

Inequalities in Child Survival

**Looking at wealth and other
socio-economic disparities in
developing countries**



Save the Children

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Executive summary

Understanding child survival in developing countries requires looking at the inequalities in children's mortality, and analysing the factors that contribute to these disparities. Countries with higher rates of under-5 mortality tend to have less inequality in child mortality between the richest and poorest households. In contrast, in countries with lower levels of under-five mortality, child deaths are more concentrated in the bottom wealth group. The share of child deaths accounted for by neonatal mortality also tends to be higher in countries with lower rates of child mortality. The data also shows that progress towards Millennium Development Goal (MDG) 4 in many on-track countries has been accompanied by rising inequality in mortality rates. This suggests that progress has often been achieved through interventions that first reached better-off households.

The analysis in the paper illustrates that the child survival picture – in terms of rate and inequality – varies in the developing world, highlighting the importance of differentiated child survival strategies between middle- and low-income countries. In many countries, reductions in child mortality among poorer households have been smaller than for the higher income groups. Once child mortality is concentrated among lower income groups – as is the case in many middle-income countries – major efforts to reduce child mortality should be equalising, but these require a focus on systematic interventions rather than 'quick win' strategies. On the other hand, under-five mortality in low-income countries is usually high not only among the poorest quintile, but in the bottom 40–60% of the population, suggesting the need for more comprehensive strategies to reduce under-five mortality across a broader spectrum of the population.

Neonatal mortality tends to fall more slowly than under-five mortality, since reducing it needs longer-term and relatively more expensive interventions associated with functioning health systems. This indicates that while there are quick wins that can help improve child survival, middle-income countries (and low-income ones that have relatively low child mortality rates) need to focus more on reducing neonatal deaths. This strategy is more important in some geographic regions than others. For example, in south Asia roughly half of child deaths occur in the first four weeks, whereas in sub-Saharan Africa neonatal deaths account for about a quarter of the total.

The case studies of India and Bangladesh illustrate that economic growth is not a sufficient precondition to reduce child mortality. A low-income country like Bangladesh, by providing wide coverage of the relevant health interventions, improved child survival significantly. While wealth is an important dimension of inequalities in under-five deaths, unequal child survival outcomes are present across other socio-economic factors, including gender, caste and religion. Reducing unequal child survival outcomes requires addressing socio-economic factors that become a source of inequality and paying special attention to groups that have traditionally been excluded. The case of India illustrates how, in a big and diverse country, national averages hardly begin to tell the story of child survival. It serves to reinforce the need for differentiated policies across states, with a focus on the poorest and disadvantaged groups, in order to reduce under-five mortality more equitably.

While most countries that experienced significant improvements in child survival saw a rise in inequality in mortality, a few have made progress without increasing inequality in child survival. Egypt is an example of a country which is on-track to meet MDG 4 and has also seen a fall in inequality in child mortality. 'Outliers' can offer important lessons to countries making efforts to improve child survival.

Introduction

Child survival has improved globally since the introduction of the Millennium Development Goals in 2000. One estimate states that the under-five mortality rate worldwide declined by 30% between 1990 and 2007 with children's survival chances increasing in 95% of countries (Overseas Development Institute, 2010). Reductions in under-five mortality, however, are usually monitored by national averages, which do not show how progress varies across different groups within countries. In many countries, disparities in under-five mortality rates between poor and rich households are huge and progress is often faster in the latter group. Large inequalities in child survival related to geographic location, gender and other social characteristics also exist.

This paper aims to understand the inequalities in child survival in the developing world. It looks at the disparities in under-five mortality in 65 low- and middle-income countries covering the period of 1990 to 2008 using data from the Demographic and Household Surveys (DHS). Measuring inequality in child mortality through the concentration index, the paper analyses the relationship between the rate and inequality in under-five mortality in developing countries. To complement the analysis, the paper presents case studies of child survival outcomes in Bangladesh and India. The case studies examine inequalities in under-five mortality and what drives these disparities in the two countries. Many studies have established the determinants that help improve children's survival chances, but it is important to analyse inequalities around these determinants, which in turn contribute to uneven progress in reducing under-five deaths. As efforts to meet Millennium Development Goal 4 (MDG 4) intensify, it is essential to monitor countries' progress beyond national averages and examine progress in different household groups. Understanding inequalities in child survival and its wider determinants has important policy implications towards meeting MDG 4.

The paper is organised as follows:

- **Section 1 looks at child survival outcomes in developing countries**
- **Section 2 presents the India case study**
- **Section 3 presents the Bangladesh case study**
- **The last section concludes the study.**

1. Patterns of inequality in child survival in developing countries

1.1 Inequalities in child survival outcomes

Under-five mortality rates are often reported as national averages, which mask progress (or lack of progress) among different household groups within countries. Looking at child mortality rates disaggregated by household wealth, geographic location, gender and other socio-economic characteristics reveals huge disparities in child survival in developing countries.

There are several ways of looking at these inequalities. Looking at the absolute inequality between rich and poor households entails measuring the difference in the under-five mortality rates between these groups. One can also measure relative inequality in under-five mortality, which is the ratio of under-five mortality between the top and bottom wealth groups. This gives an indication of how many more times poor children are likely to die than rich children. Another way of looking at inequality is by analysing how much under-five deaths are concentrated in the lower wealth quintiles, which can be done by computing a concentration index. A concentration index with a higher negative value indicates that deaths in children below five are concentrated in the poorer households.¹

In a previous paper, Wang (2003) constructed concentration indices to look at the relationship between the rate and inequality in infant and under-five deaths for 60 developing countries using DHS data collected between 1986 and 1999.² The indices show that “in general countries with high mortality rates tend to have low levels of inequality in mortality and vice versa”. Wang (2003) argues that this relationship suggests that if efforts to improve child survival were successful in the decade he examined, then interventions reached better-off households first.

This paper calculates concentration indices to re-visit the relationship between the rate and inequality in under-five mortality. The indices are computed with data from DHS collected between 1990 and 2008 for 65 developing countries. Households are divided into five quintiles using an asset index and DHS allows for under-five mortality rates to be disaggregated according to wealth quintile. There are 131 data points with most countries having at least two survey periods. After computing and testing for significance, most of the concentration indices and changes in the concentration indices over time were found to be significant at the 5% level (see Appendix).

The indices (Chart 1.1) show that countries with higher under-five mortality rates tend to have low levels of inequality in mortality. In contrast, under-five deaths are more unequal in countries with lower levels of under-five mortality. This exercise suggests that the

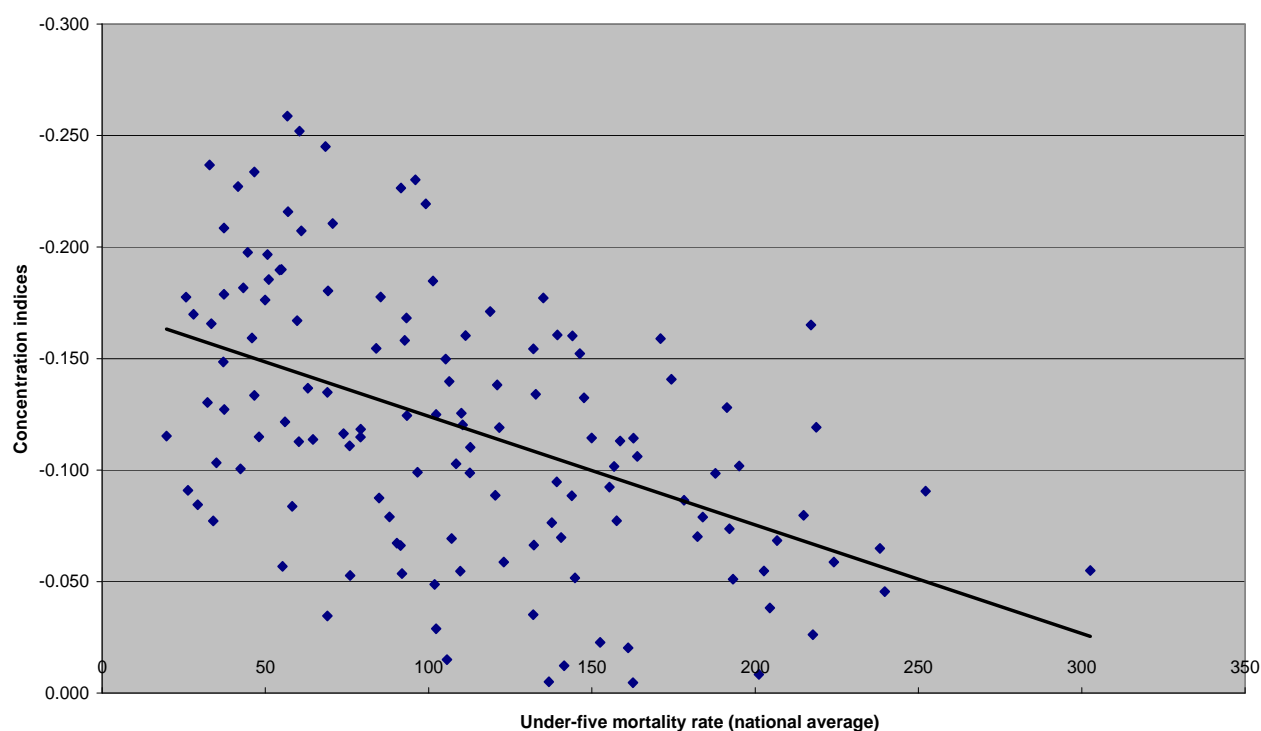
¹Wang (2003) explains that the concentration index – which acts like a Gini coefficient – is defined as two times the area between the concentration curve and the 45-degree line of inequality. The concentration curve is constructed by plotting the proportion of child deaths on the y-axis against the cumulative proportion of children on the x-axis ranked by wealth or income of their household. For more information on calculating concentration indices and testing for significance, see Wagstaff (2000).

²The DHS collects household data on health and other socio-economic characteristics in several countries using the same methodology, which allows for comparison across countries over time. It is sometimes known by other names at the country level (eg, in India it is called the National Family Health Survey).

relationship between the rate and inequality in under-five mortality did not change this decade from the previous one. Assessing the relationship by per capita income, ie, breaking down the sample by low- and middle-income countries, does not change the pattern in under-five mortality rate and inequality in mortality.

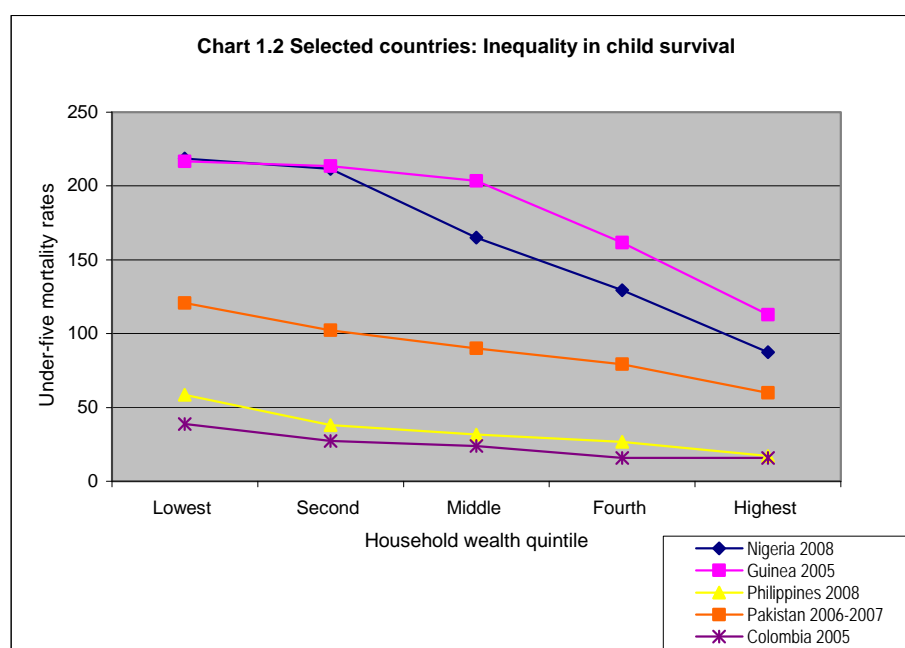
The relationship derived from the concentration indices and under-five mortality rates could be better understood by looking at the changes in under-five death rates over time. One observation from the data is how countries tend to experience an increase in inequality in mortality as measured by the concentration index during times of significant reductions in deaths among children below five years. This is especially clear in countries that have data from three or more DHS rounds and are on track to meet MDG 4.3 Inequality in mortality went up in Bangladesh between 2004 and 2007 when the under-five mortality rate fell by 23%, in Bolivia between 1994 and 1998 when the under-five mortality fell by 25% and in Nepal between 2001 and 2006 when the under-five mortality fell by 27%. This suggests that efforts to reduce under-five mortality in on-track countries may have reached the “low-hanging fruit” first, ie, better-off households or those in easy to reach areas (eg, urban areas). The data also shows, however, that there are cases when under-five mortality rates and concentration indices fall at the same time. Egypt has exhibited falling under-five mortality rates and concentration indices over the 1990s and the 2000s. Progress in the bottom wealth quintile was faster than progress in the top wealth quintile between 1995 and 2000 and between 2005 and 2008.

Chart 1.1 Developing countries: Level and inequality in under-five mortality



³ On track here refers to countries whose rate of progress, as monitored by the Countdown to 2015, Initiative, is expected to meet the MDG 4 target by 2015. Countdown to 2015 monitors progress towards MDG 4 in 68 developing countries, which together account for 97% of under-fives’ deaths in the world.

It is worth noting that the pattern of inequalities in child survival varies among developing countries (Chart 1.2). The differences in under-five mortality rates across household wealth quintiles reveal that countries face different challenges when tackling inequality in mortality. For example, both Nigeria and Guinea are plagued with very high under-five mortality rates across the population but the problem is very evident in the bottom two quintiles for the former and the bottom three quintiles for the latter. In the case of Pakistan, under-five mortality is more proportional to household wealth in the bottom four quintiles, and with the top quintile doing much better than the rest. Under-five mortality rate on average is low in the Philippines and Colombia – both middle income countries – relative to most developing countries. It is evident from the chart, however, that the poorest households in the Philippines and Colombia suffer from much higher under-five deaths than the top four quintiles. These patterns suggest the need for different policies and strategies to tackle inequalities in child mortality among different developing countries.



Source: DHS

1.2 What drives inequalities in child survival?

The direct causes of most child mortality are diseases that are highly preventable and treatable. The most common global causes of under-five deaths (excluding neonatal deaths) are pneumonia, diarrhoea, malaria and measles in descending order (Black et. al, 2010). More than a third of under-five deaths globally can be attributed indirectly to malnutrition according to the Countdown to 2015 Decade Report. Poor maternal nutrition also compromises children’s survival chances. Birth asphyxia and pre-term birth complications are among the leading causes of neonatal deaths (Black et. al, 2010). While these conditions are preventable or treatable, deeper factors are stacked against poor children surviving from these diseases.

The socio-economic conditions poor people face result in their children being more likely to be exposed to diseases, more likely to have lower resistance and less-likely to receive proper medical attention than children from better-off households (Victora et al., 2003). Poor households often lack access to safe water and sanitation, cannot afford nutritious diets, and often have no access to good-quality and affordable healthcare. These deprivations

are both driven by and contribute to widespread poverty and unemployment, low female education, weak health systems and poor governance in developing countries.

Other than socio-economic factors, Macassa and Burstrom (2005), in a study based in Mozambique, posit that behavioural and cultural factors also contribute to inequalities in child mortality. They find a strong statistical relationship between ethnicity and under-five mortality and recommend doing more qualitative studies that look at how parental beliefs and customs influence child health. In an analysis of child survival among ethnic groups in sub-Saharan Africa, Brockerhoff and Hewett (2000) find that child mortality among ethnic groups is strongly linked to economic inequalities. Their results show that child survival chances among ethnic groups increase with the presence of piped water or electricity in the households, higher occupation status of the partner or husband and use of preventive health services. A study of the effect of caste on child mortality in India by Dommaraju et al (2008) indicates that children belonging to lower castes have higher risks of dying than children from upper castes and the risk is heightened in poorer areas. Furthermore, utilisation of delivery and antenatal services are lower among women in lower castes than those from upper castes. These studies show that inequalities in child survival come from multiple deprivations, which interact with economic and socio-economic factors. Disparities based on caste or ethnicity, however, cannot be reduced to socio-economic disparities and require more understanding.

Addressing these inequalities requires a number of approaches. Simple and inexpensive, but highly effective, interventions can reduce poor children's vulnerabilities to diseases. Koenig et al. (2001) find that unvaccinated children from poor households in Bangladesh are over three times more likely to die than vaccinated children from better-off households and that immunisation can reduce this risk to just over 1.5 times higher. Immunisation is affordable and relatively easy to roll-out even in developing countries.

Long-term and structural interventions are of course necessary for sustained reductions in inequalities in under-five deaths. An analysis by Sastry (2004) indicates that improvements in income and infrastructure (ie, water supply and sanitation) reduced socio-economic inequalities in under-five mortality in the state of Sao Paulo in Brazil between 1970 and 1991. Interestingly the study finds that mother's education was the key driver of inequality in under-five mortality during this period. Improvements in income, female education, infrastructure, and healthcare – and having a political and policy environment that enables the poor to benefit from them – require structural interventions that take time for developing countries to roll-out.

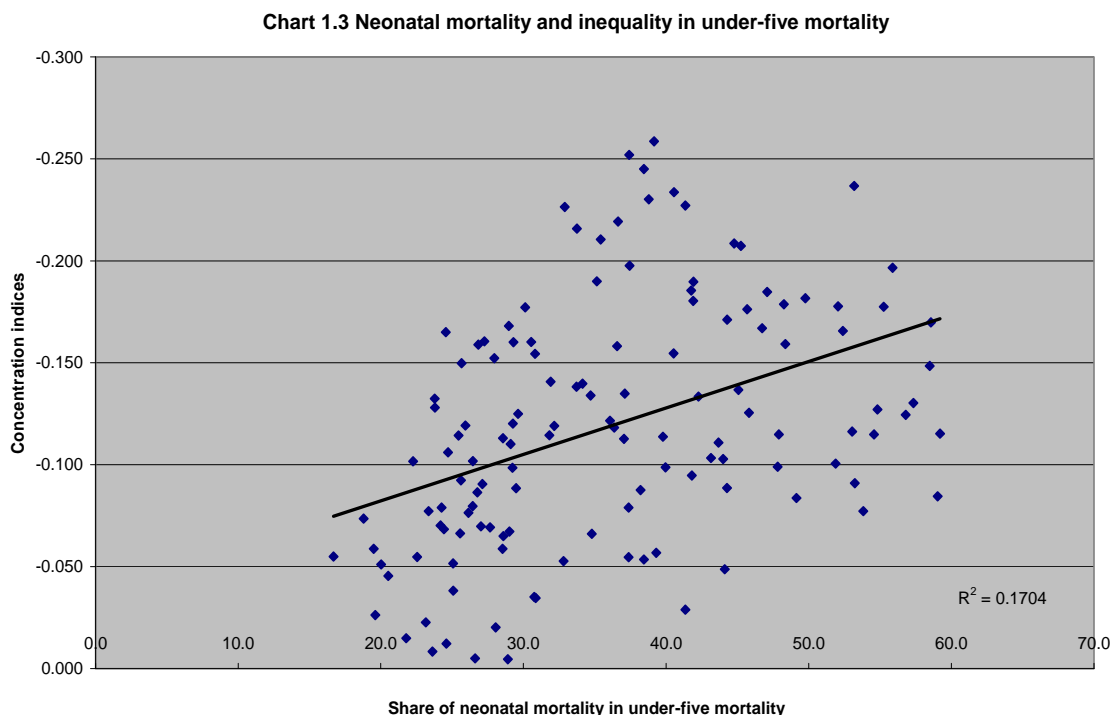
1.3 Neonatal mortality and child survival

Another notable observation from the data (see Appendix) is how the share of neonatal mortality in under-five mortality tends to be higher in those countries that have relatively low under-five mortality. Estimates from DHS data show that the share of neonatal mortality in under-five deaths is 48% in Nepal in 2006, 53% in Bangladesh in 2007 and 45% in the Philippines in 2008.

Within India, the states of Kerala and Tamil Nadu have some of the lowest under-five mortality rates in India, while the proportions of neonatal mortality in children's deaths here are higher than in most other states. Indeed, as Kerala and Tamil Nadu have made headway in child healthcare and institutional delivery, the residual challenge of reducing child mortality is increasingly concentrated in the period from birth to 28 days.

High neonatal burdens are more apparent in some regions than others. For example, the share of neonatal mortality in under-five mortality is about 28% on average in sub-Saharan

Africa, and this goes up to 48% on average in South Asia. Countries that are on track to meet MDG 4 in the sample also have a higher share of neonatal mortality in under-five mortality (39%) compared to off-track countries (29%). Furthermore, the data indicates that the higher the share of neonatal mortality in under-five mortality the more unequal mortality in children below five years tends to be (Chart 1.3).



Neonatal deaths are often driven by the child's circumstances at birth. Access to skilled birth attendants, the mother's nutritional status, the infant's birth weight and the mother's age at birth are some of the factors that influence neonatal mortality. These circumstances in turn are rooted in the deeper causes of mortality, such as poverty and weak health systems. Complications that arise during birth or the neonatal period sometimes require expensive medical care out of reach of poor households. Seeking treatment for neonatal complications also imposes opportunity costs for poor households (eg, missed hours or days of work going to a health facility) especially if health centres are not within easy reach. While innovations such as the home-based neonatal care model in Gadchiroli in India may significantly improve chances in the neonatal period (Woods, 2006), decreasing these deaths requires longer-term strategies. These include increasing institutional births, having more skilled birth attendants, improving neonatal care and, most importantly, strategies to address circumstances at birth that not only reduce child mortality but also bring a greater social dividend, including reducing inequalities in child survival outcomes.

The discussion here reveals some notable trends in the rate and inequality in under-five mortality, but also raises some questions. First, what have countries that are on track to meet MDG 4 done to make a large dent in under-five mortality? Second, why is child survival so unequal in some countries? While common themes run across the child survival narrative, there are contextual factors that are worth examining. Case studies of the experiences of India and Bangladesh in reducing under-five mortality are useful from a policy perspective. While these countries are neighbours, child survival outcomes could not have been more different. Bangladesh is on-track to meet MDG 4 by 2015, while current progress in India is not sufficient to meet this target. The case studies are not meant to be direct comparisons

of the two countries, as there are many differences between them – size and level of economic development are the more obvious ones. The narrative, however, is useful in illustrating what leads to different child survival outcomes in various countries.

2. Inequalities in child survival in India

2.1 Trends in under-5 mortality in India

India has the highest number of under-five child deaths of any country, and a mortality rate that puts it in the top 50 of countries with the highest under-five mortality rates. It needs to reduce under-five mortality to 39 per thousand live births by 2015 to meet MDG 4, but its current rate of progress is insufficient to achieve this target.⁴ The most common direct causes of mortality in children below five years in India are diarrhoea, measles and pneumonia. Malnutrition is the underlying cause of many under-five deaths. Child survival in India varies significantly across states, geographic location and socio-economic factors, reflecting uneven development in the country and inequalities in many aspects of life.

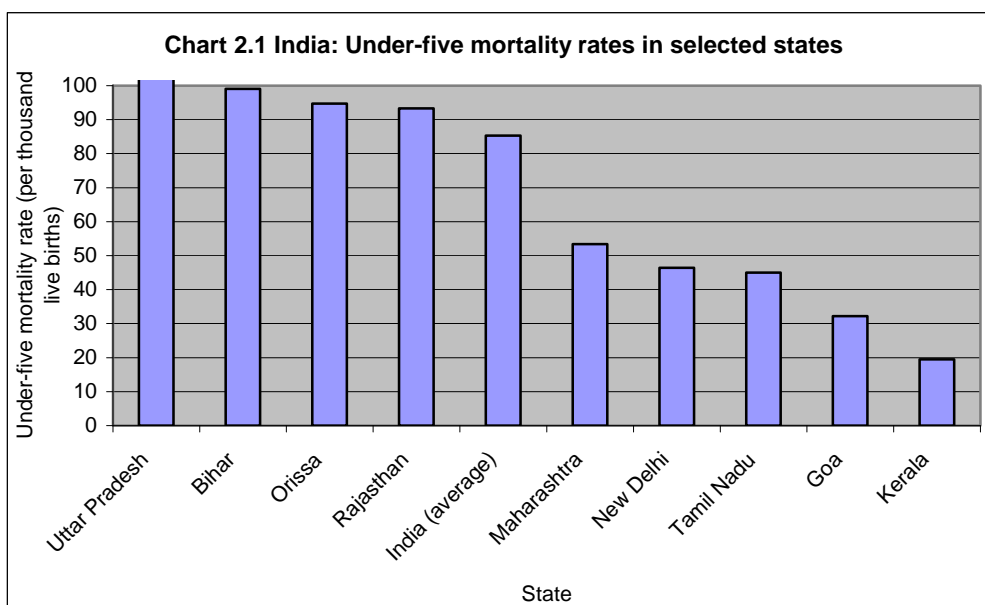
Three rounds of Demographic and Household Surveys (DHS) in 1992–93, 1998–99 and 2005–06 show the trends in the rate and reduction of under-five mortality in India (Table 2.1). Child survival is very uneven across states (Chart 2.1). Figures from the DHS 2005–06 show that Uttar Pradesh has the highest rates of mortality in children under five (111 per thousand live births), while Kerala has the lowest (20 per thousand live births). The under-five death rate in Uttar Pradesh is the same as Madagascar's in 2003, while Kerala is performing better than on-track middle-income countries like the Philippines and Peru. The difference in under-five deaths between the north and south of the country is striking. For example, the under-five mortality rate in Rajasthan is more than twice that of Tamil Nadu. Goa and Maharashtra in the west have significantly lower mortality in under-five children than eastern states such as Bihar and Orissa.

⁴ This estimate is from *Countdown to 2015 Decade Report*, 2010.

Table 2.1: Trends in the rate and reduction of under-five mortality in India, by state

	Mortality rate 1992-93				Mortality rate 1998-99				Mortality rate 2005-06				Percentage change in mortality rates bet 1992 and 1998			Percentage change in mortality rates bet 1998 and 2005			Percentage change in mortality rates bet 1992 and 2005				
	Neonatal mortality	Infant mortality	Under-5 mortality	Share of neonatal mortality in under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Share of neonatal mortality in under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Share of neonatal mortality in under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality		Neonatal mortality
New Delhi	33.4	62.2	78.4	42.6	27.6	46.2	57.6	47.9	26.4	38.5	46.4	56.9	-17	-26	-27	-4	-17	-19	-21	-38	-41	New Delhi	
Haryana	42.6	79.7	107.6	39.6	34	59	79.1	43.0	24.9	44.2	58.8	42.3	-20	-26	-26	-27	-25	-26	-42	-45	-45	Haryana	
Himachal Pradesh	38.1	65.2	85	44.8	24.9	39.7	48.4	51.4	29.8	38.3	42.7	69.8	-35	-39	-43	20	-4	-12	-22	-41	-50	Himachal Pradesh	
Jammu & Kashmir	31.9	50.1	68.3	46.7	37.7	62.8	78.7	47.9	31.9	45.5	53.8	59.3	18	25	15	-15	-28	-32	0	-9	-21	Jammu & Kashmir	
Punjab	30.2	52.6	69.2	43.6	36	56.8	69.9	51.5	30	44.9	54.6	54.9	19	8	1	-17	-21	-22	-1	-15	-21	Punjab	
Rajasthan	42.1	76.3	107.5	39.2	54.1	88.1	124.9	43.3	48.5	72.7	93.3	52.0	29	15	16	-10	-17	-25	15	-5	-13	Rajasthan	
Madhya Pradesh, inc Chhattisgarh	56.6	96.6	143.1	39.6	59.8	92.5	144.7	41.3	52.9	81.6	107.5	49.2	6	-4	1	-12	-12	-26	-7	-16	-25	Madhya Pradesh, inc Chhattisgarh	
Uttar Pradesh, inc Uttaranchal	69.8	116.1	161.6	43.2	62.1	95.4	132.1	47.0	54.1	82	110.8	48.8	-11	-18	-18	-13	-14	-16	-22	-29	-31	Uttar Pradesh, inc Uttaranchal	
Bihar, inc Jharkhand	57.1	97	136.5	41.8	49.3	75.7	110.2	44.7	44.8	67.7	99.1	45.2	-14	-22	-19	-9	-11	-10	-22	-30	-27	Bihar, inc Jharkhand	
Orissa	64.2	119.5	136.9	46.9	55.7	89.5	115.7	48.1	46.4	67.7	94.7	49.0	-13	-25	-15	-17	-24	-18	-28	-43	-31	Orissa	
West Bengal	55.1	81.1	107.3	51.4	33.8	50.9	71	47.6	38.1	52.1	65.4	58.3	-39	-37	-34	13	2	-8	-31	-36	-39	West Bengal	
Arunachal Pradesh	19.8	49.6	87.2	22.7	26.5	49.3	85.8	30.9	35.6	66.6	97.6	36.5	34	-1	-2	34	35	14	80	34	12	Arunachal Pradesh	
Assam	55.4	92.6	143.5	38.6	37	61.5	79.5	46.5	48.9	70.9	95.2	51.4	-33	-34	-45	32	15	20	-12	-23	-34	Assam	
Manipur	21.8	39	60.3	36.2	18.6	39.4	61.1	30.4	24.5	35.9	50.1	48.9	-15	1	1	32	-9	-18	12	-8	-17	Manipur	
Meghalaya	27.1	46.3	65	41.7	51.1	89.6	127.8	40.0	22.2	48	74.1	30.0	89	94	97	-57	-46	-42	-18	4	14	Meghalaya	
Mizoram	7.4	16.6	26.9	27.5	23.5	38.1	59.4	39.6	19.3	33.3	48.4	39.9	218	130	121	-18	-13	-19	161	101	80	Mizoram	
Nagaland	6.5	12.1	14.5	44.8	31.4	52.2	67.8	46.3	24	48.3	70.1	34.2	383	331	368	-24	-7	3	269	299	383	Nagaland	
Sikkim					35.6	57.9	83.7	42.5	22.5	35.3	42.1	53.4				-37	-39	-50				Sikkim	
Tripura	56.2	88.1	115.4	48.7	46.1	62.1	68.4	67.4	37.9	57.7	73.4	51.6	-18	-30	-41	-18	-7	7	-33	-35	-36	Tripura	
Goa	23	33.2	40.8	56.4	28.2	41.2	50.3	56.1	17	25.8	32.2	52.8	23	24	23	-40	-37	-36	-26	-22	-21	Goa	
Gujarat	46.3	73.5	103.8	44.6	41.9	64.4	90.7	46.2	44.9	62.8	77	58.3	-10	-12	-13	7	-2	-15	-3	-15	-26	Gujarat	
Maharashtra	37.8	56	76.1	49.7	38.1	53.2	69.9	54.5	35.6	45.3	53.4	66.7	1	-5	-8	-7	-15	-24	-6	-19	-30	Maharashtra	
Andhra Pradesh	47.5	73.1	95.9	49.5	47.5	70.8	91.3	52.0	52.2	68.4	78.7	66.3	0	-3	-5	10	-3	-14	10	-6	-18	Andhra Pradesh	
Karnataka	49.8	74.8	102	48.8	44.4	62.3	83.3	53.3	37.9	53	66.2	57.3	-11	-17	-18	-15	-15	-21	-24	-29	-35	Karnataka	
Kerala	22.1	31	40.5	54.6	15.3	20.9	26	58.8	14.5	17.7	19.5	74.4	-31	-33	-36	-5	-15	-25	-34	-43	-52	Kerala	
Tamil Nadu	46.3	70.9	95.2	48.6	35.9	51	64.5	55.7	26.3	37.7	45	58.4	-22	-28	-32	-27	-26	-30	-43	-47	-53	Tamil Nadu	
Total	52.6	86.3	118.8	44.3	47.7	73	101.3	47.1	44.4	65	85.3	52.1	-9	-15	-15	-7	-11	-16	-16	-25	-28	Total	

Source: Mortality rates from Demographic and Health Surveys Statcompiler
 Note: Mortality rates from a ten-year period prior to the survey.



Source: DHS 2005-06

There have been significant declines in deaths among children below five years in India. Nationally the fall in the under-five mortality rate has been almost the same between the survey rounds, but the reduction in neonatal and infant mortality rates has been slower in the 2000s than in the 1990s. National averages, however, mask the progress (or lack of progress) across states. Looking at the progress between the first and third rounds of the DHS, reductions in under-five mortality in many states exceeded the national average, while a number achieved below average declines, notably Rajasthan, Manipur and Andhra Pradesh. A few states – Arunachal Pradesh, Meghalaya, Mizoram and Nagaland – registered marked increases in under-five deaths but this could well be down to data or sampling problems and require further analysis.

There are variations in the reductions in under-five mortality across states between the three rounds of surveys, which must be taken into account in order to build up a more complete picture of child survival in India. For example, Rajasthan experienced an above-average decline in under-five mortality between 1998 and 2006, but the mortality rate rose in the preceding period between 1992 and 1999, meaning that much of the subsequent progress simply made up for earlier reversals. The southern states like Kerala and Tamil Nadu, however, have consistently registered above-average improvements in child survival. Differences in under-five mortality across states can be partly attributed to economic patterns. Under-five death rates in poorer states like Bihar, Rajasthan and Orissa are higher than the national average as shown in the 2005–06 survey, while these are below average in richer states like Tamil Nadu and Maharashtra.⁵ Income cannot fully explain these differences, however; Kerala, which is not among the richest states, has the lowest under-five mortality rate in all of India.⁶

⁵ The income classification of states in this paragraph were taken from an International Monetary Fund working paper by Purfield (2006).

⁶ The IMF paper (see note 7) classifies Kerala as a middle-income state.

Table 2.2: Trends in the rate and reduction of under-five mortality in India, by socio-economic characteristic

	Mortality rates 1992-93			Mortality rates 1998-99			Mortality rates 2005-06			Percentage change in mortality rates bet 1992 and 1998			Percentage change in mortality rates bet 1998 and 2005			Percentage change in mortality rates bet 1992 and 2005		
	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality
By mother's education																		
No education	60.6	100.6	140.9	55.5	87	124.4	51.9	77.7	106.2	-8.4	-13.5	-11.7	-6.5	-10.7	-14.6	-8.4	-13.5	-11.7
Primary	42.3	68.2	89.9	44.8	67	86	44.6	63.8	77.6	5.9	-1.8	-4.3	-0.4	-4.8	-9.8	5.9	-1.8	-4.3
Secondary or higher	30.7	46.3	55.6	30.6	42.1	50.5	31	42.6	48.8	-0.3	-9.1	-9.2	1.3	1.2	-3.4	-0.3	-9.1	-9.2
By mother's age at birth																		
Less than 20	70.7	107.3	140.9	63	92.6	120.7	63	85.9	106.2	-10.9	-13.7	-14.3	0.0	-7.2	-12.0	-10.9	-13.7	-14.3
20-29	44.8	75.8	107.9	40.7	63.3	90.1	38	56.8	75.1	-9.2	-16.5	-16.5	-6.6	-10.3	-16.6	-9.2	-16.5	-16.5
Medical Maternity Care																		
No antenatal nor delivery care	58.1	97.6	..	58.5	96	..	54.8	82.3	..	0.7	-1.6	..	-6.3	-14.3	..	0.7	-1.6	..
Both antenatal and delivery care	31.5	45.7	..	30.2	42.9	..	21.5	30.1	..	-4.1	-6.1	..	-28.8	-29.8	..	-4.1	-6.1	..
By gender of child																		
Male	56.9	88.6	115.4	50.7	74.8	97.8	47.1	65.9	82.1	-10.9	-15.6	-15.3	-7.1	-11.9	-16.1	-10.9	-15.6	-15.3
Female	48.1	83.9	122.5	44.5	71.1	105.1	41.5	63.9	88.7	-7.5	-15.3	-14.2	-6.7	-10.1	-15.6	-7.5	-15.3	-14.2
By household wealth index																		
Lowest	65.2	109.2	154.7	60.4	96.5	141.3	56.1	82.3	117.6	-7.4	-11.6	-8.7	-7.1	-14.7	-16.8	-7.4	-11.6	-8.7
Second	66	106.3	152.9	52	80.7	117.8	48.4	73.2	98	-21.2	-24.1	-23.0	-6.9	-9.3	-16.8	-21.2	-24.1	-23.0
Middle	55	89.7	119.5	50.7	76.3	101.3	44.9	65.9	81.4	-7.8	-14.9	-15.2	-11.4	-13.6	-19.6	-7.8	-14.9	-15.2
Fourth	39.2	65.6	86.9	38.5	55.3	69.9	36.1	51.3	61	-1.8	-15.7	-19.6	-6.2	-7.2	-12.7	-1.8	-15.7	-19.6
Highest	27.7	44	54.3	26.7	38.1	45.5	25.5	34.4	39.4	-3.6	-13.4	-16.2	-4.5	-9.7	-13.4	-3.6	-13.4	-16.2
Ratio between poorest and riches households	2.4	2.5	2.8	2.3	2.5	3.1	2.2	2.4	3.0							-3.9	2.1	9.0
By geographic location																		
Urban	35.4	59.4	78.3	33.5	49.2	65.4	32.4	48.5	60.6	-5.4	-17.2	-16.5	-3.3	-1.4	-7.3	-5.4	-17.2	-16.5
Rural	57.7	94.3	130.9	51.7	79.7	111.4	48.5	70.6	93.8	-10.4	-15.5	-14.9	-6.2	-11.4	-15.8	-10.4	-15.5	-14.9
Total	52.6	86.3	118.8	47.7	73	101.3	44.4	65	85.3	-9.3	-15.4	-14.7	-6.9	-11.0	-15.8	-9.3	-15.4	-14.7

Source: Mortality rates from the Demographic and Health Survey Statcompiler

Note: Mortality rates from a ten-year period prior to the survey, five-year period for medical maternity care.

Table 2.3: Trends in the rate and reduction of under-five mortality in India, by religion and caste

	Mortality rates 1992-93			Mortality rates 1998-99			Mortality rates 2005-06			Percentage change in mortality rates bet 1992 and 1998			Percentage change in mortality rates bet 1998 and 2005			Percentage change in mortality rates bet 1992 and 2005		
	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality
National																		
By Religion																		
Hindu	55.0	90.4	124.0	50.4	77.1	107.0	40.3	58.8	76.0	-8.4	-14.7	-13.7	-20.0	-23.7	-29.0	-8.4	-14.7	-13.7
Muslim	47.1	76.6	106.3	38.0	58.8	82.7	34.1	52.4	70.0	-19.3	-23.2	-22.2	-10.3	-10.9	-15.4	-19.3	-23.2	-22.2
Christian	32.6	49.9	68.4	29.8	49.2	68.0	31.5	41.7	52.8	-8.6	-1.4	-0.6	5.7	-15.2	-22.4	-8.6	-1.4	-0.6
Sikh	27.7	47.2	64.8	38.0	53.3	64.9	35.9	45.6	52.1	37.2	12.9	0.2	-5.5	-14.4	-19.7	37.2	12.9	0.2
Caste/Tribe																		
Scheduled caste	63.1	107.3	149.1	53.2	83.0	119.3	46.3	66.4	88.1	-15.7	-22.6	-20.0	-13.0	-20.0	-26.2	-15.7	-22.6	-20.0
Scheduled tribe	54.6	90.5	135.2	53.3	84.2	126.6	39.9	62.1	95.7	-2.4	-7.0	-6.4	-25.1	-26.2	-24.4	-2.4	-7.0	-6.4
Other backward class				50.8	76.0	103.1	38.3	56.6	72.8				-24.6	-25.5	-29.4			
Other	50.6	82.2	111.5	40.7	61.8	82.6	34.5	48.9	59.2	-19.6	-24.8	-25.9	-15.2	-20.9	-28.3	-19.6	-24.8	-25.9
Urban																		
By Religion																		
Hindu	38.6	64.0	83.2	36.6	53.3	69.6	30.9	44.3	54.7	-5.2	-16.7	-16.3	-15.6	-16.9	-21.4	-5.2	-16.7	-16.3
Muslim	28.4	51.3	70.2	25.9	39.8	57.9	21.6	35.5	44.8	-8.8	-22.4	-17.5	-16.6	-10.8	-22.6	-8.8	-22.4	-17.5
Christian	28.3	37.8	47.7	29.6	37.5	48.0	11.3	16.3	25.5	4.6	-0.8	0.6	-61.8	-56.5	-46.9	4.6	-0.8	0.6
Sikh	14.1	36.0	41.8	21.8	40.6	53.1	..	..	..	54.6	12.8	27.0	..	..	..	54.6	12.8	27.0
Caste/Tribe																		
Scheduled caste	45.0	80.6	111.2	40.1	60.4	84.0	35.0	50.7	65.4	-10.9	-25.1	-24.5	-12.7	-16.1	-22.1	-10.9	-25.1	-24.5
Scheduled tribe	43.9	55.5	79.3	35.6	57.6	79.6	29.0	43.8	53.8	-18.9	3.8	0.4	-18.5	-24.0	-32.4	-18.9	3.8	0.4
Other backward class				35.3	51.2	66.6	26.4	42.2	54.5				-25.2	-17.6	-18.2			
Other	34.1	57.1	74.4	29.8	43.5	57.0	27.5	36.1	42.1	-12.6	-23.8	-23.4	-7.7	-17.0	-26.1	-12.6	-23.8	-23.4
Rural																		
Hindu	59.1	97.1	134.4	53.8	82.8	116.2	43.3	63.0	82.5	-9.0	-14.7	-13.5	-19.5	-23.9	-29.0	-9.0	-14.7	-13.5
Muslim	56.6	89.6	124.9	43.6	67.5	94.1	40.1	60.4	82.2	-23.0	-24.7	-24.7	-8.0	-10.5	-12.6	-23.0	-24.7	-24.7
Christian	34.3	54.8	76.6	30.0	53.9	76.0	42.0	54.8	67.0	-12.5	-1.6	-0.8	40.0	1.7	-11.8	-12.5	-1.6	-0.8
Sikh	31.9	50.6	72.2	42.5	56.8	68.2	34.3	46.0	54.3	33.2	12.3	-5.5	-19.3	-19.0	-20.4	33.2	12.3	-5.5
Caste/Tribe																		
Scheduled caste	66.9	112.9	157.2	56.2	88.1	127.3	49.6	71.0	94.7	-16.0	-22.0	-19.0	-11.7	-19.4	-25.6	-16.0	-22.0	-19.0
Scheduled tribe	55.6	93.7	140.5	55.1	86.9	131.4	40.9	63.9	99.8	-0.9	-7.3	-6.5	-25.8	-26.5	-24.0	-0.9	-7.3	-6.5
Other backward class				54.7	82.2	112.2	42.1	61.1	78.7				-23.0	-25.7	-29.9			
Other	56.3	90.8	124.4	45.1	69.3	93.1	38.1	55.7	68.2	-19.9	-23.7	-25.2	-15.5	-19.6	-26.7	-19.9	-23.7	-25.2

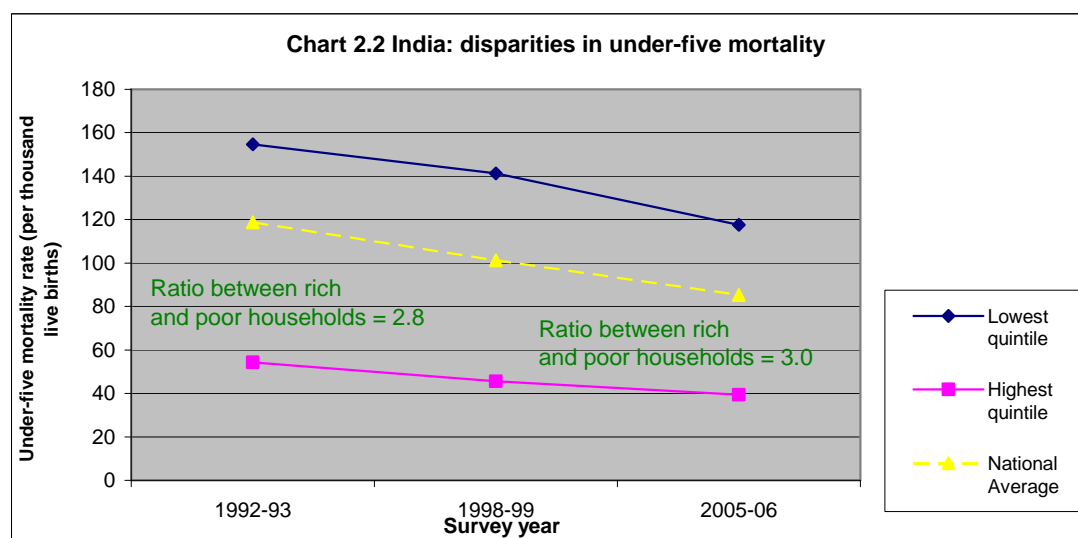
Source: Mortality rates by background characteristics from India National and Family Health Surveys (NFHS) 1, 2 and 3
 Note: Mortality rates from a five-year period prior to the survey.

2.1.1 The burden of neonatal mortality

The share of neonatal mortality in under-five mortality has been continuously going up in India and as of the 2005–06 survey makes up over half of under-five deaths (Table 2.1). The reduction in neonatal mortality is generally slower than reductions in under-five mortality. Neonatal mortality is driven by circumstances at birth—ie, access to institutional birth facilities, the infant’s birth weight, the age and nutrition of the mother during pregnancy—which in turn are caused by broader contextual issues such as poverty. Post-birth changes such as immunisation and proper nutrition can significantly improve survival chances. In states with relatively low child mortality such as Kerala and Tamil Nadu, neonatal mortality remains a challenge despite high levels of institutional birth, suggesting that efforts to improve survival among newborns need to go beyond the immediate delivery stage.

2.1.2 Socio-economic factors, religion and caste

Children’s survival prospects vary by socio-economic factors, gender, religion and caste. Those born to rich households have the best prospects of survival and the children born in the poorest households face the worst (Table 2.2). Across wealth groups, households in the top four wealth quintiles made faster progress than the bottom wealth quintile in the 1990s. However the rate of reduction in under-five mortality doubled in the bottom wealth quintile in the 2000s. This could be an indication that efforts to improve child survival have started reaching poor households. While the number of poor children dying has fallen, the relative gap between the top and bottom wealth quintiles slightly increased over the two decades. Children from the poorest households were 2.8 times more likely to die than children from the top household wealth quintile in 1992–93 and this went up to three times in 2005–06 (see Chart 2.2). The chart also suggests that the reduction in under-five deaths in the wealthiest households may have started to plateau in the last survey round.



Source of under-five mortality rates: DHS

Differences in survival are also present by geographic location and mother’s educational background. Under-five mortality rates have been consistently higher in rural areas than in urban areas since the start of the survey period covered in this paper. The most recent survey, however, indicates that the rate of decline in under-five mortality rates in urban areas has slowed since 1998–99, but has increased in rural areas. Under-five deaths

unsurprisingly have been concentrated among women with no education since 1992, but reductions in this group have been faster than in those groups of women who have primary or secondary education. Declines in under-five mortality rates have been faster among those born to mothers aged 20–29 than those born to younger mothers.

Gender is an important dimension of child survival inequality in India. While male neonatal mortality is higher than female neonatal mortality, reflecting physiological differences between the sexes, this trend is reversed for under-five mortality. This reversal may reflect differences in the care male and female children receive. The female to male ratio in India is one of the lowest globally. The 2001 Census indicates a national sex ratio of 933 women per 1,000 men, which is even lower in some states like Rajasthan, where the ratio is 921 women to 1,000 men. Female foeticide is a serious problem throughout the country affecting both rich and poor, with a recent report indicating that the worst sex ratios are found in the richest, best-educated areas in India (The Economist, 2010).

Under-five mortality rates have been higher in Hindu households than among the three other religious groups (Muslims, Sikhs and Christians) in both rural and urban areas since 1992 (Table 2.3). However, reductions in mortality in children below five years have been fastest among Hindu households at the national level between the second and third DHS rounds. Households belonging to scheduled castes and scheduled tribes in rural areas have had consistently higher under-five death rates than their counterparts in urban areas.⁷ The fall in under-five mortality rate in scheduled castes in urban areas have slowed down between 1998-1999 and 2005-2006, but progress has been faster for those in the rural areas during the same period.

2.1.3 Causes of poor and unequal child survival in India

Access to healthcare, clean water and sanitation and female education – all significant determinants of child survival – is weak in many places in India. More importantly, access to the relevant interventions is largely unequal, which drives unequal survival chances (Charts 2.3 and 2.4). While more than 80% of the richest households have access to a healthcare facility for delivery, just over 10% of the poorest households have access (DHS 2005–06). The richest households also have good access to a doctor during delivery while more than half of the poorest group depend on traditional birth attendants. Children from the bottom wealth quintile also have limited access to life-saving interventions. For example, only 19% of children from the poorest households who experience diarrhoea – the cause of 20% of child deaths in India – are given oral rehydration salts (ORS), as compared to 43% in the richest households.⁸ Immunisation for measles in the lowest wealth quintile has less than half of the coverage in the top quintile. What is striking is that those in the top quintile enjoy high access to all of these crucial interventions while access for the poorest group lags behind.

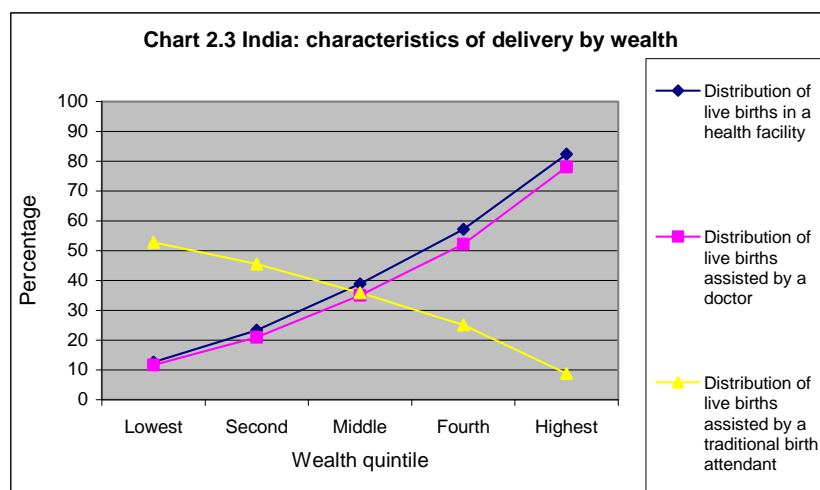
While wealth contributes to unequal under-five mortality rates across different household groups, policy choices and other less observable factors also play an important role. Providing relevant healthcare services to a broad section of the population helps decrease under-five deaths. One study (Jones et al, 2006) estimated that if proven effective child interventions were implemented universally in India, about 57% of deaths in children below five years could be prevented.⁹ Even simple interventions might be difficult to roll-out

⁷Scheduled castes and scheduled tribes are communities in India given special protection by the Constitution, due to their long history of social deprivation. Scheduled castes, also known as *Dalits*, include outcasts, while scheduled tribes, also known as *Adivasis*, include indigenous groups.

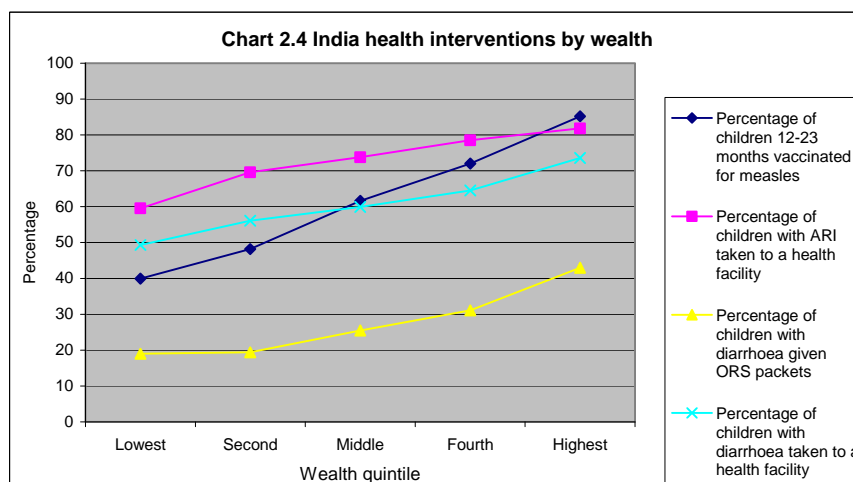
⁸Oral rehydration therapy could save about 14% of children's deaths in India (Jones et al, 2006).

⁹The most effective interventions identified for India were exclusive breastfeeding, oral rehydration therapy and complementary feeding.

widely, however, as the quality of public healthcare differs between and within states. For a long time, factors such as religion and caste, although difficult to measure, have been seen as linked to disparities in under-five mortality rates between groups. The literature on child survival posits, however, that these characteristics are closely linked to socio-economic factors – for instance, the fact that Muslims are more urbanised than Hindus in India partly explains why child mortality is lower in the former than the latter (Bhalotra et al, 2009).



Source: DHS 2005-06



Source: DHS 2005-06

Malnutrition is an underlying cause of many child deaths and plays an important role in children's life chances. About 17% (DHS 2005-2006) of children below five years suffer from acute malnutrition in India. The problem is very alarming in households belonging to the lowest wealth quintile where 21% of under-five children (12% in the richest households) are acutely malnourished. The DHS 2005-06 also reveals that about 43% of children in India, rising to 55% among those in the poorest households, are stunted, which has long-term consequences for children's physical and mental development.

Given the size and diversity of India, it is worthwhile examining individual states' progress (or lack of progress) in improving child survival. The succeeding discussion looks at the cases of Rajasthan and Tamil Nadu – two states with very different under-five mortality trajectories. The case studies aim to highlight some lessons specific to the experiences of Rajasthan and Tamil Nadu, which may be useful to other Indian states.

2.2 The north–south child survival story

Rajasthan and Tamil Nadu illustrate the huge disparity in child survival between the northern and southern states of India. The rural population in Rajasthan is 77% while Tamil Nadu is a highly urbanised state with only a little more than half its population living in rural areas.¹⁰ Tamil Nadu has a real per capita income 1.5 times that of Rajasthan in 2003-2004.¹¹

The DHS 2005-2006 shows that the under-five mortality rate in Rajasthan is one of the highest in the country at 93 per thousand live births while the figure is 45 per thousand live births for Tamil Nadu, which is on a par with some middle-income countries. Tamil Nadu has a high burden of neonatal mortality, making up 58% of deaths in children below five years. In Rajasthan, neonatal deaths account for 52% of under-five mortality. In Tamil Nadu, the pattern of a low under-five death rate, with neonatal mortality accounting for a high share of the residual challenge, is similar to patterns experienced by middle-income countries. This disparity in child survival between the two states is driven not only by income but by other socio-economic factors as well.

Disparities in child survival within both states reflect the inequalities in under-five mortality at the national level (Tables 2.4 and 2.5). Children below five years from the poorest households in Rajasthan are two times more likely to die than those from the richest households. In Tamil Nadu the poorest children are 2.4 times more likely to die than those from the top wealth quintile. Disparities within districts also exist. For example, the NFHS indicates that in Chennai (the capital of Tamil Nadu), the average under-five mortality rate is 35 per thousand live births but this goes up to 46 per thousand live births in slum areas (32 per thousand live births in non-slum areas). Disparities in child survival can also be seen among castes and religious groups, geographic location and gender.

2.2.1 Drivers of unequal child survival progress

Rajasthan is a less economically developed state than Tamil Nadu and faces many challenges in improving child survival. It is geographically diverse with many remote areas and lags behind human development indicators for India as a whole. For example, the state literacy rate is 60% (44% for females) – against a national average of 65% total (54% for females) – which trails behind southern states like Kerala (91% total, 88% for females) and Tamil Nadu (74% total, 64% for females).¹²

Access to health interventions that improve child survival is much higher in Tamil Nadu than Rajasthan (Charts 2.5 and 2.6). About 38% of women in India give birth in health facilities but this falls to 30% in Rajasthan and goes up to 87% in Tamil Nadu. A relatively urbanised population, and an efficient road network and public transport system have contributed to high rates of institutional delivery in Tamil Nadu. More importantly, nearly 80% of live births are assisted by a doctor in Tamil Nadu compared to just over 20% in Rajasthan.

¹⁰Statistics from the Rural Health Bulletin based on the Census of 2001.

¹¹An IMF paper (Purfield, 2006) classifies Rajasthan as a poor state with a real per capita income of 8,571 Rupees (2003-2004), while Tamil Nadu is considered a rich state with a real per capita income of 12,976 Rupees.

¹²Literacy rates from the National Census 2001.

Table 2.4: Trends in the rate of under-five mortality in Rajasthan, by socioeconomic characteristics

Rajasthan	Mortality rates 1998-99			Mortality rates 2005-06		
	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality
By household wealth						
Lowest				56.5	84.3	112.6
Second				36.2	68.4	96.7
Middle				50.8	75	94.5
Fourth				56.3	72.4	82.2
Highest				34.5	48.6	55.9
Ratio between top and bottom				1.6	1.7	2.0
By standard of living						
Low	62.5	105.2	164.5			
Medium	56.4	91.3	124.7			
High	35.4	54.1	68.6			
Ratio between top and bottom	1.8	1.9	2.4			
By geographic location						
Urban	45.6	68.9	93.3	46.2	65.1	76.4
Rural	56.3	93.1	133.2	49.1	74.6	97.6
By Religion						
Hindu	55.5	90.5	126.2	50.4	73.8	95.8
Muslim	45.4	73.9	122.2	37.5	67.8	77.5
Caste/Tribe						
Scheduled caste	60.3	98.9	140.7	65.3	96.4	123.1
Scheduled tribe	58	94.7	155	38.4	73.2	113.8
Other backward class	54.7	87.5	123.2	45.6	66.9	80.8
Other	49.9	81.6	109.3	44.7	58.1	69.9
By gender of child						
Male	57.5	88.9	115.7	47.7	70.5	87.7
Female	50.4	87.2	134.9	49.4	75.2	99.4

Source: Mortality rates for 10-year period prior to the survey by background characteristics from India NFHS 2 and 3.

Note: NFHS breaks down households by five wealth quintiles in the 2005-2006 survey but only has three categories by standard of living in the earlier survey.

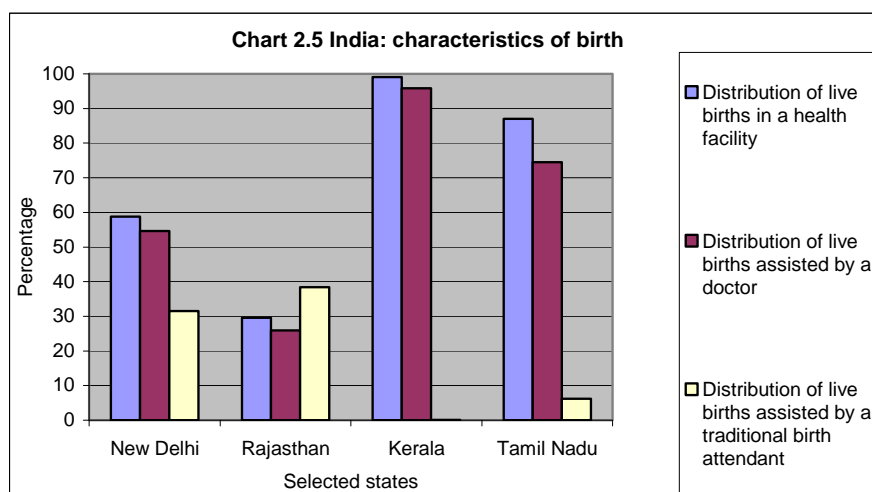
Infant and under-five mortality rates for Muslim group for 2005-2006 based on 250-499 unweighted cases.

Table 2.5: Trends in the rate of under-five mortality in Tamil Nadu, by socioeconomic characteristics

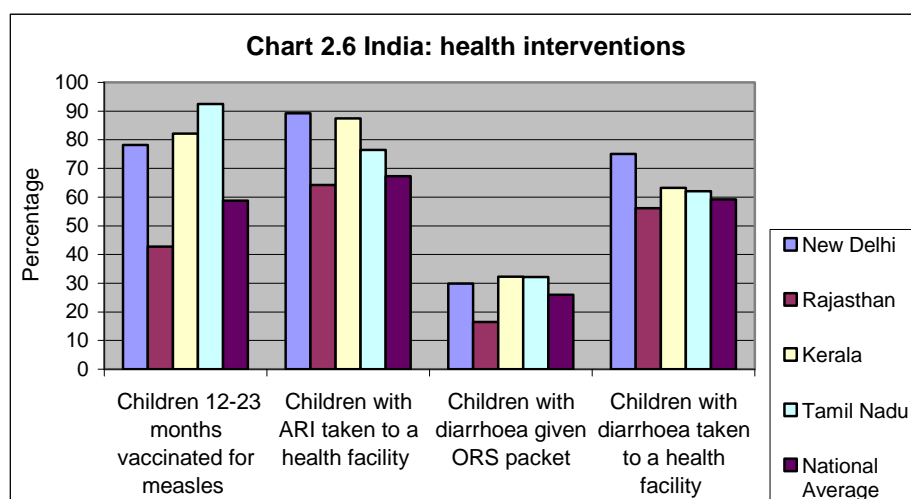
Tamil Nadu	Mortality rates 1998-99			Mortality rates 2005-06		
	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality
By household wealth						
Lowest				31.2	53.2	65.7
Second				31.8	55.3	68.5
Middle				33.6	41.9	49.8
Fourth				15.9	20.8	22.3
Highest				16.7	23.2	27.3
Ratio between top and bottom				1.9	2.3	2.4
By standard of living						
Low	42.5	62	78.8			
Medium	34.4	47.4	60.4			
High	23.3	30.3	33.9			
Ratio between top and bottom	1.8	2.0	2.3			
By geographic location						
Urban	27	40.4	48.7	19.4	31	34.7
Rural	40.5	56.3	72.5	31.6	42.8	52.9
Caste/Tribe						
Scheduled caste	29.2	41.8	63.3	25.2	37.4	48.3
Other backward class	37.1	52.7	63	26.7	38.2	44.6
By gender of child						
Male	35.3	50.2	62.3	29.7	37.6	42.3
Female	36.6	51.8	66.8	22.7	37.8	47.9

Source: Mortality rates for 10-year period prior to the survey by background characteristics from India NFHS 2 and 3.

Note: NFHS breaks down households by five wealth quintiles in the 2005-2006 survey but only has three categories by standard of living in the earlier survey. Neonatal, infant and under-five mortality rates for the lowest household wealth quintile for 2005-2006 based on 250-499 unweighted cases.



Source: DHS 2005-06



Source: DHS 2005-06

Access to life-saving interventions is lower in Rajasthan than Tamil Nadu. Only 17% of children who get sick with diarrhoea in Rajasthan are given ORS, compared to 32% in Tamil Nadu and 26% for all of India. Measles immunisation only covers about 42% of children aged 12-23 months in Rajasthan, compared to 92% in Tamil Nadu.

Disparities in child survival across the country reflect the state of local healthcare. The quality of the implementation of the Integrated Child Development Services (ICDS), a huge national programme that aims to address the health needs of pre-school children, varies across states. A survey conducted in 2004 indicates that a fully functioning ICDS could make a difference to children's nutrition.¹³ ICDS centres in Tamil Nadu compared to the other five states surveyed performed far better in terms of opening hours, the number of infants in the under three age group who attend regularly, basic infrastructure facilities and salaries paid regularly to the health workers (Lakshman, 2006). The experience has been different in the northern states where the ICDS is plagued with problems of lack of funding, poor infrastructure, and understaffing among others (Dreze, 2006). Some observe that political commitment to children's health – for example, children's health is a lively political issue in Tamil Nadu – may make the difference.¹⁴ The survey indicates however that some western states like Maharashtra – where mothers said that centres are open regularly and provide immunisation services – are catching up.

The National Rural Health Mission (NRHM) is another programme of the Indian government, which aims to provide, among other things, accessible and affordable healthcare to the poorest and most vulnerable sections of the population. One specific objective of the programme is to reduce child and maternal mortality. The NRHM faces many challenges, however, and its implementation is uneven among states. Institutional deliveries have increased through NRHM but this has overburdened health facilities – for example, it is not possible to keep mother and child for 48 hours after delivery due to lack of rooms and shelter (Sharma, 2009). The failure to address existing problems before initiating the NRHM is seen as an obstacle to properly implementing the programme in some states (Kumar, 2008). Despite the rural focus of the NRHM, the programme still finds it difficult to reach vulnerable groups in remote areas such as scheduled castes and tribes (Sharma, 2009).

¹³ Field survey called Focus On Children Under Six (FOCUS) conducted in 2004 in six states: Chhattisgarh, Uttar Pradesh, Maharashtra, Rajasthan, Himachal Pradesh and Tamil Nadu.

¹⁴ See, for example, Dreze (2006) and Lakshman (2006).

Female education and the status of women in society are strongly associated with improvements in child survival. The DHS 2005-2006 reveals that in Rajasthan only 16% of females surveyed had attended secondary school, while this goes up to 38% in Tamil Nadu. The same survey indicates that 92% of the women surveyed in Tamil Nadu earn cash compared to only 50% in Rajasthan. Differences in women's status in society – partly reflected by their education, decision-making powers and control over resources – have an impact on their control over issues that affect their health and their children's health. For example, Rajasthan has lower vaccination coverage than the national average and differentials in male and female immunisation rates persist (Jain et al, 2006). Furthermore, Jain et al (2006) reveal that "lack of information" about immunisation programmes was often the reason given for incomplete immunisation. Lack of information reflects a general unawareness on the side of the household, but at the same time illustrates that providers have to do more to reach out to their targets.

The reasons discussed here are the more obvious drivers of disparities in child survival. It would be unwise to discount other factors such as household behaviour and attitudes – which are difficult to measure – that may affect under-five mortality. For example, higher immunisation rates among boys in Rajasthan could suggest son-preference. One study (Guillot and Gupta, 2004) argues that factors like kinship systems, property rights and female autonomy, while their impact is difficult to quantify, may play significant roles in explaining rates of child survival.

2.3 What can we learn from the India case study?

India's case reflects a few important lessons from the child survival story

- Economic growth may help reduce under-five mortality but is not a sufficient precondition for improving child survival. While under-five mortality has fallen in India, high and sustained growth rates in recent years have not been enough to put the country on-track for the MDG 4 target. Economic growth clearly has to be accompanied by policies and programmes that are well implemented across states and made accessible to the poor and difficult-to-reach households.
- Even when absolute disparities in under-five mortality have fallen over time, relative inequality, measured by the ratio between the riches and poorest households, may still increase. This shows that relative inequality is more difficult to address than absolute inequality.
- While wealth is an important dimension of inequality in mortality among children, non-economic factors also drive disparities in child survival. Significant differences in under-five mortality are present across castes, gender and between tribal people and the rest of the population in India. These inequalities are strongly linked to social and economic factors such as geographic location and the level of the mother's education as shown in empirical studies. As such, reducing disparities in child survival requires addressing economic factors and at the same time looking at non-economic sources of inequalities.
- Progress in neonatal mortality may lag behind progress in under-five mortality since it is driven by the structural causes of child mortality.
- As the contrasting experiences of Rajasthan and Tamil Nadu reflect, economic and social development at the state level influences child survival. Improving the quality and management of public healthcare or improving governance not only help increase children's survival chances but also bring other social dividends.

The state case studies show very different child survival trajectories in India. Rajasthan's experience is that of a typical low-income country, with the state needing to roll out basic health interventions to increase reductions in under-five mortality. These include improving access to proven effective interventions for child survival such as immunisation and oral

rehydration therapy for diarrhoea. The strategy should make an effort to include households in remote areas and traditionally difficult to reach groups. Longer-term strategies should include improvements in female literacy and female education. Tamil Nadu on the other hand is behaving more like a typical middle-income country. After significant reductions in under-five mortality, it is now past the 'quick win' strategies and needs to implement systematic interventions – other than increasing institutional births – that address children's circumstances at birth to make a dramatic dent in neonatal mortality.

Overall, there is a need to tackle the uneven implementation of the ICDS and the NRHM across states. Allocating more money for health is only one part of the solution. More importantly, state capacities to manage and deliver good-quality healthcare must be addressed. Given the diversity of contexts and the differences in progress towards MDG 4 across India, a national child survival strategy has its limitations. Differentiated strategies across states are crucial for reducing under-five mortality.

3. Trends in under-five mortality in Bangladesh

Bangladesh is one of the few low-income countries in the world that is on track to meet MDG 4 by 2015. Bangladesh has done this while remaining a low-income country: although it has experienced annual growth rates of 4–6% since the 1980s, half of the population still live on less than \$1.25 a day. The Countdown to 2015 Decade Report indicates that it is very near its 2015 target of bringing down the under-five mortality to 50 per thousand live births.

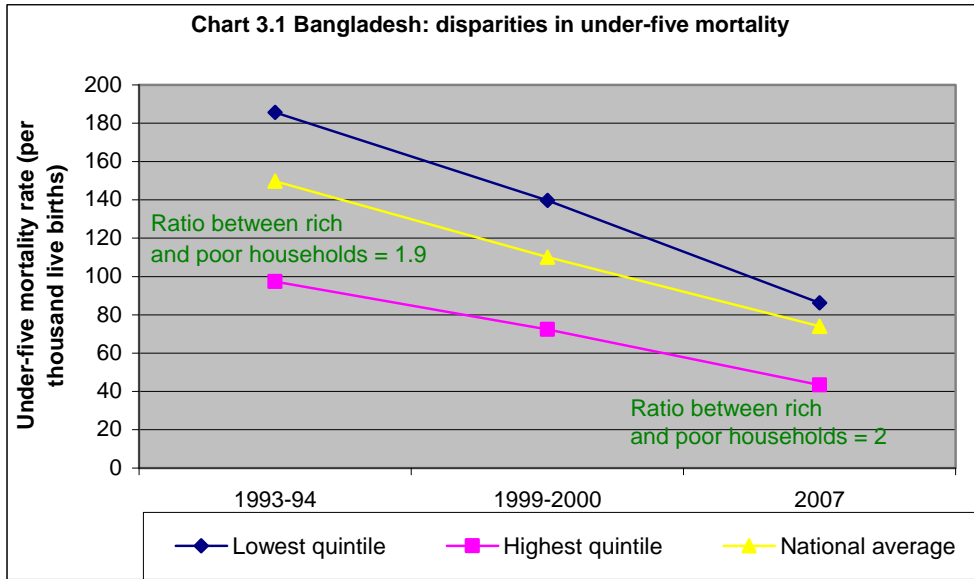
Under-five mortality rate fell by 33% between 1999 and 2007, but neonatal mortality only declined by 22% during the same period. Neonatal deaths make up over 50% of under-five deaths. Pneumonia, diarrhoea, measles and malaria are the most common causes of under-five mortality. The levels of and trends in under-five deaths vary across administrative divisions and socio-economic factors.

Children's chances of surviving to their fifth birthday vary according to where they are in the country (Table 3.1). The DHS 2007 survey shows under-five deaths range from 58 in Khulna to 107 in Sylhet. During the same survey round, mortality among children below five years declined fastest in Dhaka and the slowest in Khulna, but the latter has the lowest under-five mortality rate in the country. The pace of decline in under-five deaths in Chittagong and Rajshahi was below the national average in 2007. Sylhet, the poorest division, also has the highest under-five mortality rate among the administrative divisions. Even within administrative regions, child mortality varies. For example, childhood mortality in slum areas was 14 times that of the urban non-slums, and double that of the district municipalities (NIPORT, 2008). Even in the best performing divisions there are areas where mortality rates compare with the divisions with the highest child mortality rates (UNICEF, 2010).

Child mortality differs significantly across socio-economic factors (Table 3.2). In 2007, there were far fewer children dying in the poorest households compared to the 1990s. Yet children from households in the lowest wealth quintile however are still twice as likely to die as those in the highest wealth quintile (Chart 3.1). The risk of death is reduced sharply for children in the top two wealth quintiles compared with children in the lowest three wealth quintiles.

The under-five mortality rate is considerably higher in rural areas than in urban areas. There has been a sustained reduction in mortality of newborns and children aged 1-5 years in rural areas, but the leveling-off of mortality rates at a relatively high level in urban areas suggests the decline in rural areas may not continue for long. Urban child mortality rates may reflect what is achievable with existing programmes at current coverage levels.

A mother's level of education is inversely related to her child's risk of dying, and both infants and under-five children benefit from having their mothers receive even a small amount of schooling (eg, primary education); the proportionate benefit to under-five children is greater than that to infants. It is likely this occurs because a larger proportion of older children's deaths are preventable due to interventions such as nutrition and prompt medical attention, which tend to be strongly associated with maternal education. Mortality in children under-five has also been higher for those children born to mothers less than 20 years of age, compared to those born to older women.



Source of data: DHS

Table 3.1: Trends in the rate and reduction of under-five mortality in Bangladesh, by administrative region

	Mortality rate 1993-94				Mortality rate 1999-2000				Mortality rate 2007				Post-1993 percentage change in mortality rates			Post-1999 percentage change in mortality rates		
	Neonatal mortality	Infant mortality	Under-5 mortality	Share of neonatal mortality in under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Share of neonatal mortality in under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Share of neonatal mortality in under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality
Barisal	63.2	102	146.5	43.1	47.5	75.7	108.7	43.7	31.3	49.8	71.3	43.9	-24.8	-25.8	-25.8	-34.1	-34.2	-34.4
Chittagong/Sylhet	65.3	103.2	167.2	39.1	51.3	84.2	123.3	41.6	39.7	62.7	87.7	45.3	-21.4	-18.4	-26.3	-22.6	-25.5	-28.9
Chittagong	65.3	103.2	167.2	39.1	40.9	69.5	110	37.2	34	53.6	79.4	42.8	-37.4	-32.7	-34.2	-16.9	-22.9	-27.8
Sylhet					81.7	126.9	161.9	50.5	53.2	84.3	107.4	49.5				-34.9	-33.6	-33.7
Dhaka	62.3	105.3	156.8	39.7	51.8	83.9	115.2	45.0	37.9	55.5	68.6	55.2	-16.9	-20.3	-26.5	-26.8	-33.8	-40.5
Khulna	59.2	90.1	113.2	52.3	47.2	64.5	79.2	59.6	32.2	48.6	58.1	55.4	-20.3	-28.4	-30.0	-31.8	-24.7	-26.6
Rajshahi	64.6	94.9	134.7	48.0	49.6	76.2	100.8	49.2	46.1	57.8	71	64.9	-23.2	-19.7	-25.2	-7.1	-24.1	-29.6
Total	63.5	100.5	149.7	42.4	50.4	79.7	110	45.8	39.2	57.1	73.9	53.0	-20.6	-20.7	-26.5	-22.2	-28.4	-32.8

Source: Mortality rates from the Demographic and Health Surveys

Table 3.2: Trends in the rate and reduction of under-five mortality in Bangladesh, by socio-economic characteristic

	Mortality rate 1993-94			Mortality rate 1999-2000			Mortality rate 2007			Percentage change in mortality rates			Change in mortality rates bet 1999		
	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality	Neonatal mortality	Infant mortality	Under-5 mortality
By mother's education															
No education	71	113.3	170.6	55.3	91.9	130.4	46.8	71.1	92.7	-22.1	-18.9	-23.6	-15.4	-22.6	-28.9
Primary	55.7	89	124.6	48.1	74.5	99.9	37.3	57.7	73.4	-13.6	-16.3	-19.8	-22.5	-22.6	-26.5
Secondary or higher	40.9	57.5	90.2	41	54.7	67.5	33.1	41.2	51.7	0.2	-4.9	-25.2	-19.3	-24.7	-23.4
By mother's age at birth															
Less than 20	81.5	120.1	164.7	72.1	103.5	129.7	54.9	74.6	90	-11.5	-13.8	-21.3	-23.9	-27.9	-30.6
20-29	55.7	89.2	140.2	41.3	70.4	102.2	29.6	45.4	62.8	-25.9	-21.1	-27.1	-28.3	-35.5	-38.6
Medical Maternity Care															
No antenatal nor delivery care	57.3	84.5	..	45.8	73.4	..	50.5	70.7	..	-20.1	-13.1	..	10.3	-3.7	..
Both antenatal and delivery care	9.1	17.8	..	33.8	53.3	..	20	25.1	..	271.4	199.4	..	-40.8	-52.9	..
By gender of child															
Male	70.9	107.3	149.3	54.8	82.3	108.4	42	60.5	75.5	-22.7	-23.3	-27.4	-23.4	-26.5	-30.4
Female	55.7	93.4	150	45.8	76.9	111.7	36.4	53.5	72.1	-17.8	-17.7	-25.5	-20.5	-30.4	-35.5
By household wealth index															
Lowest	69.1	115.2	185.7	54.4	92.9	139.7	48.3	66	86.3	-21.3	-19.4	-24.8	-11.2	-29.0	-38.2
Second	76.3	117.9	174	61.2	93.6	126.7	44	67.4	84.7	-19.8	-20.6	-27.2	-28.1	-28.0	-33.1
Middle	55.6	93.4	136.1	53.7	78.1	105.5	39.6	63	83.4	-3.4	-16.4	-22.5	-26.3	-19.3	-20.9
Fourth	67	92.4	132.1	40.1	62.8	85.1	32.4	46	61.5	-40.1	-32.0	-35.6	-19.2	-26.8	-27.7
Highest	41.7	70.5	97.3	35.1	57.9	72.4	26.8	35.8	43.3	-15.8	-17.9	-25.6	-23.6	-38.2	-40.2
Ratio between poorest and richest households	1.7	1.6	1.9	1.5	1.6	1.9	1.8	1.8	2.0						
By geographic location															
Urban	43.7	80.9	114.3	41.8	74.2	96.5	33.2	50.4	62.9	-4.3	-8.3	-15.6	-20.6	-32.1	-34.8
Rural	65.6	102.6	153.4	52.1	80.7	112.7	40.8	58.8	76.6	-20.6	-21.3	-26.5	-21.7	-27.1	-32.0
Total	63.5	100.5	149.7	50.4	79.7	110	39.2	57.1	73.9	-20.6	-20.7	-26.5	-22.2	-28.4	-32.8

Source: Mortality rates from DHS Stat Compiler

3.1 Progress and challenges in improving child survival

Bangladesh, despite its low income status, has significantly improved health interventions relevant to child survival. There have been impressive gains in selected health indicators and coverage of health interventions, such as, use of oral rehydration therapy (ORT) for the management of diarrhoea, vitamin A supplementation, and immunisation. Data from DHS shows that 81.9% of children in Bangladesh have been fully immunised for the common childhood illnesses. Nearly 80% of children from the poorest households have been fully immunised compared to 88% in the richest households. About 77% of children with diarrhoea are given ORS packets (69% in the bottom wealth quintile).

Coverage for some interventions such as pneumonia, a common cause of under-five deaths, could be improved. For example, only 57% of children with acute respiratory infections (ARIs) are taken to a health facility, and this falls to 45% for children in the bottom wealth quintile. The percentage of children with ARIs taken to a health facility or to a health worker has declined in rural areas from 31% in 1996–97 to 25% in 2007; although it was 17% in 2004. The trend highlights the lack of progress and the serious challenges that impede the achievement of a high coverage of ARI case management (Arifeen, 2008). The use of antibiotics for childhood illness, such as pneumonia, is high particularly from informal health care providers (Ahmed et al. 2009).¹⁵

Survival chances in the neonatal period, however, have lagged behind improvements in child survival, as evidenced by the high neonatal burden in Bangladesh. The majority of neonatal deaths occur in the first few days of birth, and most can be attributed to birth asphyxia, low birth weight and sepsis. Neonatal deaths are driven by the child's circumstances at birth and survival is closely related to the care received by the mother before, during and after delivery and care of the newborn. Poor quality of care, misperceptions regarding the need for emergency care and other social barriers contribute to neonatal mortality.

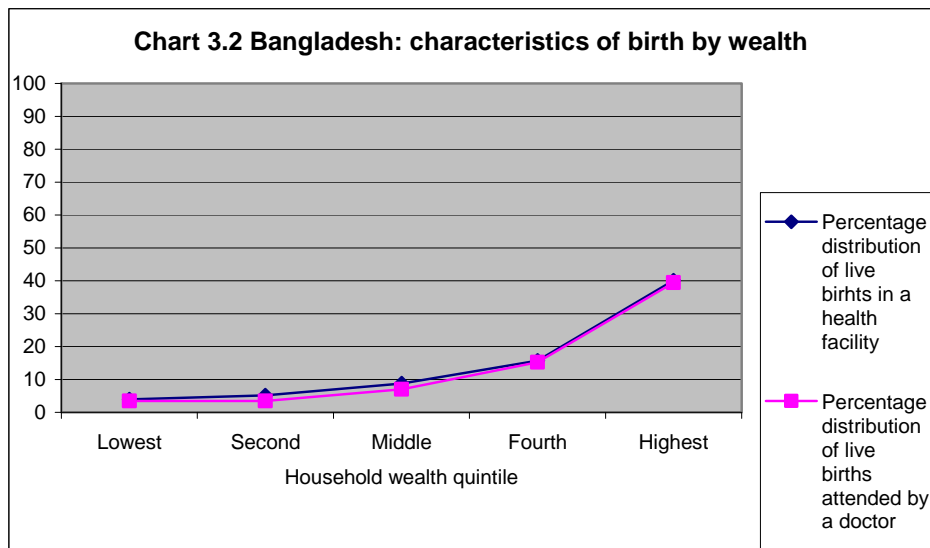
Progress in ensuring skilled attendance at delivery has been limited in Bangladesh, increasing from about 9% in 1993–94 to 18% in 2007 (BDHS 1993–94, 2007). Only 19% of newborns in the BDHS 2007 received care from a trained provider within two days of birth, and 78% received no care within 42 days postpartum. Access to a health facility and a doctor during delivery is highly unequal. About 40% of deliveries among households in the top wealth quintile are in a health facility and attended by a doctor, while only 4% of households in the bottom wealth quintile have access to the same care during delivery (Chart 3.2).

Malnutrition, which contributes to over one half of child deaths, is a huge challenge to child survival. Data from various DHS rounds during the past decade reveal malnutrition trends. Stunting is still common among children, with 16% severely stunted and 27% moderately stunted.¹⁶ A halving of the proportion of children who are underweight between 1990 and 2015 is an MDG 1 target.¹⁷ Improvements in feeding practices have contributed to a reduction in the proportion of children that is underweight, from 56% in 1996 to 47% in 2004. The coverage of vitamin A among children aged 9–59 months has also been consistently increasing. However, better-off households have tended to benefit from gains in nutrition to a greater extent than poor households (World Bank, 2008). Absolute inequality also increased between girls and boys in terms of nutrition indicators.

¹⁵ Informal (not registered with any government regulatory body) healthcare providers were categorised as community health workers, unqualified allopathic providers, traditional healers, non-secular faith healers, traditional birth attendants, and homeopaths.

¹⁶ Based on new WHO growth standards.

¹⁷ This means that underweight rates will need to decline at an average of 3.8% per year but the current rate of progress is well below this.



Source: DHS 2007

Despite significant economic growth and an increase in the national per capita income in the past decade, poverty is still widespread in Bangladesh. The deprivations of poverty go beyond lack of income. Low income increases the chances of hunger and malnutrition. For example, people are unlikely to afford the diverse diet necessary for good complementary feeding, thereby reducing resistance to disease. Secondly, it constrains the use of appropriate medical care both directly, as medical fees cannot be paid, and indirectly, as transport and the other costs associated with using health services are not affordable, and given the high 'opportunity costs', such as income foregone owing to the time spent seeking healthcare. There is evidence that government subsidies to health services have benefited rich people (Data International, 2001).

Bangladesh however has started to address the wider determinants of inequalities in child survival. Inequalities in education, for example, can drive disparities in child mortality; thus there is need to ensure access to education, especially female education, for poor people. In 1993, Bangladesh, with the help of donors, introduced tuition stipends for girls, to increase girls' access to secondary education. Female enrolment in secondary schools in Bangladesh increased from 1.1 million in 1991 to 3.9 million in 2005, including in disadvantaged areas (World Bank, 2009).

3.2 What can we learn from Bangladesh?

Bangladesh appears to be on track to achieve MDG 4 targets by a fair margin. While impressive progress has been made towards under-five mortality in general, improvement in neonatal mortality has not been as successful. There are also disparities in children's survival chances across household wealth groups and other socio-economic factors.

The case of Bangladesh shows that proper management of common childhood illnesses can make a dent in under-five mortality. Providing health interventions relevant to child survival – and ensuring good coverage especially among the bottom wealth quintile – reduces child deaths across household wealth groups. While Bangladesh has significantly reduced the number of children dying in the poorest groups, it still needs to close the relative gap between the richest and poorest households.

A focus on addressing newborn deaths will be important for Bangladesh's strategy to further improve child survival. There are health system challenges relating to the design and implementation of programmes to reduce neonatal mortality. However, with appropriate training and sustained support, the quality of care from the government first-level facilities can be substantially improved (Arifeen et al, 2004). Certain interventions, such as skilled attendance at delivery and postnatal care for newborns, need to be scaled up rapidly to bring down neonatal mortality in Bangladesh. In particular, greater focus is needed on extending these services to the poorest households.

In addition, well-designed health education programmes that promote changes in behaviour and practices that impact on health – for example, promotion of exclusive breastfeeding, good complementary feeding practices, women's education, birth registration, maternity and child benefits – can contribute significantly to a reduction in under-five mortality.

Policies and programmes that address inequalities in the wider determinants of child survival should be strengthened. For example, cash transfers can be used to boost demand for education and health services among poor households, which in turn are associated with declining under-five deaths. Addressing these wider determinants and the inequalities around them help bring sustained changes in child survival.

Conclusion

This paper shows that understanding inequalities in child survival requires looking at the context both across and within countries. While the concentration indices give an overview of the disparities in under-five mortality in developing countries, the case studies provide lessons specific to the experiences of India and Bangladesh. The following discussion outlines the insights and policy implications that can be gleaned from this paper.

First, concentration indices estimated for 65 developing countries between 1990 and 2008 show that countries with lower levels of under-five mortality tend to have higher inequality in mortality. The data shows that a number of on-track countries experienced an increase in inequality, as measured by the concentration index, during periods of significant decline in under-five deaths. A few countries like Egypt however, have managed both to reduce under-five mortality and inequality in mortality. These patterns suggest that interventions in countries that have made a dent in child mortality typically reached better-off households first. Poorer households have lagged behind child survival outcomes as a result. The patterns of inequality in under-five mortality vary across developing countries, indicating that each one faces different challenges in tackling these disparities.

Second, child survival patterns show that neonatal mortality tends to fall slower than under-five mortality. The data shows that the share of neonatal mortality in under-five deaths tends to be higher in countries with lower under-five mortality rates. Typically, reductions in under-five mortality start with efforts targeted towards quick wins such as immunisations, while structural interventions come later. These structural interventions are critical to tackling neonatal mortality, since deaths in the first month of life are often driven by circumstances at birth – eg, access to skilled birth attendance, mother's age at birth – which in turn are determined by underlying causes of mortality such as poverty. The case of Bangladesh shows that while it has reduced under-five mortality significantly, mainly through basic health interventions, it now needs to overcome these underlying causes of child mortality to bring down neonatal deaths further.

Third, while wealth is an important dimension of inequalities in child survival, disparities in under-five mortality across non-economic factors also exist. Unequal child survival outcomes are present across gender, ethnicity, caste and tribe. Previous studies have shown that these dimensions of inequality are strongly linked to economic factors such as income or access to services. As such, reducing unequal child survival outcomes requires addressing socio-economic factors that become a source of inequality and paying special attention to groups that have traditionally been excluded.

Fourth, the experiences of India and Bangladesh show that, even if absolute disparities in under-five mortality between the poorest and richest households fall, relative inequality is harder to change: the under-five mortality ratio between the top and bottom quintile households in these two countries has increased in the past two decades.

Fifth, child survival outcomes in developing countries show that, while income helps in reducing under-five mortality, it is not a sufficient condition for meeting MDG 4. Countries that are on track to meet MDG 4, like Bangladesh and Nepal, are both low-income countries. Bangladesh has experienced economic growth in the past two decades that is likely to have contributed towards improved child health, but it is worth noting that growth rates in Bangladesh were lower than India's or some south-east Asian countries like Vietnam. Bangladesh's experience shows that policy choices – such as moving towards full

immunisation coverage – matter more than income growth in driving progress towards MDG 4.

Sixth, national averages obscure as much as they reveal about child survival in a big and diverse country like India. While India is off-track to meet MDG 4 as a nation, some southern states like Kerala and Tamil Nadu are likely to meet this goal. The child survival story in Tamil Nadu is similar to that of many on-track middle-income countries, whereas Rajasthan's experience has more in common with a low-income sub-Saharan African country. Inequalities in child survival exist in India across various dimensions: between states, wealth groups, geographic location, gender, and caste and tribe. Spectacular economic growth in India has not translated into broad-based improvements in child survival. India's experience illustrates the need for more inclusive policies and more consistent implementation, taking into account each state's needs.

Policy implications

The insights gleaned from the paper have a number of policy implications. First, there is a clear need for a differentiated strategy for reducing under-five mortality between low-income and middle-income countries. Middle-income countries – and in some cases low-income countries that have made significant progress in reducing under-five mortality – have often reached 'low-hanging fruit' first, at the expense of the poorest households. Making progress beyond this point requires a focus on systematic interventions rather than 'quick win' strategies. In low-income countries with average high mortality rates child deaths are less concentrated in the poorest wealth quintile, and rates are usually high in the bottom 40% or 60% of the population. These countries need to roll out a basic package of effective interventions across a broader spectrum of the population, including the poorest and traditionally excluded groups.

Second, rolling out a package of basic interventions may reduce under-five mortality in general, but progress towards reducing neonatal deaths may lag behind. Middle-income countries and countries that are on track to meet MDG 4 have seen an increase in the share of neonatal mortality in under-five deaths. It is notable that in these countries the share of neonatal mortality in under-five mortality is often above 40% and as high as over 50%. Countries with higher burdens of neonatal deaths need to address the structural causes of child deaths to bring down neonatal mortality. These include strategies that address children's circumstances at birth, such as poverty and the mother's access to healthcare during birth. This approach is more relevant in south Asia, where neonatal deaths account for a larger share of total under-five mortality, than in sub-Saharan Africa, where deaths in the period after 28 days account for three-quarters of child mortality.

Third, a few countries, like Egypt, have managed to reduce under-five mortality and inequality in mortality at the same time. It is important to look at such 'outliers' and the lessons they can offer to countries which are making efforts to improve child survival.

Finally, there has to be greater effort to report disaggregated child mortality data more frequently. The analysis in this paper has shown that national averages do not necessarily show the real picture of child survival. Within countries, inequalities exist across many dimensions. Progress usually masks the situation of poor and traditionally excluded households. Reporting disaggregated child mortality indicators in more regular intervals will help policy-makers implement inclusive strategies to reduce under-five mortality and will provide a better picture of child survival improvements in developing countries.

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Appendix: Under-five mortality rates, neonatal mortality rates and concentration indices

Country	Year	National Average Under-Five Mortality Rate	Concentration Index	National Average Neonatal Mortality Rate	Share of Neonatal Mortality in Under-5 Mortality Rate	Std Error (CI)	t-test (CI)	Std Error (change in CI from one survey to the next)	t-test (change in CI from one survey to the next)
Armenia	2005	32.26	-0.130	18.5	57.3	0.045	2.922	0.008	-1.980
Armenia	2000	48	-0.115	26.2	54.6	0.043	2.650	..	..
Azerbaijan	2006	58.2	-0.084	28.6	49.1	0.038	2.188	..	..
Bangladesh	2007	73.9	-0.116	39.2	53.0	0.029	3.951	0.004	-4.249
Bangladesh	2004	96.6	-0.099	46.2	47.8	0.028	3.534	0.004	7.137
Bangladesh	1999-2000	110	-0.126	50.4	45.8	0.027	4.647	..	..
Benin	2001	162.7	-0.114	41.4	25.4	0.024	4.709	0.003	-11.442
Benin	1996	183.9	-0.079	44.6	24.3	0.034	2.335	..	..
Bolivia	2003	92.7	-0.158	33.9	36.6	0.016	9.591	0.002	33.996
Bolivia	1998	99.1	-0.219	36.3	36.6	0.019	11.658	0.002	-27.255
Bolivia	1994	132.1	-0.154	40.7	30.8	0.028	5.513	..	..
Brazil	1996	56.7	-0.259	22.2	39.2	0.021	12.078	..	..
Burkina Faso	2003	193.2	-0.051	38.7	20.0	0.018	2.803	0.002	4.141
Burkina Faso	1998-99	224.1	-0.059	43.7	19.5	0.024	2.462	0.003	-7.380
Burkina Faso	1993	204.5	-0.038	51.3	25.1	0.024	1.586	..	..
Cambodia	2005	106.3	-0.140	36.3	34.1	0.019	7.209	0.002	-9.242
Cambodia	2000	121.6	-0.119	39.1	32.2	0.019	6.134	..	..
Cameroon	2004	147.6	-0.132	35.1	23.8	0.025	5.342	0.003	6.094
Cameroon	1998	146.3	-0.152	40.9	28.0	0.034	4.456	0.005	1.490
Cameroon	1991	144	-0.160	42.2	29.3	0.036	4.395	..	..
CAR	1994-95	158.6	-0.113	45.3	28.6	0.033	3.397	..	..
Chad	1996-97	201.1	-0.008	47.5	23.6	0.023	0.365	..	..
Colombia	2005	25.7	-0.177	14.2	55.3	0.018	9.780	0.002	-3.516
Colombia	2000	28	-0.170	16.4	58.6	0.031	5.398	0.005	-8.902
Colombia	1995	37.4	-0.127	20.5	54.8	0.031	4.064	0.005	-5.205
Colombia	1990	35	-0.103	15.1	43.1	0.037	2.782	..	..
Comoros	1996	112.6	-0.099	45	40.0	0.053	1.853	..	..
Congo Brazzaville	2005	123	-0.059	35.1	28.5	0.027	2.197	..	..
Congo DRC	2007	155.4	-0.092	39.8	25.6	0.019	4.832	..	..
Cote d'Ivoire	1998-99	174.3	-0.141	55.6	31.9	0.046	3.059	0.008	-3.221
Cote d'Ivoire	1994	149.9	-0.114	47.7	31.8	0.028	4.093	..	..
Dominican Rep.	2007	37.1	-0.148	21.7	58.5	0.017	8.959	0.002	18.673
Dominican Rep.	2002	43.2	-0.182	21.5	49.8	0.016	11.561	0.003	17.021
Dominican Rep.	1999	46.6	-0.234	18.9	40.6	0.062	3.766	0.014	-1.834
Dominican Rep.	1996	61	-0.207	27.6	45.2	0.024	8.624	..	..
Egypt	2008	33.4	-0.166	17.5	52.4	0.016	10.243	0.002	6.080
Egypt	2005	49.9	-0.176	22.8	45.7	0.014	12.512	0.001	2.814
Egypt	2000	69.2	-0.180	29	41.9	0.015	11.754	0.002	30.209
Egypt	1995	95.9	-0.230	37.2	38.8	0.014	15.956	..	..
Eritrea	2002	107	-0.069	29.6	27.7	0.031	2.203	0.004	-10.781
Eritrea	1995	152.5	-0.023	35.3	23.1	0.038	0.593	..	..
Ethiopia	2005	132	-0.035	40.6	30.8	0.018	1.928	..	..
Gabon	2000	91.4	-0.066	31.8	34.8	0.029	2.254	..	..
Ghana	2008	84.8	-0.088	32.4	38.2	0.034	2.589	0.005	-6.782
Ghana	2003	109.7	-0.055	41	37.4	0.031	1.748	0.004	15.685

Country	Year	National Average Under-Five Mortality Rate	Concentration Index	National Average Neonatal Mortality Rate	Share of Neonatal Mortality in Under-5 Mortality Rate	Std Error (CI)	t-test (CI)	Std Error (change in CI from one survey to the next)	t-test (change in CI from one survey to the next)
Ghana	1998	110.4	-0.120	32.3	29.3	0.031	3.868	0.004	3.068
Ghana	1993	132.8	-0.134	46.1	34.7	0.037	3.626	..	..
Guatemala	1998-99	64.6	-0.114	25.7	39.8	0.026	4.333	0.003	1.339
Guatemala	1995	79.2	-0.118	28.8	36.4	0.018	6.435	..	..
Guinea	2005	187.8	-0.099	54.9	29.2	0.023	4.370	0.003	1.203
Guinea	1999	195.1	-0.102	51.6	26.4	0.023	4.332	..	..
Haiti	2005-06	102.3	-0.125	30.3	29.6	0.023	5.414	0.003	-17.009
Haiti	2000	137.7	-0.076	36	26.1	0.023	3.344	0.003	-2.441
Haiti	1994-95	140.6	-0.070	38	27.0	0.031	2.269	..	..
Honduras	2005-06	37.3	-0.179	18	48.3	0.016	11.001	..	..
India	2005-06	85.3	-0.178	44.4	52.1	0.009	19.713	0.001	9.566
India	1998-1999	101.3	-0.185	47.7	47.1	0.009	20.560	0.001	-18.359
India	1992-1993	118.8	-0.171	52.6	44.3	0.009	20.073	..	..
Indonesia	2007	51	-0.185	21.3	41.8	0.013	14.633	0.001	3.447
Indonesia	2002-03	54.4	-0.190	22.8	41.9	0.013	14.446	0.001	15.719
Indonesia	1997	70.6	-0.211	25	35.4	0.012	17.002	..	..
Jordan	2002	29.3	-0.085	17.3	59.0	0.024	3.518	0.003	-2.528
Jordan	1997	34	-0.077	18.3	53.8	0.023	3.336	..	..
Jordan	1990	42.4	-0.101	22	51.9	0.020	5.075	..	..
Kazakhstan	1999	63	-0.137	28.4	45.1	0.045	3.018	..	..
Kenya	2003	112.7	-0.110	32.8	29.1	0.023	4.839	0.003	14.281
Kenya	1998	105.2	-0.150	27	25.7	0.029	5.172	0.004	4.472
Kenya	1993	93.2	-0.168	27	29.0	0.021	7.873	..	..
Kyrgyz Rep.	1997	75.8	-0.111	33.1	43.7	0.052	2.136	..	..
Lesotho	2004	101.8	-0.049	44.9	44.1	0.032	1.530	..	..
Liberia	2007	141.5	-0.012	34.8	24.6	0.026	0.464	..	..
Madagascar	2003-04	111.3	-0.160	34	30.5	0.021	7.591	0.003	-20.576
Madagascar	1997	163.9	-0.106	40.5	24.7	0.028	3.730	..	..
Malawi	2004	157.6	-0.077	36.8	23.4	0.018	4.351	0.002	-12.368
Malawi	2000	202.7	-0.055	45.7	22.5	0.017	3.204	0.002	-5.360
Malawi	1992	239.7	-0.046	49.2	20.5	0.028	1.617	..	..
Mali	2006	214.8	-0.080	56.8	26.4	0.015	5.214	0.001	-10.088
Mali	2001	238.2	-0.065	68.1	28.6	0.016	4.003	0.002	16.021
Mali	1995-96	252.2	-0.091	68.4	27.1	0.023	3.861	..	..
Mauritania	2000-01	102.3	-0.029	42.3	41.3	0.027	1.062	..	..
Moldova	2005	26.3	-0.091	14	53.2	0.045	1.998	..	..
Morocco	2003-04	50.6	-0.197	28.3	55.9	0.021	9.532	0.003	-15.972
Morocco	1992	83.9	-0.155	34	40.5	0.023	6.640	..	..
Mozambique	2003	178.2	-0.086	47.7	26.8	0.018	4.886	0.002	17.485
Mozambique	1997	218.7	-0.119	56.7	25.9	0.027	4.378	..	..
Namibia	2006-07	69	-0.135	25.6	37.1	0.024	5.542	0.003	-7.042
Namibia	2000	60.2	-0.113	22.3	37.0	0.028	4.036	0.004	-15.658
Namibia	1992	91.8	-0.054	35.3	38.5	0.030	1.768	..	..
Nepal	2006	79.1	-0.115	37.9	47.9	0.024	4.839	0.003	-4.111
Nepal	2001	108.4	-0.103	47.7	44.0	0.021	4.794	0.003	-3.195
Nepal	1996	139.2	-0.095	58.2	41.8	0.027	3.474	..	..
Nicaragua	2001	44.6	-0.198	16.7	37.4	0.020	9.979	0.002	-30.742
Nicaragua	1998	56	-0.122	20.2	36.1	0.019	6.252	..	..

Country	Year	National Average Under-Five Mortality Rate	Concentration Index	National Average Neonatal Mortality Rate	Share of Neonatal Mortality in Under-5 Mortality Rate	Std Error (CI)	t-test (CI)	Std Error (change in CI from one survey to the next)	t-test (change in CI from one survey to the next)
Niger	2006	217.7	-0.026	42.7	19.6	0.019	1.345	0.002	14.252
Niger	1998	302.6	-0.055	50.5	16.7	0.027	2.059	..	..
Nigeria	2008	171	-0.159	45.9	26.8	0.010	15.878	0.001	6.992
Nigeria	2003	217.1	-0.165	53.3	24.6	0.021	7.843	0.003	-14.187
Nigeria	1990	191.3	-0.128	45.5	23.8	0.019	6.677	..	..
Pakistan	2006-07	93.3	-0.124	53	56.8	0.018	6.791	0.002	-17.682
Pakistan	1990-91	120.4	-0.089	53.3	44.3	0.023	3.935	..	..
Paraguay	1990	46.6	-0.133	19.7	42.3	0.027	4.880	..	..
Peru	2000	60.4	-0.252	22.6	37.4	0.018	14.196	0.002	-3.078
Peru	1996	68.4	-0.245	26.3	38.5	0.016	15.638	0.002	-9.932
Peru	1991-92	91.5	-0.226	30.1	32.9	0.022	10.410	..	..
Philippines	2008	37.3	-0.209	16.7	44.8	0.020	10.556	..	..
Philippines	2003	41.6	-0.227	17.2	41.3	0.019	12.273	0.002	-16.063
Philippines	1998	54.9	-0.190	19.3	35.2	0.019	10.265	..	..
Rwanda	2005	182.3	-0.070	44.1	24.2	0.020	3.530	0.002	-0.849
Rwanda	2000	206.7	-0.068	50.5	24.4	0.021	3.322	0.002	-28.081
Rwanda	1992	162.6	-0.005	47	28.9	0.026	0.176	..	..
Senegal	2005	135.1	-0.177	40.7	30.1	0.016	11.079	0.002	-9.299
Senegal	1997	139.4	-0.161	38	27.3	0.026	6.234	..	..
South Africa	1998	56.9	-0.216	19.2	33.7	0.028	7.656	..	..
Swaziland	2006-07	105.6	-0.015	23	21.8	0.037	0.404	..	..
Tanzania	2004-05	132.2	-0.066	33.8	25.6	0.020	3.322	0.002	-20.745
Tanzania	1999	161.1	-0.020	45.2	28.1	0.034	0.594	0.005	6.863
Tanzania	1996	144.8	-0.052	36.3	25.1	0.023	2.269	..	..
Togo	1998	143.8	-0.088	42.4	29.5	0.029	3.065	..	..
Turkey	1998	59.7	-0.167	27.9	46.7	0.028	5.904	..	..
Turkmenistan	2000	88.02	-0.079	32.9	37.4	0.031	2.566	..	..
Uganda	2000-01	156.8	-0.102	34.9	22.3	0.020	4.958	..	..
Ukraine	2007	19.8	-0.115	11.7	59.2	0.051	2.253	..	..
Uzbekistan	1996	55.2	-0.057	21.7	39.3	0.051	1.125	..	..
Vietnam	2002	32.9	-0.237	17.5	53.2	0.042	5.646	0.008	-9.669
Vietnam	1997	45.9	-0.159	22.2	48.4	0.039	4.085	..	..
Yemen	1997	121	-0.138	40.8	33.7	0.015	9.042	..	..
Zambia	2007	136.8	-0.005	36.4	26.6	0.025	0.203	0.003	24.607
Zambia	1996	192.1	-0.074	36.1	18.8	0.022	3.347	..	..
Zimbabwe	2005-2006	69.02	-0.035	21.3	30.9	0.027	1.296	0.003	10.094
Zimbabwe	1999	90.3	-0.067	26.2	29.0	0.031	2.150	0.004	-3.410
Zimbabwe	1994	75.9	-0.053	24.9	32.8	0.039	1.353	..	..

Source of raw data: DHS Statcompiler

Under-five and neonatal mortality rates over a ten-year period prior to the survey.

Concentration indices and changes over time in the concentration indices significant at

5% for t-test values above 1.96.