Child Health in West Bengal
Comparison with Other Regions in India

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There are few areas where the statistics are as dismal as child health in India. This paper analyses four interrelated child health indicators in West Bengal – child malnourishment (measured by the rates of stunting and wasting), prenatal, infant, and child mortality rates. It also provides evidence on how these rates vary with the gender of the child, parental education, and the wealth status of households. West Bengal does not fare badly on child health in relation to the all-India figures and does better than the rest of east India, but lags behind south India. Its performance on mortality rates is much better than India as a whole, and, quite significantly, compares favourably with those in south India. However, effective policy interventions are required to delink maternal health from child health and the importance of this cannot be overstated.

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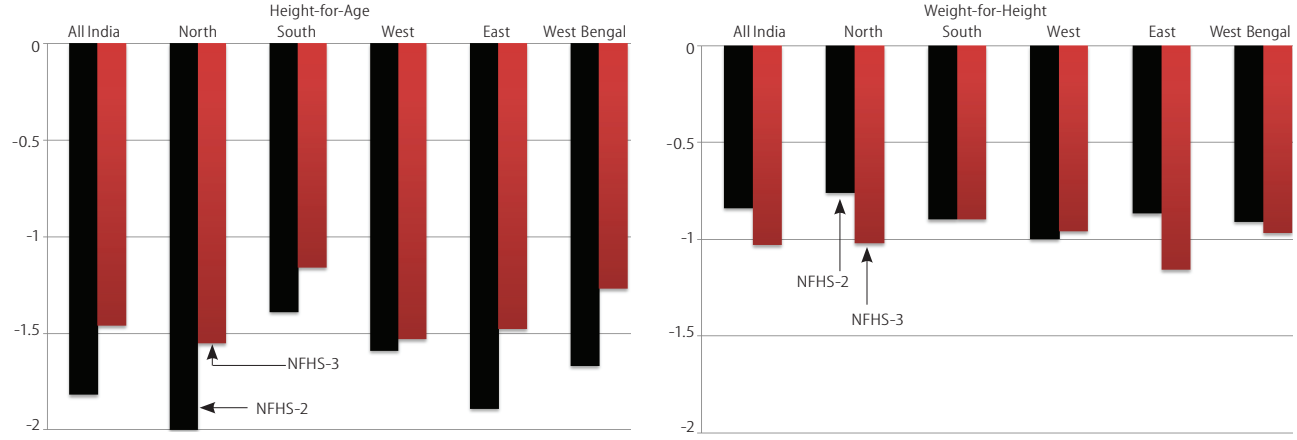
1 Introduction

India's economic performance during the latter half of the 1990s and the first half of the new millennium has been variously described as that of an "emerging economy" (Basu 2004) and, more colourfully, as that of an "emerging giant" (Panagariya 2008), a "partially awakening giant" (Chaudhuri and Ravallion 2007), and an "awakening giant" (Bardhan 2010).[1] The depiction of India as a "giant" of various descriptions is based on macro indicators such as gross domestic product (GDP) growth rates, growth of real income, and of foreign direct investment (FDI). However, the macro performance during this period did not match several other indicators such as measures of undernourishment and child health.

Nowhere is the mismatch more dramatic than in the case of child health. Notwithstanding an uninterrupted record of high growth rates over the past decade, India has recorded one of the worst performances on undernourishment and child health. Its child health statistics are not only worse than those in neighbouring countries in south Asia, but also those in many countries in sub-Saharan Africa, which are poorer than India.[2] According to the latest figures in "India: Malnutrition Report", available at the World Bank's South Asia website, 48% of children in India under the age of five are stunted, 43% are underweight, and more than one in four infants are born with a low birth weight. Ray and Sinha (2011) compare the state of health of young children, aged 0-3 years, between China, India, and Vietnam, and find that China and Vietnam easily outperform India on both stunting and wasting. They report that from 1992-93 to 2005-06 there was a marginal improvement in stunting in India with the proportion of stunted children dropping from 50.20% to 41.40%, but wasting remained virtually static at around 20% (ibid: Table 12). A true perspective of the dismal nature of these figures emerges when one notes that the rates in China were 21% for stunting and 6.50% for wasting. It is clear from current trends that India will not meet the Millennium Development Goal of halving the 1990 rates of child underweight. These figures are matched by equally dismal figures on maternal health.

Apart from the dismal nature of child and maternal health statistics, there are several other adverse effects of poor child health that should add to our concerns. For example, a study by Fishman et al (2004) based on longitudinal data found that for children aged less than five years having a low weight for

Figure 1: Mean Height-for-Age and Weight-for-Height Z-Scores (NFHS-2 and NFHS-3)



age (that is, being underweight) resulted in an increased risk of mortality, particularly from infectious diseases like diarrhoea and acute respiratory infection (ARI).[3] Poor health of infant children, if not corrected in the early days, tends to persist into adulthood and this, in turn, entails costs of low productivity on the economy. India also has a significant correlation between maternal health, as measured by a mother's body mass index (BMI), and child health.[4] As noted in Mishra and Ray (2012: Table 7), there is evidence of a negative association between the BMI of mothers and child wasting in India, but not in China. The strength of this association increased in India over 1998-99 to 2005-06, and reflected a policy failure to delink maternal health from that of offspring through nutrition programmes of antenatal and postnatal care. India did not have the nutrition programmes that China had in place. The failure was all the more striking over the period when India was recording impressive growth rates.

This study provides evidence on the state of child and maternal health in West Bengal and examines how it compares with other regions in India. The economics literature on child health in India is not as large as one would expect given its obvious importance.[5] The literature at the regional level on under-nutrition, and child and maternal health is still more limited. There is hardly any study that looks at the state of maternal and child health in West Bengal, let alone comparing it with that of other regions during the period of high growth.[6] West Bengal is a particularly interesting case since it was ruled by the Left Front throughout this period. While West Bengal has been given considerable credit for rural land reforms and several pro-poor policies in the early days of left rule, there has not been much effort to see if this has translated into improved health statistics. All policy failures cannot be attributed to changing political regimes. With the uninterrupted rule of more than three decades having come to an end recently, this is an appropriate time to take stock of the state's performance on important welfare indicators. Given the close association between child and maternal health, we look at these aspects in the context of West Bengal vis-à-vis the rest of India, and we do so in conjunction with infant mortality. Another distinct feature of this study is the evidence it provides on the effect of household wealth and mother's education on the anthropometric status of children. It investigates whether West Bengal's experience on the interaction between wealth/education and child/maternal health is in line with the rest of India.

The rest of the paper is organised as follows. Section 2 discusses the health measures and the data sets that have been used in this study. The results are presented and analysed in Section 3, while Section 4 concludes the paper.

2 Health Measures and Data

The three most commonly used measures of child health are height for age, weight for height, and weight for age.[7] Low values of these variables define, respectively, stunting, wasting, and underweight. The height for age is expressed as an z score defined as the difference between a child's height and that recommended for a child of that age divided by the standard error of height values. The weight for height is similarly measured by an z score defined as the difference between a child's weight and that recommended for a child with that height divided by the

Table 1: Height-for-Age and Weight-for-Height Z-Scores (NFHS-2 and NFHS-3)

	Height-for-Age Z-Scores			Weight-for-Height Z-Scores		
	NFHS-2	NFHS-3	Difference (NFHS-2 – NFHS-3)	NFHS-2	NFHS-3	Difference (NFHS-2 – NFHS-3)
All India	-1.82	-1.46	-0.35***	-0.84	-1.03	0.18***
North	-2.00	-1.55	-0.46***	-0.76	-1.02	0.26***
South	-1.39	-1.16	-0.24***	-0.90	-0.90	-0.01
West	-1.59	-1.53	-0.06	-1.00	-0.96	-0.04
East	-1.89	-1.48	-0.41***	-0.87	-1.16	0.29***
West Bengal	-1.67	-1.27	-0.39***	-0.91	-0.97	0.07

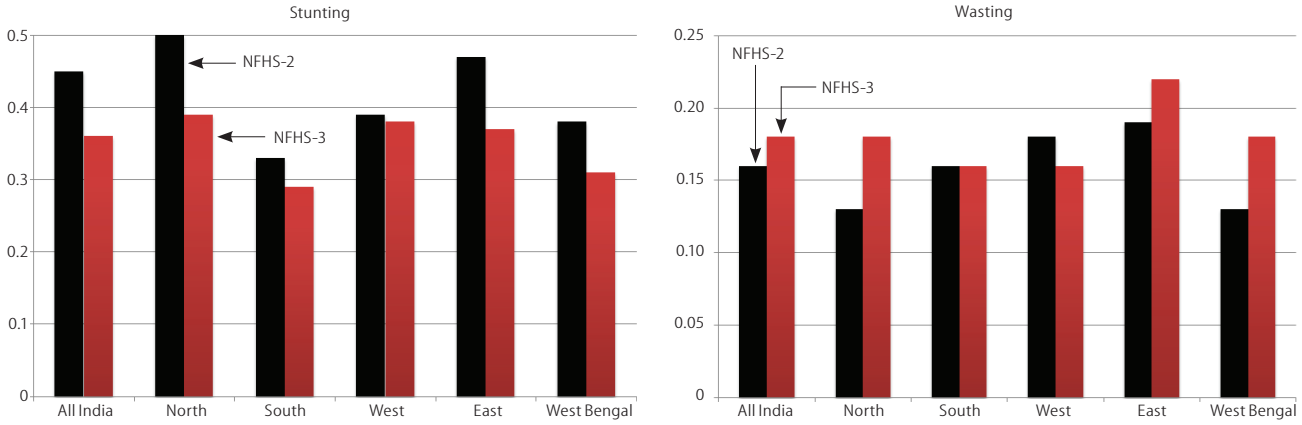
Improvement is associated with a negative difference.
***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

Table 2: Stunting and Wasting Rates (NFHS-2 and NFHS-3)

	Stunting			Wasting		
	NFHS-2	NFHS-3	Difference (NFHS-2 – NFHS-3)	NFHS-2	NFHS-3	Difference (NFHS-2 – NFHS-3)
All India	0.45	0.36	0.09***	0.16	0.18	-0.03***
North	0.50	0.39	0.12***	0.13	0.18	-0.05***
South	0.33	0.29	0.04***	0.16	0.16	-0.01
West	0.39	0.38	0.01	0.18	0.16	0.02**
East	0.47	0.37	0.10***	0.19	0.22	-0.02**
West Bengal	0.38	0.31	0.07***	0.13	0.18	-0.05***

Improvement is associated with a positive difference; stunting defined by height-for-age z-score < -2; wasting defined by weight-for-height z-score < -2.
***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$

Figure 2: Proportion of Stunted and Wasted Children (NFHS-2 and NFHS-3)



standard error. Traditionally, the recommended norm has been based on anthropometric data collected in the US by the National Center for Health Statistics (NCHS). In response to criticism of basing the norm on the health data of US children, in recent years the World Health Organisation (WHO) has based the norm on a more representative sample. Children whose z scores for height for age and weight for height fall below –2 are considered to be stunted and wasted, respectively. While height for age is a measure of the long-run health status of a child, weight for height and weight for age are measures of the short-term health status. Economists have usually taken the weight measures more seriously since low weight is regarded as exposing a child to death.[8] A child is said to be undernourished if her/his z score is less than –2, and severely undernourished if her/his z score is less than –3. A child's status on undernourishment will depend on the z score that is being used. Svedberg (2000) argues that the reliance on only one measure will lead to an underestimate of undernourishment since it misses children who are considered undernourished by other indices. He proposes a composite index of anthropometric failure (CIAF) that incorporates all undernourished children, be they wasted and/or stunted and/or underweight. Nandy et al (2005) have shown that the use of a CIAF for India suggests that 59.8% of children in 1998-99 were undernourished, while 45.2%, 15.9%, and 47.1% of children were stunted, wasted, and underweight, respectively. In this study, however, we follow the tradition of using the conventional measures of stunting and wasting to measure undernutrition.

Neonatal mortality (NM) is defined as the number of deaths during the first 28 days of life per 1,000 live births in a given year or period. Mortality during the neonatal period is considered a good indicator of both maternal and newborn health and care. Infant mortality (IM) is defined as the number of deaths (1 year of age or younger) per 1,000 live births. IM reflects the state of medical services at the time of the birth of the child. Child mortality (CM) is defined as the number of deaths of children (5 years of age or younger) per 1,000 live births.

This study is based on the information contained in the second and third rounds of the National Family Health Surveys (NFHS-2 and NFHS-3). The NFHS-2 was conducted in 1998-99 in 26 states of India, gathering extensive information on population, health, and nutrition, with an emphasis on women and young children. The NFHS-3 was carried out in 2005-06 with added information on the anaemic status of children. We take advantage of the disaggregated information by states to pay special attention to the nutritional status of women and infant children in West Bengal over the period spanned by the NFHS-2 and NFHS-3, and compare the state's performance with those in the rest of India. The NFHS data sets also provide information

Table 3: Stunting and Wasting for Different Population Subgroups, Comparing West Bengal to Major States in India

	All India (Major States)			West Bengal		
	NFHS-2	NFHS-3	Difference	NFHS-2	NFHS-3	Difference
Panel A: Stunting						
Male	0.44	0.36	0.08***	0.34	0.30	0.04
Female	0.46	0.37***	0.10***	0.43	0.32	0.11***
Rural	0.49	0.40	0.09***	0.45	0.38	0.09***
Urban	0.35	0.30	0.05***	0.25	0.23	0.03
Hindu	0.46	0.37	0.09***	0.34	0.27	0.07***
Other religion	0.42	0.36	0.06***	0.48	0.37	0.11***
Wealth quintile 1	0.57	0.50	0.08***	0.58	0.45	0.14***
Wealth quintile 2	0.53	0.45	0.08***	0.43	0.36	0.08*
Wealth quintile 3	0.48	0.38	0.10***	0.35	0.28	0.07
Wealth quintile 4	0.40	0.32	0.08***	0.29	0.23	0.06
Wealth quintile 5	0.26	0.19	0.07***	0.09	0.10	-0.00
Mother: No education	0.54	0.47	0.08***	0.54	0.39	0.15***
Mother:Primary school	0.45	0.39	0.06***	0.41	0.37	0.04
Mother: Secondary school	0.31	0.26	0.04***	0.18	0.20	-0.02
Panel B: Wasting						
Male	0.16	0.19	-0.03***	0.14	0.17	-0.03
Female	0.15	0.18	-0.02***	0.12	0.18	-0.06***
Rural	0.16	0.19	-0.03***	0.14	0.20	-0.06***
Urban	0.13	0.16	-0.03***	0.11	0.14	-0.03
Hindu	0.16	0.19	-0.03***	0.13	0.17	-0.04**
Other religion	0.14	0.17	-0.03***	0.14	0.20	-0.06**
Wealth quintile 1	0.21	0.24	-0.02***	0.20	0.22	-0.02
Wealth quintile 2	0.18	0.21	-0.03***	0.11	0.23	-0.11***
Wealth quintile 3	0.16	0.18	-0.02**	0.12	0.13	-0.01
Wealth quintile 4	0.13	0.16	-0.03***	0.11	0.12	-0.01
Wealth quintile 5	0.10	0.13	-0.03***	0.07	0.14	-0.07**
Mother: No education	0.18	0.21	-0.03***	0.16	0.23	-0.07**
Mother:Primary school	0.16	0.20	-0.04***	0.15	0.15	-0.00
Mother: Secondary school	0.12	0.15	-0.03***	0.09	0.15	-0.06**

***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

on the educational status of mothers and the wealth status of households. These are used to provide evidence on whether maternal education and household affluence have any impact on a child's health status.

3 Results

Figure 1 (p 51) compares the average z-scores of children (0-3 years) in West Bengal with that in India as a whole and in the country's four major regions.[9] Figure 2 (p 52) presents and compares the stunting and wasting rates between the various regions in India, with special attention to how West Bengal fares in comparison to the rest of the country. It is clear that along with the rest of India, West Bengal experienced an improvement in child stunting and a worsening in child wasting during 1998-99 to 2005-06. Neither in terms of stunting nor wasting does West Bengal fare any worse than the all-India average. Indeed, it fares much better than the rest of east India on stunting, though less so on wasting. South India fares the best among the regions, especially on stunting, while east and north India fare the worst.

Table 4: Neonatal, Infant, and Child Mortality Rates for NFHS-2 and NFHS-3

	Neonatal Mortality			Infant Mortality			Child Mortality		
	NFHS-2	NFHS-3	Difference	NFHS-2	NFHS-3	Difference	NFHS-2	NFHS-3	Difference
All India	0.045	0.040	0.005***	0.075	0.060	0.015***	0.091	0.070	0.021***
North	0.051	0.044	0.006***	0.088	0.069	0.019***	0.106	0.081	0.025***
South	0.037	0.032	0.005**	0.054	0.045	0.009***	0.064	0.050	0.014***
West	0.036	0.037	-0.001	0.054	0.050	0.004	0.065	0.056	0.009***
East	0.045	0.041	0.004*	0.072	0.061	0.011***	0.090	0.074	0.016***
West Bengal	0.030	0.036	-0.005	0.049	0.049	0.001	0.060	0.057	0.003

***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

Table 3 (p 52) presents a more disaggregated picture of the extent of malnutrition, captured by the stunting and wasting rates by gender, rural/urban, wealth quintile, and mother's education. In West Bengal, there is a gender divide in child stunting (against girls) in NFHS-2, but this pro-male bias appears to have diminished over 1998-99 to 2005-06 (and is not statistically significant in NFHS-3). Rural children do much worse than urban children in stunting in West Bengal, but not in child wasting. This essentially implies that the long-term health of children is considerably worse in rural areas compared to that in urban areas. Both stunting and wasting rates diminish as households become richer. We find evidence of a strong wealth effect in that both stunting and wasting rates decline as we move up the scale of wealth distribution. There is a large reduction in the stunting rate from Q4 to Q5 – it drops from 29% to 9% in NFHS-2 and from 23% to 10% in NFHS-3. The drop is not as dramatic in the case of wasting, but even here there is a large wealth effect.

Mother's education has strong and positive effects on the health of children. Here as well, the effect is monotonic and the effect of mother's education on the health of children is stronger in West Bengal compared to India as a whole. For example, in West Bengal, NFHS-2 records a sharp drop in child stunting rates between children of mothers with no education (54%) and those with secondary education (18%). At the all-India level, the corresponding stunting rates decrease from 54% to 31%. In contrast to stunting, the decrease in wasting rates with increased education of mother is much less. In West Bengal, NFHS-3 records no change in the wasting rates (15%) between primary and secondary educated mothers, though there was a noticeable drop in NFHS-2 from 15% to 9%. Two further (and interesting) observations are, one, the improvement in child stunting in West Bengal is statistically significant in the bottom three quintiles (Q1, Q2 and Q3), but not in the top two wealth quintiles (Q4 and Q5). Two, the improvement in child stunting in West Bengal between 1998-99 and 2005-06 took place only in

Figure 3: Neonatal, Infant and Child Mortality

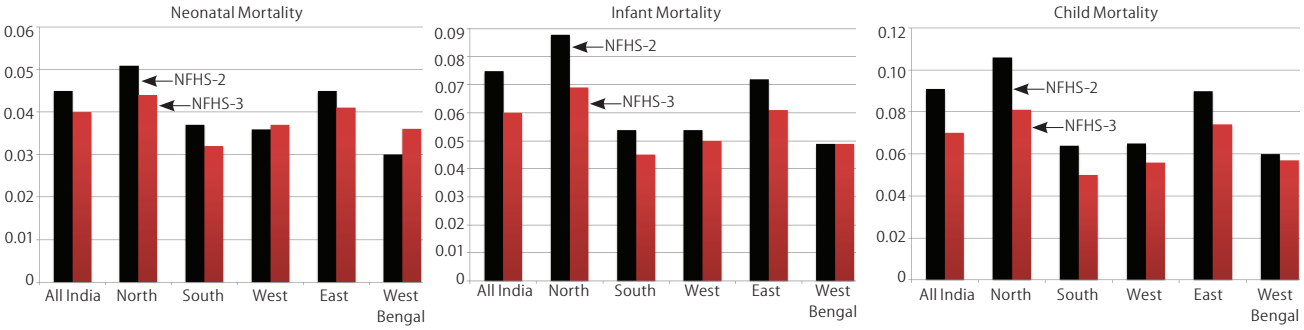


Table 1 (p 51) presents the height for age and the weight for height z-scores (HAZ and WHZ) in the various regions, along with that in West Bengal and the country as a whole. Table 2 (p 51) presents the corresponding rates for child stunting and wasting in the last two rounds of the NFHS. These tables confirm the pictures in Figures 1 and 2, showing a statistically significant improvement in child stunting in most regions, including West Bengal, and a statistically significant worsening in child wasting in most regions, again including West Bengal. The improvement in stunting and the deterioration in wasting in West Bengal during the most recent period, 1998-99 to 2005-06, was highly significant (at 1% significance level), consistent with the all-India picture. Note, however, from Table 2 that in terms of magnitude West Bengal's improvement in stunting was lower than that in the east region as a whole, but the deterioration in wasting outstripped that in the east region and in India as a whole.

Table 5: Neonatal, Infant, and Child Mortality for the Different Population Subgroups, Comparing West Bengal to the Major States of India

	All India (Major States)			West Bengal		
	NFHS-2	NFHS-3	Difference	NFHS-2	NFHS-3	Difference
Panel A: Neonatal Mortality						
Male	0.048	0.042	0.006***	0.034	0.047	-0.013**
Female	0.042	0.038	0.005***	0.027	0.024	0.003
Urban	0.032	0.032	0.000	0.016	0.029	-0.012**
Rural	0.050	0.045	0.004***	0.038	0.040	-0.003
General caste	0.038	0.040	-0.002	0.028	0.036	-0.008*
Hindu	0.048	0.042	0.006***	0.029	0.035	-0.006
Muslim	0.036	0.036	0.000	0.034	0.039	-0.005
Other religion	0.031	0.028	0.002	0.030	0.000	0.030
Mother's education no	0.042	0.042	0.000	0.035	0.042	-0.006
Mother's education primary	0.031	0.032	-0.001	0.020	0.033	-0.013*
Mother's education secondary	0.022	0.016	0.006**	0.007	0.000	0.007
Father's education no	0.055	0.048	0.007***	0.040	0.041	-0.001
Father's education primary	0.053	0.047	0.005*	0.032	0.040	-0.008
Father's education secondary	0.039	0.037	0.002	0.026	0.032	-0.006
Father's education higher secondary	0.033	0.024	0.008***	0.017	0.018	-0.001
Wealth quintile: lowest	0.060	0.054	0.006**	0.039	0.038	0.001
Wealth quintile: second	0.051	0.047	0.004*	0.040	0.038	0.002
Wealth quintile: middle	0.048	0.041	0.007***	0.031	0.045	-0.013
Wealth quintile: fourth	0.036	0.036	0.000	0.018	0.041	-0.023***
Wealth quintile: highest	0.025	0.024	0.001	0.015	0.012	0.003
Panel B: Infant Mortality						
Male	0.075	0.061	0.014***	0.054	0.059	-0.005
Female	0.075	0.059	0.016***	0.044	0.038	0.007
Urban	0.050	0.047	0.003	0.032	0.042	-0.010
Rural	0.083	0.068	0.015***	0.058	0.053	0.005
General caste	0.064	0.060	0.004**	0.043	0.049	-0.005
Hindu	0.079	0.062	0.017***	0.048	0.047	0.001
Muslim	0.061	0.056	0.005*	0.052	0.052	0.000
Other religion	0.048	0.040	0.008*	0.061	0.000	0.061*
Mother's education no	0.068	0.063	0.005	0.053	0.056	-0.003
Mother's education primary	0.045	0.043	0.002	0.029	0.044	-0.015*
Mother's education secondary	0.029	0.020	0.009***	0.018	0.000	0.018**
Father's education no	0.095	0.077	0.018***	0.068	0.060	0.009
Father's education primary	0.085	0.071	0.014***	0.047	0.051	-0.004
Father's education secondary	0.064	0.052	0.012***	0.042	0.043	-0.001
Father's education higher secondary	0.047	0.033	0.014***	0.028	0.023	0.005
Wealth quintile: lowest	0.104	0.081	0.023***	0.061	0.051	0.011
Wealth quintile: second	0.088	0.074	0.013***	0.064	0.056	0.008
Wealth quintile: middle	0.079	0.063	0.016***	0.056	0.055	0.000
Wealth quintile: fourth	0.055	0.052	0.003	0.029	0.055	-0.026***
Wealth quintile: highest	0.036	0.032	0.004**	0.024	0.019	0.005
Panel C: Child Mortality						
Male	0.088	0.068	0.019***	0.063	0.067	-0.004
Female	0.094	0.071	0.023***	0.057	0.046	0.011
Urban	0.059	0.053	0.006***	0.038	0.047	-0.010
Rural	0.101	0.080	0.021***	0.071	0.063	0.008
General caste	0.074	0.070	0.005***	0.053	0.057	-0.004
Hindu	0.096	0.072	0.024***	0.056	0.052	0.004
Muslim	0.074	0.066	0.008**	0.069	0.066	0.003
Other religion	0.058	0.044	0.013***	0.061	0.000	0.061*
Mother's education no	0.079	0.071	0.008**	0.060	0.061	-0.001
Mother's education primary	0.049	0.046	0.003	0.031	0.045	-0.013
Mother's education secondary	0.031	0.022	0.009***	0.018	0.004	0.014
Father's education no	0.120	0.094	0.026***	0.093	0.077	0.016
Father's education primary	0.104	0.083	0.021***	0.057	0.056	0.001
Father's education secondary	0.075	0.059	0.016***	0.045	0.046	-0.001
Father's education higher secondary	0.053	0.035	0.017***	0.028	0.026	0.002
Wealth quintile: lowest	0.131	0.100	0.031***	0.075	0.068	0.007
Wealth quintile: second	0.110	0.089	0.021***	0.083	0.061	0.022*
Wealth quintile: middle	0.093	0.072	0.022***	0.063	0.062	0.001
Wealth quintile: fourth	0.063	0.056	0.006**	0.034	0.059	-0.025**
Wealth quintile: highest	0.040	0.034	0.006***	0.025	0.022	0.003

***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

households where the mother had no education. This contrasts sharply with the all-India result, which records improvement in stunting for children regardless of the level of mother's education.

The neonatal, infant, and child mortality rates in the two NFHS rounds, at the all-India level and disaggregated by regions along with those in West Bengal, are reported in Table 4 (p 53). The all-India figures show a statistically significant improvement (that is, decline) in all the three mortality rates between 1998-99 and 2005-06, as do north, south, and east India. However, West Bengal is an exception. There was no noticeable change in either neonatal or infant mortality rates, and a very weak improvement in child mortality during this period. The silver lining was that for all three types of mortality, the rates in West Bengal were much lower than in the country as a whole. It is interesting to note that while the south outperformed the rest of the country, especially West Bengal, on child health, the neonatal, infant and child mortality rates in the south were no better than in West Bengal, even marginally worse. This suggests that while the quality of medical services in the form of neonatal and postnatal care in West Bengal compared quite favourably with the rest of the country, recording some of the lowest mortality rates in all three categories, the same cannot be said of the state of child health in West Bengal vis-à-vis the rest of India, especially south India.

Figure 3 (p 53) confirms the picture in Table 4. It shows that the mortality rates in West Bengal are no worse than in the rest of India. Most significantly, they are marginally better than in south India, which reverses the result on child health. Note, however, that while the south witnessed a sharp improvement in mortality rates during the period spanned by the NFHS-2 and NFHS-3, there was hardly any change in West Bengal. There was even a small increase in neonatal mortality rates in West Bengal.

Table 5 presents neonatal, infant, and child mortality rates, disaggregated by gender of the child, area of residence, religion, parental education, and the wealth quintile to which the household belongs. It allows a comparison of the performances of West Bengal with the rest of India. The following features are worth noting.

(a) West Bengal has a gender divide in all the three types of mortality rates in the NFHS-3, unlike the rest of India, with boys recording much higher mortality rates. Table 5 suggests that the gender disparity in West Bengal increased between the NFHS-2 and NFHS-3. This observation needs to be qualified by noting that the NFHS does not provide information of deaths of children in the mother's womb. So these results are likely to be biased and should be treated with caution.

(b) West Bengal is one of the best performers on all the three mortality rates, as already noted from Table 4.

Table 6: Child Anthropometric Status in West Bengal

	(1) HAZ OLS WB	(2) WHZ OLS WB	(3) Stunted Probit Marginal Effect WB	(4) Wasted Probit Marginal Effect WB
Male	0.060	-0.031	-0.043**	0.013
	(0.057)	(0.045)	(0.022)	(0.015)
Age of child: 7-12	-0.451***	-0.426***	0.111**	0.068*
	(0.105)	(0.092)	(0.048)	(0.036)
Age of child: 13-18	-0.927***	-0.711***	0.327***	0.159***
	(0.110)	(0.093)	(0.047)	(0.042)
Age of child: 19-24	-1.225***	-0.810***	0.431***	0.209***
	(0.117)	(0.098)	(0.046)	(0.049)
Age of child: 25-29	-0.827***	-0.753***	0.248***	0.112***
	(0.113)	(0.092)	(0.050)	(0.041)
Age of child: 30-36	-1.054***	-0.748***	0.334***	0.099**
	(0.130)	(0.096)	(0.053)	(0.045)
Number of sisters	0.012	-0.062	0.001	0.026*
	(0.065)	(0.046)	(0.023)	(0.014)
Number of brothers	-0.040	0.029	0.028	0.004
	(0.067)	(0.047)	(0.024)	(0.016)
Birth weight low	-0.355***	-0.134**	0.130***	0.045**
	(0.071)	(0.055)	(0.027)	(0.019)
Birth order=2	-0.012	-0.034	-0.034	-0.009
	(0.089)	(0.070)	(0.033)	(0.023)
Birth order=3	-0.168	0.012	0.016	-0.046
	(0.138)	(0.104)	(0.051)	(0.029)
Birth order=4	-0.366*	0.093	0.026	-0.073**
	(0.192)	(0.136)	(0.069)	(0.035)
Age of mother at birth: 20-24	0.210***	-0.146**	-0.055*	0.034
	(0.076)	(0.061)	(0.029)	(0.021)
Age of mother at birth: 25-29	0.227**	-0.094	-0.044	0.054*
	(0.103)	(0.077)	(0.036)	(0.030)
Age of mother at birth: 30-34	0.312**	-0.031	-0.065	0.089*
	(0.140)	(0.124)	(0.047)	(0.047)
Age of mother at birth: 35 or higher	0.403*	-0.063	-0.144**	0.063
	(0.234)	(0.167)	(0.062)	(0.066)
Mother's education primary schooling	-0.029	0.062	0.005	-0.026
	(0.084)	(0.062)	(0.030)	(0.020)
Mother's education secondary or higher	0.111	0.069	-0.077**	-0.034
	(0.090)	(0.074)	(0.033)	(0.023)
Mother is wife of the household head	0.188***	0.030	-0.075***	-0.018
	(0.062)	(0.051)	(0.024)	(0.016)
Father's education primary schooling	-0.028	0.112*	-0.004	-0.022
	(0.087)	(0.066)	(0.030)	(0.020)
Father's education secondary or higher	0.086	0.127*	-0.055*	-0.021
	(0.091)	(0.073)	(0.032)	(0.023)
Know ORS	0.084	-0.037	-0.016	0.007
	(0.074)	(0.056)	(0.027)	(0.019)
Use ORS	-0.069	-0.302**	0.001	0.043
	(0.144)	(0.148)	(0.052)	(0.055)
Wealth quintile: lowest	-0.813***	-0.355**	0.313***	0.057
	(0.171)	(0.148)	(0.077)	(0.053)
Wealth quintile: second	-0.672***	-0.349***	0.234***	0.044
	(0.151)	(0.135)	(0.073)	(0.048)
Wealth quintile: middle	-0.443***	-0.195	0.166**	0.002
	(0.136)	(0.120)	(0.068)	(0.040)
Wealth quintile: fourth	-0.342***	-0.029	0.175***	-0.007
	(0.104)	(0.098)	(0.055)	(0.031)
Has radio	-0.090	0.066	0.012	-0.018
	(0.065)	(0.053)	(0.026)	(0.017)
Has television	0.018	-0.067	-0.057*	0.044*
	(0.087)	(0.076)	(0.034)	(0.026)
Has access to pipe water	0.195*	0.036	-0.007	0.029
	(0.106)	(0.095)	(0.046)	(0.031)
Hindu	0.006	0.124**	-0.052*	-0.042**
	(0.075)	(0.057)	(0.028)	(0.019)
Other caste	-0.022	0.088*	-0.016	-0.022
	(0.067)	(0.051)	(0.025)	(0.017)
Month of measurement: February	-0.041	-0.193***	0.032	0.073***
	(0.083)	(0.067)	(0.033)	(0.026)
Month of measurement: March	-0.229**	0.073	0.076**	0.014
	(0.090)	(0.072)	(0.035)	(0.024)
Month of measurement: April	-0.011	-0.069	0.045	0.017
	(0.119)	(0.092)	(0.047)	(0.033)
Month of measurement: May	-0.578	0.672	0.181	
	(0.751)	(0.425)	(0.293)	
Month of measurement: December	-0.019	-0.068	-0.004	0.001
	(0.088)	(0.071)	(0.034)	(0.024)
Child was breastfeed for 6 to 24 months	0.118	0.203**	-0.052	-0.069***
	(0.119)	(0.083)	(0.037)	(0.022)
Child was given: water	-0.163*	0.053	0.050	-0.029
	(0.087)	(0.072)	(0.034)	(0.027)
Child was given: milk	0.084	0.011	-0.039	0.012
	(0.067)	(0.053)	(0.025)	(0.017)
Child was given: green vegetables	-0.056	-0.132**	0.039	0.025
	(0.069)	(0.053)	(0.025)	(0.018)
Child was given: fruit	0.184**	-0.050	-0.056**	-0.004
	(0.072)	(0.057)	(0.027)	(0.019)
Onset of breastfeeding: 1h or less	0.265*	-0.141	-0.081	0.020
	(0.149)	(0.120)	(0.050)	(0.043)
Onset of breastfeeding: 1h to 1 day	0.297**	-0.173	-0.058	0.054
	(0.147)	(0.119)	(0.052)	(0.042)
Onset of breastfeeding: more than 1 day	0.322**	-0.138	-0.077	0.030
	(0.149)	(0.120)	(0.051)	(0.042)
At least 1 household member smokes	-0.072	0.055	0.034	0.007
	(0.063)	(0.051)	(0.025)	(0.017)
Mother's BMI: <16.5	-0.086	-0.366***	0.018	0.137***
	(0.088)	(0.073)	(0.033)	(0.030)
Mother's BMI: 16.5 to 18.5	-0.120*	-0.272***	0.041	0.068***
	(0.070)	(0.053)	(0.025)	(0.019)
Mother's BMI: 25 to 30	0.081	0.158	-0.031	-0.035
	(0.126)	(0.132)	(0.062)	(0.036)
Mother's BMI: >30	0.639*	0.586**	-0.092	
	(0.357)	(0.291)	(0.161)	
Mother's anaemia level: mild	0.024	0.060	-0.009	-0.020
	(0.070)	(0.058)	(0.026)	(0.017)
Mother's anaemia level: moderate	-0.173**	-0.082	0.043	-0.014
	(0.083)	(0.062)	(0.032)	(0.021)
Mother's anaemia level: severe	0.089	-0.164	-0.084	0.062
	(0.202)	(0.180)	(0.078)	(0.078)
Mother's anaemia level: missing	0.007	0.195	-0.015	-0.060
	(0.213)	(0.186)	(0.077)	(0.040)
Diarrhoea		0.127		-0.021
		(0.112)		(0.033)
Rural	0.112	0.145**	-0.046	0.003
	(0.097)	(0.072)	(0.036)	(0.025)
Year: 2005	0.404***	-0.025	-0.079***	0.050***
	(0.072)	(0.059)	(0.028)	(0.019)
Constant	-0.807***	-0.077		
	(0.281)	(0.230)		
Observations	2,178	2,186	2,178	2,164

Robust standard errors in parenthesis; OLS: ordinary least squares; WB: West Bengal.
*** p < 0.01, ** p <0.05, * p <0.1.

(c) There are strong wealth and maternal education effects on mortality rates in West Bengal, though the wealth effect does not seem to be felt until the third quintile. The superior performance of West Bengal on mortality is also seen from that in each wealth quintile, or for each category of mother's education, the mortality rates in West Bengal are well below the all-India figures.

The summary measures of child health and the mortality rates presented in Tables 1 to 5 do not show the effect of parental and household characteristics on them since they do not control for variables other than the ones we are interested in. Such evidence for West Bengal is presented in Tables 6 (p 55) and Table 7, which report the regression estimates of the coefficients of the various determinants of child health (Table 6) and of the three mortality indicators (Table 7). Table 6 also reports the probit estimates of stunting and wasting in West Bengal. The following features are worth noting.

(a) Stunting and wasting are prevalent at all ages of a child. In other words, once stunting or wasting have set in, it is difficult to reverse the process.

(b) Contrary to the summary results discussed earlier, the regression results suggest that parental education does not have an effect on child health at all levels of education. Mother's primary schooling and father's secondary or post-secondary education help to reduce stunting, but have no effect on wasting.

(c) The wealth effect on child health is much stronger than parental education. However, between the two measures of child health, the wealth effect on stunting is strong and significant, and contrasts with the weak and insignificant wealth effect on child wasting.

(d) Children of malnourished mothers (with low BMI) are at much greater risk of wasting, but not from stunting. In other words, in the short run, a child born to a malnourished mother is at risk of dying due to underweight, but once the child survives, the effect on the child's long-run health weakens in both size and significance.

If we look at Table 7 the following inferences can be made:

(a) A male child in West Bengal is at much greater risk of dying than a female child on all the three mortality indicators.

(b) Mother's secondary education, but not father's, reduces the risk of child death on all three indicators. In the case of the father, education helps to reduce child mortality, but not neonatal or infant mortality. The policy message is clear – the authorities should target mothers for improved education to reduce neonatal mortality rates. But the strategy should switch to bringing in the father as well to reduce infant and child mortality.

(c) In contrast to parental education, parental wealth has no effect on any of the three mortality rates in West Bengal. This is in sharp contrast to the results in the context of child health, where we found that the wealth effect dominates the effect of parental education.

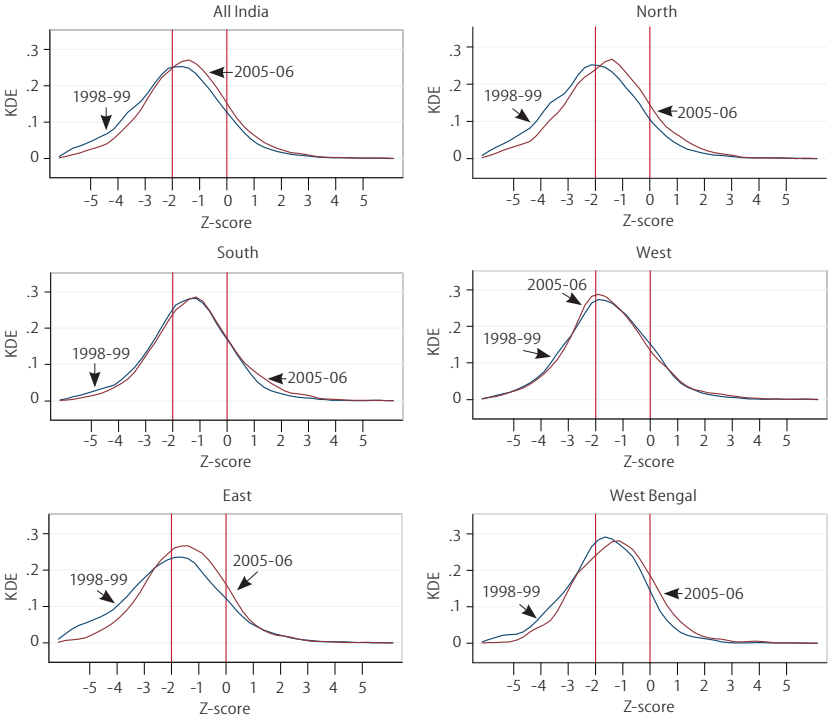
Returning to child health, Figure 4 (p 57) shows the distribution of the z scores for height for age (Panel A) and weight for height (Panel B) and the movement in the distributions over the period considered in this study. They are in line with the estimates presented in Tables 1 and 2.

Table 7: Neonatal Mortality, Infant Mortality, and Child Mortality in West Bengal

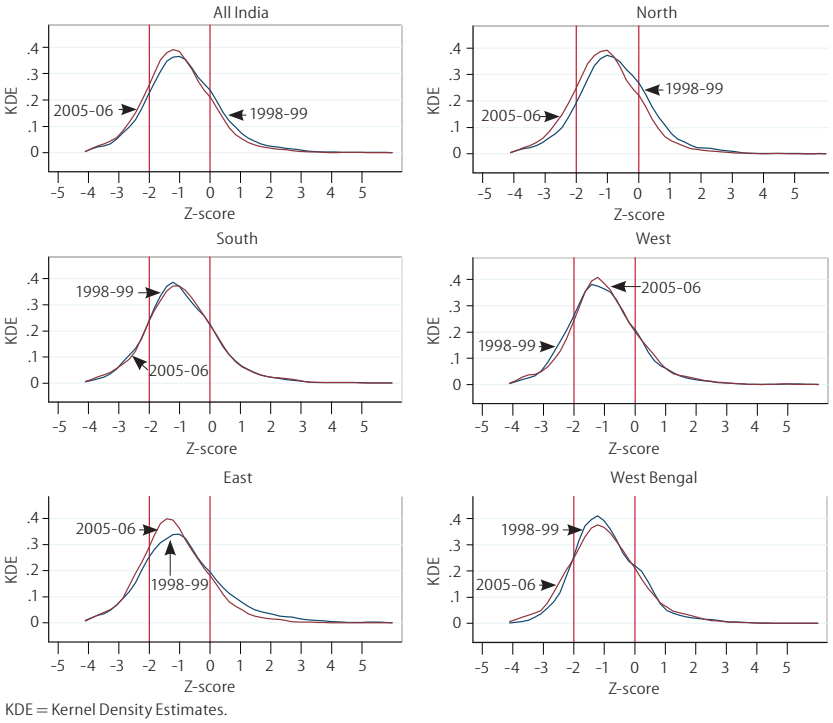
	(1) Neonatal Mortality	(2) Infant Mortality	(3) Child Mortality
Male	0.014***	0.015***	0.012***
	(0.004)	(0.004)	(0.005)
Year of birth = 1991	0.016	0.012	0.010
	(0.014)	(0.014)	(0.015)
Year of birth = 1992	0.017	0.014	0.009
	(0.015)	(0.015)	(0.015)
Year of birth = 1993	0.012	0.017	0.012
	(0.014)	(0.016)	(0.015)
Year of birth = 1994	0.029	0.017	0.017
	(0.018)	(0.016)	(0.016)
Year of birth = 1995	-0.001	0.007	0.003
	(0.012)	(0.015)	(0.014)
Year of birth = 1996	0.003	-0.009	-0.017
	(0.012)	(0.012)	(0.011)
Year of birth = 1997	0.003	-0.013	-0.023**
	(0.011)	(0.010)	(0.009)
Year of birth = 1998	-0.002	-0.008	-0.022**
	(0.010)	(0.011)	(0.010)
Year of birth = 1999	-0.008	-0.026***	-0.037***
	(0.010)	(0.009)	(0.008)
Year of birth = 2000	-0.009	-0.020*	-0.030***
	(0.010)	(0.011)	(0.010)
Year of birth = 2001	-0.001	-0.012	-0.027***
	(0.013)	(0.013)	(0.010)
Year of birth = 2002	-0.002	-0.012	-0.029***
	(0.012)	(0.013)	(0.010)
Year of birth = 2003	0.005	-0.014	-0.028***
	(0.015)	(0.012)	(0.010)
Year of birth = 2004	-0.003	-0.021**	-0.036***
	(0.013)	(0.011)	(0.008)
Year of birth = 2005	-0.006	-0.025***	-0.040***
	(0.011)	(0.009)	(0.007)
Year of birth = 2006		-0.026	-0.040***
		(0.020)	(0.015)
Age of mother at birth (16-20)	-0.018***	-0.026***	-0.030***
	(0.007)	(0.009)	(0.010)
Age of mother at birth (21-25)	-0.026***	-0.033***	-0.038***
	(0.007)	(0.009)	(0.010)
Age of mother at birth (26-30)	-0.027***	-0.035***	-0.037***
	(0.005)	(0.007)	(0.008)
Age of mother at birth (31-36)	-0.019***	-0.032***	-0.033***
	(0.005)	(0.006)	(0.008)
Age of mother at birth (37 or higher)	-0.020***	-0.018	-0.008
	(0.006)	(0.012)	(0.015)
Urban	-0.008*	-0.003	-0.003
	(0.005)	(0.006)	(0.007)
Hindu	0.010	0.006	0.014
	(0.018)	(0.019)	(0.021)
Muslim	0.010	0.002	0.016
	(0.022)	(0.020)	(0.024)
Mother's education primary schooling	-0.005	-0.010	-0.013*
	(0.005)	(0.006)	(0.007)
Mother's education secondary or higher	-0.025***	-0.033***	-0.036***
	(0.005)	(0.007)	(0.009)
Father's education primary schooling	-0.003	-0.011**	-0.019***
	(0.005)	(0.005)	(0.005)
Father's education secondary schooling	-0.004	-0.009	-0.018***
	(0.005)	(0.006)	(0.006)
Father's education higher secondary	0.002	-0.002	-0.013
	(0.010)	(0.011)	(0.011)
Wealth quintile: lowest	0.006	0.015	0.019
	(0.011)	(0.014)	(0.015)
Wealth quintile: second	0.008	0.023	0.027*
	(0.011)	(0.015)	(0.016)
Wealth quintile: middle	0.012	0.023	0.024
	(0.011)	(0.014)	(0.015)
Wealth quintile: fourth	0.011	0.016	0.018
	(0.010)	(0.012)	(0.013)
Year: 2005	0.015**	0.023**	0.036***
	(0.008)	(0.010)	(0.011)
Observations	8,533	8,571	8,571

Robust standard errors in parenthesis.
*** p< 0.01, ** p<0.05, * p<0.1.

Figure 4: Distribution of Height-for-Age and Weight-for-Height Z-Scores



KDE = Kernel Density Estimates.



KDE = Kernel Density Estimates.

4 Conclusions

With the change of regime in West Bengal, there is a need to look at various aspects of the quality of living in the state. An essential element of the quality of living is the state of child health. The topic has acquired considerable importance in the development literature (see, for example, Dasgupta 1995). Apart from that, good health has an intrinsic value of its own, it also has an instrumental value in enabling an individual to realise her/his full capability and contribute effectively to society. This is particularly true of child health. It is now well accepted that malnourishment in the very early days of childhood, unless addressed and reversed, is likely to persist into adulthood. In the case of female children, this may translate into malnourished maternal health, and that in turn may be passed on to the health of the offspring.

The state of child health in India has recently attracted considerable attention because this is one area where the figures are truly dismal. What are the differences, if any, between the various regions in India on child health? There is not much evidence on this. This study attempts to provide it, paying special attention to the state of West Bengal. The analysis looks at the interrelated areas of child health and child mortality rates. There are some features that deserve mention.

First, the state of child health in West Bengal is no better or worse than the rest of India as a whole. It is a better performing state than the other states in east India. However, West Bengal, in common with several other states, lags behind south India. Second, West Bengal shares the paradoxical result (reported recently for all India in Maitra et al 2012) that while there has been an improvement in children's height for weight that measures stunting, there has been deterioration in children's weight for age that measures wasting. Third, the study disaggregates the child health statistics in West Bengal by gender of the child, parental wealth, and education. It finds strong and positive parental education and wealth effects on child health in West Bengal. This points to the positive role that improving awareness through parental education can play in improving child health.

Fourth, West Bengal's neonatal and infant mortality rates are among the lowest in India. It is interesting that West Bengal's record on infant and child mortality stacks up quite well when compared with that of south India, which has a lead on child health. However, during the period in this study, 1998-99 to 2005-06, the mortality rates in West Bengal did not share the steady improvement recorded in many other parts of India. Clearly, there is room for improvement in this and other aspects. Finally, and quite significantly, while parental education has

a strong and positive effect on reducing infant mortality, the wealth effect is weak and insignificant. This suggests that the mortality rates are unlikely to decline if policymakers simply rely on increasing household affluence. One needs direct policy intervention in the form of more parental education, especially mother's education, for improving the dismal mortality statistics that prevail in West Bengal and the rest of India. The results also point to the need for improved medical services, hospital delivery, and antenatal and postnatal care to make a significant dent in this area.

The Government of West Bengal launched a programme called Health Systems Development Initiative (HSDI) on 16 August 2005 aimed at operationalising the health sector strategy (HSS). The proposed support under HSDI helps the state government take key aspects of the HSS forward by realigning its spending priorities. The purpose of the HSDI is "enhanced and equitable utilisation of quality health services by the poorest and those in greatest need".[10] Within days of taking office in May 2011, West Bengal Chief Minister Mamata Banerjee announced her intention of putting health in the forefront of policy initiatives. The data set used in this study relates to a period that is now seven years in the past. It is important to get new and updated information on the state of child health in the years that have elapsed since NFHS-3. An important message of this study is the need to collect disaggregated and reliable information that will facilitate the formulation of new and effective policies in child health, which is an area of much concern. The need for devising new and targeted policy interventions in this area cannot be overstated.

NOTES

1 The volume edited by Winters and Yusuf (2007), where the Chaudhuri and Ravallion (2007) paper appears, has the still more colourful title *Dancing with Giants*.

2 This view has been disputed by Panagariya (2013) who claims "that this narrative, nearly universally accepted around the world, is false" (p 98). Panagriya's view has been challenged in a series of papers published in the 24 August 2013 issue of the EPW.

3 See the WHO report edited by Ezzati et al (2004), where the Fishman et al (2004) paper appears, for a comprehensive analysis of the other risk factors.

4 See Mishra and Ray (2012).

5 See Maitra et al (2012) for a recent study at the all-India level on child health.

6 See, however, Das and Bose (2009) for a study on the anthropometric status of children of the Bauri caste in West Bengal.

7 See Svedberg (2000) for a comprehensive discussion of the measures of under-nutrition.

8 Between the two weight measures, weight for age will show a higher rate of malnourishment than weight for height since the latter, unlike the former, controls for age.

9 To be specific, the North consists of Haryana, Himachal Pradesh, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh; the South consists of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu; the East consists of Assam, Bihar, Odisha and West Bengal; and the West consists of Gujarat and Maharashtra.

10 See http://www.wbhealth.gov.in/health_sector/inner/pdf/HSDI-Reforms%5BPDF%20of%20the%20brochure%29.pdf for details.

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