal mortality: the probability of dying between 28 weeks of gestation and the first week of life
Post-neonatal mortality: the difference between infant and neonatal mortality
Under-five mortality: the probability of dying before the fifth birthday

ADB Asian Development Bank
ANM Assistant nurse midwife
ARI Acute respiratory infection
CDC Centers for Disease Control and Prevention
CDD Control of diarrheal diseases
CI Confidence interval
CMR Child mortality rate
CSSM Child Survival Safe Motherhood (program)
DHS Demographic and health survey
DPT3 Diphteria, pertussis and tetanus three doses
EPI Expanded Program of Immunization
GOI Government of India
ICDS Integrated Child Development Scheme
ICMR Indian Council of Medical Research
IMCI Integrated Management of Childhood Illness
IMR Infant mortality rate
LBW Low birth weight
MOHFW Ministry of Health and Family Welfare
MICS Multi-Indicator Cluster Survey
NFHS National Family Health Survey
NGO Non-governmental organization
NNMB National Nutrition Monitoring Bureau
NNMR Neonatal mortality rate
ORS Oral rehydration solution
ORT Oral rehydration therapy
PMR Perinatal mortality rate
SD Standard deviation
SRS Sample Registration System
TFR Total fertility rate
USMR Under-five mortality rate
UP Uttar Pradesh
WHO World Health Organization
Summary of key findings and major recommendations

Key findings of this study

- Infant and child mortality in India has declined substantially over the past fifteen to twenty years. According to Sample Registration System data, infant mortality declined by 35 percent during the past fifteen years. According to the National Family Health Survey, under-five mortality declined by about 25 percent between 1978-83 and 1988-93. India's decline in infant mortality has been slightly more rapid than the average in other low-income countries.

- This record of continued success in reducing infant and child mortality appears to be in jeopardy. Periods of two to three years of stagnation in the decline in the infant mortality rate have in the past been preceded and followed by years of very rapid declines. The current period of slow decline has lasted four years, however, and indicates a true period of stagnation in the rate of decline as the infant mortality rate has dropped by only 3 per 1,000. As a result, the infant mortality rate is increasingly departing from the longer-term trend. This will make it difficult to achieve the national child mortality goals by 2000.

- Non-income factors have played a significant role in lowering IMR and U5M in recent years, and available data suggest that maternal and child health interventions have contributed to a reduction in child mortality rates in India. Program data are insufficient to directly attribute mortality decline to program efforts, however.

- The decline in child mortality in urban areas has been slower than in rural areas. As a result, urban-rural mortality differentials have become smaller. The difference between urban and rural areas in under-five mortality rates has been reduced from 65 to 45 per 1,000 births between the 1978-83 and 1988-93 periods.

- Under-five mortality has declined because of declines in the neonatal, post-neonatal, and child mortality rates. Proportionately, post-neonatal mortality has declined more than neonatal mortality, increasing the relative importance of perinatal and neonatal mortality. Effective interventions could result in a rapid reduction in the perinatal and neonatal mortality rates and therefore in the overall IMR and U5M.

- Social, cultural, and health conditions related to the low status of women in India have a negative impact on child survival. Improving female education and nutrition, and increasing the use of health services during pregnancy and delivery would further lower child mortality.

- Girls experience a higher level of child morbidity and mortality than do boys from the age of one month to five years, and they receive less health care. Eliminating gender differences in mortality rates would significantly reduce infant and child mortality overall.

- Malnutrition among Indian children is very prevalent and is an underlying and contributing factor to mortality from many causes.

- Future child health policies and strategies should build on the lessons learned from child health programs in India, sustain the achievements that have already been made, enhance quality and efficiency, and address specific gaps in neonatal care and referral services.
Major recommendations

- The slowing down in India’s child mortality reduction rate calls for new approaches to the problem of child mortality. First, an updated strategic framework for childhood illness, health, and development is needed. The government of India needs to reassess the country’s current child mortality reduction goals and go forward with enhanced integrated approaches for child health and nutrition. Existing child health programs and strategies, including initiatives for the eradication and elimination of vaccine-preventable childhood diseases, and specific health and nutrition interventions need to be examined in the context of a broader child health framework that goes beyond disease-, program-, and sector-specific approaches.

- Second, central to more effective and efficient strategies for child survival, health, and development, is a better understanding of the maternal and child health and nutrition cycle and its main determinants. The “maternal and child health and nutrition cycle” approach recognizes that:
  \[\Rightarrow\] maternal health and nutrition outcomes are key determinants to birth outcomes;
  \[\Rightarrow\] birth outcomes are key determinants for child mortality, health, and development outcomes;
  \[\Rightarrow\] (early) childhood health, nutrition and development outcomes are key determinants for adolescent health, nutrition, and development;
  \[\Rightarrow\] adolescent health influences maternal mortality, health, and nutrition outcomes; and,
  \[\Rightarrow\] the cycle continues.

Socioeconomic, environmental, behavioral, health, and nutrition factors influence this cycle. The challenges for the child health and development community in the next decade will be to jointly address the most important determinants and gaps with affordable, cost-effective, feasible, and culturally appropriate interventions that take into account both demand and supply factors, and to involve local communities in the identification of needs and priorities.

- Third, considering the differences in infant and child mortality performance between states, stratified child health policies are needed that take into account state-specific epidemiological and demographic patterns and key determinants. Policy options are provided (Section 3) for states with remaining high U5M/IMR levels and slow rates of decline, for states that have reached lower levels of U5M/IMR but are experiencing a slowdown in U5M/IMR reduction, and for states with large proportion of urban poor. A summary of some of the gaps and barriers identified in this study, and suggested policy options to address them are also provided. While neither comprehensive nor state specific, the matrix summarizing gaps and policy options (Box 3.1, Section 3) is meant to serve as an input to further discussions, and to facilitate design and planning for child mortality reduction at the state level.
Introduction

In 1999, about 10 million children under the age of five will die throughout the world. Of these, 2.1 million deaths will occur in India alone, the highest total of any one country. In India, one out of every four deaths is a child under age five; a high proportion of these children could have been saved with basic health interventions such as immunizations and oral rehydration solution (ORS). Improving child survival remains a major development task in India.

India’s goals for the year 2000 include reducing the national mortality rate for children under age five to less than 100 per 1,000 live births, the infant mortality rate to less than 60 per 1,000 live births, and the perinatal mortality rate to less than 85 per 1,000 births. During the second half of the 1980s and early part of the 1990s, significant progress was made toward these goals. At that time, the national targets appeared to be within reach, despite large disparities among India's states in terms of mortality levels, rates of decline, and child health determinants.

In recent years, however, data indicate that the decline of key child mortality measures is slowing down, making it unlikely that India will achieve its child survival goals by the year 2000. This study was undertaken to inform the current debate on child mortality trends and to suggest possible contributing factors that might make a difference in child health policy formulation over the next decade.

Objectives

This study is written primarily for national- and state-level health policy makers in India. It seeks to answer the following three questions:

- Is the apparent stagnation in India’s child mortality rate real or simply due to irregularities in the data? (Section 1)
- If the stagnation is taking place, what factors are behind it? (Section 2)
- What are the policy options that will help sustain progress, address remaining gaps, and maximize the impact on child survival in India? (Section 3)

The first section examines demographic information to establish trends in child mortality rates. The second section reviews the literature and program reports to better explain the factors at work behind the trends and examine the key determinants that influence child health and survival. The third section puts forth conclusions and provides a matrix of policy options to sustain achievements, accelerate efforts, and ensure continuing declines in child mortality.

A significant body of literature and demographic data already exists on India’s child health and survival trends, performance studies, nutrition analysis, and child health program reviews and surveys. This study synthesizes and analyzes this existing body of information to reach its conclusions and recommendations. The major articles and reports used in this study are listed in Section 5.
1. Has the Decline in Child Mortality in India Slowed Down?

1.1 Overview

This section seeks to establish whether recent speculation about a slowing down in the decline of India’s infant and child mortality rates is in fact supported by the available data. To find the answer, short- and long-term national trends in infant and child mortality are analyzed. Data for some individual Indian states are provided, but not analyzed in detail.

This analysis is based mainly on two sets of data from India: The National Family Health Survey (NFHS) conducted in 1992-93 and annual data from the Sample Registration System (SRS). Each of these datasets has strengths and weaknesses. The NFHS is a DHS-type survey conducted at the national and state level. It uses a questionnaire designed to produce internationally comparable indicators. The SRS collects data through continuous registration as well as by using surveys. Appendix 1 contains further information on these two sampling systems.

1.2 Long-term trends: A steady drop

Figure 1.1 shows the decline in India’s annual infant mortality rates for the period from 1981 to 1997, the last year for which SRS data have been published. This trend line is compared with the estimated trend for other low-income countries (excluding China) for the same period, and indicates that the decline in infant mortality in India has been slightly more rapid than the average decline in other low-income countries.

![Figure 1.1 Trends in IMR, 1981-1997](image)
Figure 1.2 shows the decline in several child mortality indicators for India based on NFHS data, presented as average rates for five-year periods from 1978 through 1993. Each indicator shows substantial declines over the fifteen-year period.

It is difficult to compare India to individual countries at similar levels of economic development, since other low-income countries do not have a vital registration system as complete and reliable as the SRS in India. Figure 1.3 compares the under-five mortality rates in India and seven other countries that conduct demographic and health surveys, indicating that India's rate of decline has been about average in that group.

The data presented in these figures confirm the fact that India's infant and child mortality rates have declined substantially over the past fifteen to twenty years. According to the SRS data, infant mortality declined by 35 percent during the past fifteen years. According to the NFHS, under-five mortality declined by about 25 percent between the periods from 1978-83 and 1988-93. The decline in infant mortality has been slightly more rapid than that in other low-income countries.
1.3 Recent trends: A period of stagnation

The long-term trends described in Section 1.2 provide the standard against which India’s recent declines in child mortality can be compared. The following analysis of trends in recent years relies on SRS data through 1997, since the mortality data from the NFHS survey end with the 1988-93 period and thus cannot shed light on more recent developments.

The 16-year SRS series, which covers 1981-1997, reveals a pattern in which large year-to-year declines in the IMR are followed by two or three years of smaller-than-average yearly declines, as summarized in Box 1.1. Thus, the annual data (as shown in Table 4.1) do not offer a good basis for conclusions about trends.

**Box 1.1 Trends in IMR Decline**

<table>
<thead>
<tr>
<th>Year</th>
<th>IMR Decline</th>
<th>Decline in subsequent year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981-82</td>
<td>5 (per 1,000 births)</td>
<td>0 (per 1,000 births)</td>
</tr>
<tr>
<td>1984-85</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>1989-90</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>1992-93</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

*Source: SRS data, see Table 4.1*

One way to deal with fluctuations in annual data is to use moving averages, but this method smooths out real fluctuations and is somewhat crude. Another way to evaluate whether a large change is significant (or whether no change indicates stagnation) is to consider the annual estimates and their confidence intervals over a period of a few years. Figure 1.4 shows the annual estimates from 1990 onwards, with 95 percent confidence intervals, and the decline that would have occurred if the trend, based on the average annual decline for the period 1980-1990, had continued.
As shown in Figure 1.4, the rate of decline in India’s IMR slowed during 1990-92, but then recovered to the long-term trend estimate by 1993. Since 1994, however, the infant mortality rate has increasingly departed from the long-term trend. Given the sampling errors associated with the data, the decline from 1993 to 1997 should be viewed as a drop from the 72-76 range to the 69-73 range. The most optimistic interpretation of these numbers would mean a decline of 7 per 1,000 during this four-year period, well below the longer-term average annual decline. In the most pessimistic interpretation, however, a small increase in the infant mortality rate during this period cannot be ruled out.

The long-term data clearly indicate that periods of two to three years of stagnation in the decline in the infant mortality rate have been preceded and followed by years of very rapid declines. The most recent data, however, departs from this pattern. The current period of slow decline has lasted four years, and seems to indicate a period of true stagnation. One can therefore conclude that the rate of decline in the IMR is indeed slowing down. This finding will make it difficult for India to achieve its national child mortality goals by the year 2000.

1.4 Other findings

Figure 1.5 (based on the SRS data in Table 4.1) compares infant mortality rate trends for urban and rural areas of India. Table 4.2, based on NFHS data, also shows long term trends in these infant and child mortality rates for urban and rural areas. According to both sets of data, the decline in child mortality in urban areas has been slower than in rural areas. As a result, urban-rural mortality differentials have become smaller. According to NFHS data, the difference in under-five mortality rates between urban and rural areas became smaller between the late 1970s/early 1980s and the late 1980s/early 1990s, with the gap narrowing from approximately 65 to 45 deaths per 1000 births.
The decline in urban areas has been slower both in terms of absolute deaths per 1,000 and in percentage terms. While mortality decline would be expected to slow down at low levels, urban mortality rates for India are still quite high. The urban trend in some of the states with the lowest mortality is evidence that mortality declines can continue to be strong even at these relatively low levels.

The rate of decline in India's infant and child mortality shows a great deal of variation among major states. Tables 4.1 and 4.2 also contain data for individual states included in the SRS and NFHS datasets. Large differences exist among states, with under-five mortality falling rapidly in Kerala, Karnataka, and Tamil Nadu and very slowly in Rajasthan, Gujarat, and Assam. Table 4.3 ranks the SRS data from states with the largest to the smallest overall IMR decline between 1981 and 1997. Improvements in data collection methods probably did not occur evenly among the states, however, so small differences in the percentage change among states may not be meaningful. It is beyond the scope of this paper to look in detail at trends in individual states.

Table 4.4 breaks infant mortality into its neonatal and post-neonatal mortality components, indicating that post-neonatal mortality has declined more than neonatal mortality. According to SRS data, neonatal mortality declined by 33 percent from 1972 to 1995, whereas post-neonatal mortality declined by 62 percent during the same period. The NFHS data show a similar pattern. While child mortality rates could certainly decline more by further reductions in post-neonatal mortality, neonatal mortality will become an increasing proportion of child mortality. To achieve future declines in U5MR, neonatal mortality needs greater attention.
2. Why is the Decline in Child Mortality Slowing Down?

2.1. Overview

Section 1 of this study concludes that the decline in India’s child mortality rates is indeed leveling off. This section explores the possible reasons for this trend. In doing so, it reviews the literature on determinants of child mortality, including information from the government of India on maternal and child health programs and the recent NFHS report on infant and child mortality (Pandey et al., 1998). Some important determinants of child health lie beyond the scope of this literature review, however, including educational, social, and environmental factors such as access to water and sanitation.

The absence of routine data collection and systematic analysis of the determinants of child health poses a challenge for attributing trends in child mortality to program inputs. Another challenge is the extent to which it is possible to generalize from selected studies to India as a whole. Most of the available data are from four states: Uttar Pradesh, Madhya Pradesh, Kerala, and Tamil Nadu. Routine data at the district and sub-district level, and from sub-populations, are lacking except in special studies, often conducted by NGOs. The interpretation of reported program indicators, surveys, and reviews are affected by the reliability of data, comparability between different data sources, and representativeness of samples.

2.2 Determinants of child mortality in India

Child mortality trends, differentials, and determinants are important statistics for national and state health policy makers in India and have been the subject of many reviews, studies, and consultations. These studies include Zachariah and Patel (1982); Philip (1985); Puffer (1985); Sandell et al. (1985); Visaria (1985); Tilak (1991); Anilkumar and Asharaf (1993); Khan (1993); Goyal (1994); and Measham et al. (1999).

The report Infant Mortality in India: Differentials and Determinants (Jain and Visaria, 1988) sought to explain the pace of IMR decline from 1968 to 1978 and developed a framework for analysis of factors contributing to the observed decline in IMR. These included proximate factors (such as non-medical factors and medical care during the prenatal period, care at birth, 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 IMR. Jain and Visaria concluded that, although data was lacking to adequately assess the relative importance of various determinants, a substantial decline in IMR is possible without significant improvement in economic development. They made a case for a minimum package of essential services: reproductive health services, perinatal care, improved breastfeeding practices, immunization, home-based treatment of diarrhea, and timely introduction of supplementary foods. Consistent with many other studies and recommendations, they predicted that increased access to such a package of essential maternal and child health services would significantly reduce high infant mortality rates. Several other reports laid out intervention strategies and directions based on similar analysis and assumptions including Ghai (1985); Kumar and Datta (1985); Pratindhi
et al. (1987); and Bhargava (1991). IMR studies at the district level have yielded similar findings regarding the importance of access to essential health services (Sandell et al., 1985).

The report *Mortality Change in India Since Independence* (Anilkumar and Asharaf, 1993) noted that the observed change in India’s IMR in the 1980s was heavily influenced by its fast decline in a few states that began with higher IMR than others and contained a large share of the overall population. These states are Bihar, Madhya Pradesh, Orissa, Rajastan, and Uttar Pradesh. The authors concluded that further reduction of IMR in these five states would largely determine the decline at the national level.

2.3 *Income as a determinant of child mortality*

IMR often serves as a key development indicator, reflecting the combined effects of economic development, health interventions, technological change, and the sociocultural environment. Several studies have attempted to break out the impact of these various determinants on IMR. Studies of IMR and child mortality trends in Kerala done by Zachariah and Patel (1982) and Philip (1985) show that socioeconomic factors explain only a small percentage of IMR differentials at the household level. The role of other socioeconomic determinants of child mortality, such as availability of flush or pit toilets, clean cooking utensils, fuel, and ownership of household goods, are reported on in the NFHS report *Infant and Child Mortality in India* (Pandey et al., 1998), but not reviewed in more detail here.

A recent World Bank report on *Performance of Indian States in Reducing Infant Mortality and Fertility from 1975 – 1990* (Measham et al., 1999) supports the previously documented inverse relationship between per capita income and IMR. Increases in income have reduced IMR, although the income effect is stronger on total fertility rates (TFRs).

Non-income factors play an even more significant role than income in lowering the IMR. The effect of technological progress (including access to preventive and curative health services) on lowering IMR was found to have been the strongest between 1985 and 1990. Technological change caused IMR to decline 20 percent between 1975 and 1990. However, public health expenditures did not have a significant influence on lowering the IMR. They noted that although the poorest states performed worst in terms of IMR and TFR, the richest states did not perform best. The best state performers in the country had relatively low per capita income levels, but achieved relatively good results for those levels. The percent difference between the expected IMR for a given level of income and time period and the actual IMR gives the “relative performance rate.” According to these estimates, Kerala, Tamil Nadu, and Karnataka are the best performers in the country and, significantly, Kerala and Karnataka are also among the poorest in economic terms. The worst performers are the poorest states: Uttar Pradesh and Orissa. However, Andra Pradesh, Punjab, Bihar, and Gujarat have higher-than-expected IMRs for their income levels. Notably, some of the weak performers are the relatively rich states of Haryana, Gujarat, and Maharashtra.
As shown in Box 2.1, Indian states vary significantly in their rates of IMR decline, IMR relative performance, and U5M levels. For example:

- As expected, states that have the lowest rates of decline in IMR are poor performers and their U5M rates remain high (Assam, Gujarat, and Rajasthan).
- States that have shown the highest rate of decline in IMR are at the lower levels of U5M rates, and their performance ranges from the best (Kerala) to good (Karnataka and Tamil Nadu).
- Some states remain at very high U5M levels, although their rates of IMR decline have been quite high (Bihar and Orissa). Orissa shows the poorest performance and can do much better for its level of income.
- Haryana has a high rate of decline in IMR and its U5M is in the lower range. Haryana's relative performance is poor, however, and it can do much better for its level of income.

To fully explain the profile for each state, additional information on program inputs and recent trends is needed. Several countries in demographic and epidemiological transition are finding it difficult to prevent or reverse a slowdown in U5M/IMR decline. One possible reason why IMR declines are slowing down in some states in India and in some other countries is that current child survival interventions are more effective at reducing high under-five mortality levels (with a relatively large proportion of post-neonatal mortality) than in achieving a significant declines in places that have already achieved relatively lower levels. Another possible reason in some places is a decline or leveling off in actual coverage rates of preventive and curative child health services. To continue to be effective, new approaches and interventions are needed to specifically influence the neonatal phase or address gaps such as nutrition and reproductive health interventions, in addition to sustaining and improving the efficacy of existing child health programs.
2.4 Child health programs and child mortality reduction

A full understanding of child survival trends in India is hampered by the lack of useful program data for routine monitoring or intermittent evaluation purposes. Only a few indicators related to implementation of child health programs are readily available to assess state progress over time: immunization rates, institutional deliveries, acute respiratory infection (ARI) prevalence rates and mothers’ knowledge about ARI symptoms, oral rehydration solution (ORS) rates, and care-seeking indicators.

Most of these indicators have limited value in assessing outcomes and outputs, and are not proximate determinants for child and infant mortality. While some of these indicators measure program inputs over time, those inputs need to be linked to outputs and outcomes to better evaluate progress. Although immunization programs have received much attention, immunization coverage rates by state for at least two points in time are not readily available. Furthermore, immunization rates may be overstated. For example, the reported DPT3 rate for India as a whole has hovered around 90 percent throughout the 1990s (WHO, 1999) but the 1992-93 NFHS measured DPT3 coverage at only 52 percent. Similarly, the percentage of children vaccinated against measles was measured by the NFHS at only 42 percent—less than half the previously reported figure. Improving the quality of the data is essential to assessing the contribution of child health program activities and specific services to the reduction of child mortality.

Standard indicators that reflect quality of care and service utilization (such as use of oral rehydration therapy) can serve as proxies for child mortality and enable a comparison between states and countries, but such indicators were not available for trend analysis. The upcoming NFHS (1998-99) survey report will make it possible to compare current rates with the NFHS 1992-93 rates. The recent Multi-Indicator Cluster Survey (MICS) gives a good cross-sectional overview of the current status of child health and nutrition, but is less useful for trend analysis.

Tables 4.4 – 4.6 summarize available data on selected child health program indicators from different data sources. Table 4.5 groups the data in Table 4.4 by clusters of states with similar U5MR levels, and indicates a positive relationship between coverage of key child health interventions (such as ORT, ARI, and immunization rates) and the reduction in under-five mortality. When the 1998-99 NFHS data become available, this relationship can be further analyzed and validated. Table 4.6 suggests that similar relationships exist between immunization and feeding rates and U5M rates, although it is based on less conclusive MICS data and does not include states with U5MR of less than 50.

In short, the available data show that non-income factors have played a significant role in lowering IMR and U5M in recent years. Data from the NHFS suggest that maternal and child health program interventions have contributed to a reduction in child mortality rates in India. Program data are insufficient to directly attribute program efforts to mortality decline, however.

2.5 Urban/rural differentials

As described in Section 1.4, the recent IMR decline in urban areas has been slower than in rural areas, resulting in a narrowing of the urban/rural gap. Most studies of infant deaths have been conducted in rural areas. However, reports by the Integrated Child Development Scheme (ICDS) document the problems of urban slums and recommend multidisciplinary action: family planning education, adequate antenatal care services including tetanus immunization, training of front-line
health workers, recognition of high risk pregnancies, and neonatal services (Singhal et al., 1986). The recommended health interventions for the urban poor are similar to those for the rural poor, although implementation strategies might differ in order to effectively reach the urban poor. A recent study documents the inability of many urban poor to discriminate among the various sources of health care available to them, as well as their preference for local private practitioners (many of whom may be unqualified), and frequent discontinuation of treatment and changing of practitioners (de Soyza et al., 1998). The study recommends a more concerted effort to improve primary health care services in the private sector and develop more practical approaches for the standard management of childhood illnesses, emphasizing the management of young infants with low weight.

Many other studies have focused on differences in urban/rural determinants in infant and child mortality including Gupta (1981); Reddiah et al. (1988); Singhal et al. (1990); Reddaiah and Kapoor (1992); Biswas et al. (1993); Khalique et al. (1993); and Pandey et al. (1998). A study by Bhardwaj and Hasan (1993) identified the main factors in perinatal and neonatal mortality in rural India as poor utilization and low demand for health services, illiteracy, low rates of tetanus toxoid immunization, and poor hygiene. The authors concluded that most deaths were preventable and that only 10 percent of the deaths were unavoidable at the rural level. The recent NFHS report on Infant and Child Mortality in India (Pandey et al, 1998) found that most of the large urban/rural differences in infant and child mortality rates (unadjusted child mortality is nearly twice as high in rural as in urban areas) disappear when controlling for the effects of other variables. The findings suggest that most urban/rural differences in infant and child mortality are due to factors related to residence rather than to residence itself. Women who live in urban areas are more likely to be literate, use clean cooking fuel, and have access to better sanitation, for example. These characteristics tend to be correlated with each other and related to residence. Urban vs. rural residence seemed to have a greater effect on infant and child mortality (after adjusting for other factors) in states where mortality levels were high.

2.6 Perinatal and neonatal mortality determinants

Concerted global and national efforts have been made to improve child mortality, especially in the postneonatal phase, through implementation of readily available, affordable, cost-effective, and feasible child health interventions such as oral rehydration therapy and immunization. Less attention has been given to defining, prioritizing, and influencing the multiple determinants to perinatal and neonatal mortality. As shown in Table 4.7, for the period 1972 – 1995, neonatal mortality has gradually increased as a percentage of total child mortality due to a faster decline in the post-neonatal mortality rate. The SRS and NFHS data presented in Section 1 show a similar pattern. As expected, the decline in perinatal mortality rates (PMR) also lags behind the overall decline in child mortality.

Much of the child mortality literature has documented problems in the perinatal and neonatal phases, including Bhatia et al. (1984A and B); Gupta and Gupta (1985); Agarwal and Agarwal (1987); Chakraborty (1987); Tandon et al. (1987); Bhave (1989); Puffer et al. (1985); Singhal et al. (1990); Bhargava et al. (1991); Sachdev et al. (1991); Suguna Bai et al. (1991); Chavan et al. (1992); and Soudarssanane et al. (1992). Despite this large body of literature, little progress has been made toward implementing large-scale solutions to perinatal and neonatal phase problems. The relative importance of perinatal/neonatal determinants of child survival is increasing and must be addressed to achieve significant further declines in child mortality. Effective interventions are available and their implementation could result in a rapid reduction of the PMR and NMR.

The Indian Council of Medical Research (ICMR) issued a report in 1989 that supported this conclusion and identified gaps that need to be addressed (ICMR, 1989). In 1971 the perinatal mortality
The rate for rural areas was 57/1000; 14 years later, the rural PMR had only declined to 52/1000 (SRS data). In 1971, the urban PMR was 36/1000, and in 1985 the rate was still 30/1000. The report presented an approach based on identifying risk factors with a direct relationship to the outcome of perinatal deaths: illiteracy, birth interval of less than 24 months, previous stillbirth(s), previous pre-term birth(s), untrained birth attendant, and low birth weight (LBW). From 1988-1990, the ICMR conducted a national collaborative study in three rural and three urban slumn communities, involving approximately 30,000 participants in thirty-one sub-populations. The baseline survey to identify families and women at risk revealed higher PMR rates than the SRS data had shown, with a rural PMR of 62/1000 and an urban PMR of 52/1000 (ICMR, 1990).

Several studies have shown that addressing the risk factors identified by the ICMR can result in rapid reduction in PMR. A six-year effectiveness study in Bihar (Gupta and Gupta, 1985) showed a reduction in PMR from 79/1000 in 1978 to 58/1000 in 1983. The Bihar study took place in a controlled environment, using health education to promote better utilization of antenatal care services and other services offered by the Mines Hospital in the Indian Copper Complex. This is one of many studies that have yielded good results for program inputs in controlled contexts.

Neonatal health has recently been taken up as priority agenda by the WHO South East Asian Regional Office (SEARO), and an expert group reported in 1998 on the status of newborn health in India and neighboring countries and identified priorities for newborn care delivery, training, research and advocacy (Paul and Deorari, 1999). Priorities and strategies for the expansion of essential newborn care at district and sub-district levels are outlined by the All India Institute of Medical Sciences (Paul, 1999).

2.7 Maternal determinants

As noted above, perinatal mortality studies point to the link between the health of the mother and the birth outcome. The high PMR in India reflects the poor status of women, including poor nutritional status (malnutrition and anemia), low rates of literacy, lack of autonomy, and early age of marriage and childbirth. In addition, low rates of antenatal care, low utilization of obstetric and other health services, and large numbers of deliveries attended by untrained personnel result in poor maternal health and poor birth outcomes such as low birth weight and prematurity (World Bank, 1996). Toxemia and infection are other important contributing factors to the high rate of prematurity, perinatal mortality, and growth retardation (Raman, 1980). The effects of maternal characteristics are not limited to the perinatal period. As Table 4.8 shows, mortality from ages one to four also differs significantly by maternal background characteristics.

The educational level of mothers tends to have a strong effect on the mortality of young children, as discussed in the NFHS report by Pandey et al. (1998). Educated mothers usually are healthier themselves, give birth to healthier babies, provide a healthier environment, and are more likely to have information about care options and actively seek care. In this study, a mother's literacy level emerges as an important factor in the child's first five years, especially after the first month. Children of illiterate mothers in India have rates of infant mortality 40 percent higher than rates for children of literate mothers, for example.

Contrary to expectations, however, another recent NFHS report (Kishor and Parasuraman, 1998) identified an association between mothers' employment outside the home and an elevated risk of infant and child mortality. Mothers' employment influenced infant mortality in urban areas, with a