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Measuring wealth-based health inequality among Indian children: the importance of equity vs efficiency

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The concentration index is the most commonly used measure of socio-economic-related health inequality. However, a critical constraint has been that it is just a measure of inequality. Equity is an important goal of health policy but the average level of health also matters. In this paper, we explore evidence of both these crucial dimensions—equity (inequality) and efficiency (average health)—in child health indicators by adopting the recently developed measure of the extended concentration index on the National Family Health Survey (NFHS-3) data from India. An increasing degree of inequality aversion is used to measure health inequalities as well as achievement in the following child health indicators: under-2 child mortality, full immunization coverage, and prevalence of underweight, wasting and stunting among children. State-wise adjusted under-2 child mortality scores reveal an increasing trend with increasing values of inequality aversion, implying that under-2 child deaths have been significantly concentrated among the poor households. The level of adjusted under-2 child mortality scores increases significantly with the increasing value of aversion even in states advanced in the health transition, such as Kerala and Goa. The higher values of adjusted scores for lower values of aversion for child immunization coverage are evidence that richer households benefited most from the rise in full immunization coverage. However, the lack of radical changes in the adjusted scores for underweight among children with increasing degrees of aversion implies that household economic status was not the only determinant of poor nutritional status in India.

Keywords Equity, efficiency, concentration index, child health, India

KEY MESSAGES

- To ensure that improvements in health are benefiting the poor, evaluations of health achievement need to take into consideration both performance in terms of the average level of health and performance in addressing health inequalities.
- The study results indicate that richer households benefited most from the rise in full immunization coverage, but that household economic status is not the only determinant of poor nutritional status in India.
- The pattern of evidence provides comparative insights which are helpful for determining and prioritizing child health interventions among the various states in India.

Introduction

The United Nations strategic Millennium Development Goals (MDGs) have directed focus onto the improvement of the average health status of the population (Pande and Yazbeck 2003). However, a large number of recent studies on health inequalities[1] have documented evidence that average health status is an inadequate summary measure of a country's health performance or achievement (Sen 1997; Braveman 1998; Deaton 2003; WHO 2008). The assessment of health inequalities with the comparative analyses of their determinants is critical for determining the most effective health policy agenda (Braveman 1998; Deaton 2003; WHO 2008). It is clear that any evaluation of achievement needs to take into consideration both performance in addressing health inequalities and performance in terms of the average level of health for the population. In India, the levels of inequalities in health by region and state are significant and highly persistent (Pande and Yazbeck 2003; Joe *et al*. 2008). For instance, the demographically less advanced north Indian states of Bihar, Madhya Pradesh, Uttar Pradesh, Rajasthan and Orissa are characterized by poor average health: high levels of infant and child mortality, low rates of full child immunization coverage and high prevalence rates of child under-nutrition (IIPS and ORC Macro 2007). However, evidence of this poor average health status is inadequate to inform policy interventions relating to the intensity of health inequalities at the state level, as the level of socio-economic inequalities in health are persistent even in some of the socio-economically well off states like Goa, Kerala and Maharashtra (Joe *et al*. 2008).

Such mixed trends lead to concern about the distribution in child health indicators across different groups and in particular whether the health of children has improved among the poor households. It is therefore important to measure and report concentration indices (a measure of socio-economic-related health inequality) in addition to average health status (a measure of efficiency). However, it is difficult to obtain a sense of overall achievement looking at each measure separately. Indeed some states might have done well in improving average health status but might have become more inequitable if most improvements were in richer segments of the population. Other states may have become more equitable but less efficient in improving average health status; yet others may have improved on both grounds.

From the background of such varied contexts and corresponding policy demands, recently developed methodologies allow us to create an achievement index that combines performance on both efficiency and equity grounds. Therefore, the main aim of this paper is to examine comparative evidence on (a) wealth-related health inequalities, (b) average health status and (c) overall health achievement using the 'achievement index' proposed by Wagstaff (2002), for child health indicators in Indian states. The objective is to estimate achievement indices for five child health outcome indicators: under-2 mortality, full immunization coverage, prevalence of stunting, of underweight and of wasting among Indian children. Comparative assessment of the evidence across states in India will help to determine whether it is equity or efficiency, or both, that requires particular attention.

Measurement issues in assessing health inequalities

The literature on health inequality measurement has benefited substantially from the literature on income inequality measurement (Wagstaff *et al*. 1991; Mackenbach and Kunst 1997). For example, concentration curves have been used to identify socio-economic inequality in health variables and investigate whether it is more pronounced at one point of time than another. In other words, it is the graphical presentation that helps to identify whether ill health is concentrated in the poorer section of the population or distributed uniformly across various income/wealth groups.

The concentration index, which is directly related to the concentration curve, quantifies the degree of socio-economic-related inequality in a health variable (Kakwani 1977; Kakwani 1980; Wagstaff *et al*. 1989; Kakwani *et al*. 1997). The concentration index has been used, for example, to measure and to compare the degree of socio-economic-related inequality in child mortality (Wagstaff 2000), child immunization (Gwatkin 2003), child malnutrition (Wagstaff *et al*. 2003), adult health (van Doorslaer *et al*. 1997), health subsidies (O'Donnell *et al*. 2007) and health care utilization (van Doorslaer *et al*. 2006). The concentration index, therefore, is a useful tool for measuring inequalities in the health sector. However, as mentioned earlier, it has its limitations.

First, the concentration index has implicit in it a particular set of value judgments about aversion to inequality. The second drawback of the index—and the generalization of it—is that it is just a measure of inequality. Although equity is an important goal of health policy, it is not the only one. It is not just health inequality that matters; the average level of health is also important. Policy makers are, therefore, likely to be willing to trade one off against the other; a little more inequality might be considered acceptable if the average increases substantially. This led to a second extension of the concentration index (Wagstaff 2002): a general measure of health 'achievement' that captures inequality in the distribution of health (or some other health sector variable) as well as its mean.

The 'extended concentration index', proposed by Wagstaff (2002), allows attributes of inequality to be made explicit, and helps us to see how the value of measured inequality changes as the attributes to inequality change.

Methods

Data from India's National Family Health Survey-3, 2005–06 (NFHS-3) are used in this analysis. Achievement indices are estimated for five child health outcome indicators: under-2 child mortality, full immunization coverage, prevalence of stunting, of underweight and of wasting among children by state and for India as a whole.

First, we estimated the adjusted score[2] for under-2 child mortality, based on data on the number of children born and the number surviving to age 2 years. A 15-year birth history cut-off point has been used. This period is chosen as a compromise between providing recent estimates and ensuring enough births to reduce the effects of sampling error. Measuring survival to (or death by) age 5 years would involve a longer censoring period, produce older estimates of inequality, and not differ much from the under-2 mortality because, on

average, 80% of under-5 child deaths occur in the first 2 years of life (Macro International 1993; Hill *et al*. 1999).

Secondly, to examine inequality in immunization, an indicator of the full immunization rate has been modelled for analysis. NFHS-3 collected information on vaccination coverage for all living children born in the 5 years preceding the survey, i.e. since January 2000 (in the states which began fieldwork in 2005) or since January 2001 (in states which began fieldwork in 2006). According to the guidelines developed by the World Health Organization, children are considered fully vaccinated when they have received a vaccination against tuberculosis (BCG); three doses of the diphtheria, whooping cough (pertussis) and tetanus (DPT) vaccine; three doses of the poliomyelitis (polio) vaccine; and one dose of the measles vaccine by the age of 12 months. The dependent variable for the study is immunization status of children aged 12–23 months ('1' for fully immunized and '0' for otherwise).

Thirdly, the analysis of child nutritional status indicators covers children born in the last 5 years. Child stunting, wasting and underweight are the child nutrition indicators included for assessment of inequalities in child nutrition. The definitions of five child health outcome variables included in the analysis are provided in Box 1, with more detailed descriptions provided in Appendix 1.

Wealth index

The NFHS-3 data set provides an index of household economic status (wealth quintile) for each household, which was constructed based on data from 109 041 households. The wealth quintiles distribution was generated by applying principal components analysis to 33 household assets[3] for these 109 041 households. The wealth quintile distribution has been used to determine poor–rich households for modelling analysis in this paper.

The extended concentration index

The standard concentration index proposed by Kakwani *et al*. (1997) is:

$$C = \frac{2}{n,\ \mu}\sum_{i=1}^{n} h_i R_i - 1$$

where n is the sample size, h_i is the ill-health indicator for i^{th} person, μ is the mean level of ill health, and R_i is the fractional rank in the living-standards distribution of the i^{th} person. The value judgments implicit in C are seen most easily when C is rewritten in an equivalent way as

$$C = 1 - \frac{2}{n,\ \mu}\sum_{i=1}^{n} h_i(1 - R_i)$$

The quantity $h_i/n\mu$ is the share of health (or ill health) enjoyed (or suffered) by person i. This is then weighted in the summation by twice the complement of the person's fractional rank, that is, $2(1-R_i)$. Thus, the poorest person's health share is weighted by a number close to two. The weighting scheme follows a declining trend in a stepwise fashion, reaching a number close to zero for the richest person. The concentration index is simply one minus the sum of these weighted health share values. The extended concentration index can be written as follows:

$$C(v) = 1 - \frac{2}{n,\ \mu}\sum_{i=1}^{n} h_i(1 - R_i)^{(v-1)} \quad v > 1$$

where v is the inequality-aversion parameter, which is described below.

The weight attached to the i^{th} person's health share, $h_i/n\mu$, is now equal to $v(1-R_i)^{(v-1)}$, rather than $2(1-R_i)$. When $v=2$, the weight is the same as in the regular concentration index; thus C(2) is the standard concentration index. By contrast, when $v=1$, everyone's health is weighted equally. The weights vary depending on the degree of inequality aversion (v). A higher level of v decreases the weight on higher wealth groups and increases the weight on the lower wealth groups (see Figure 1).

Computation of the extended concentration index on grouped data

The grouped-data analogue of the previous equation is as follows:

$$C(v) = v\sum_{t=1}^{n} f_t(1 - R_i)^{(v-1)} - \frac{v}{\mu}\sum_{t=1}^{n} f_t(1 - R_i)^{(v-1)}$$

$$C(v) = 1 - \frac{v}{\mu}\sum_{t=1}^{n} f_t h_t(1 - R_i)^{(v-1)}$$

Where f_t is the sample proportion in the tth group, h_t is the average level of health or ill health of the tth group, and R_t is its

Box 1 Child health variables (yes = 1, otherwise = 0)

- Under-2 mortality (child died within 24 months for births between 2–15 years of birth history)
- Child not fully immunized (child of 12–23 months did not received all recommended child vaccines)
- Height-for-age for children under 5 years (stunting; below -2SD)
- Weight-for-age for children under 5 years (underweight; below -2SD)
- Weight-for-height for children under 5 years (wasting; below -2SD)

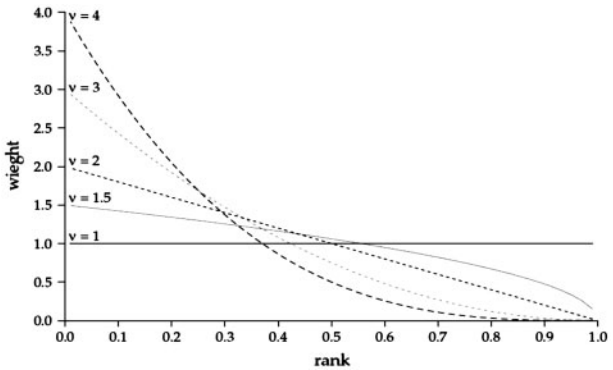

Figure 1 Wagstaff's weighting scheme for extended concentration index *Source*: Wagstaff (2002).

fractional rank as follows:

$$R_t = \sum_{\gamma=1}^{t-1} f_\gamma + \frac{1}{2} f_t$$

which indicates the cumulative proportion of the population to the midpoint of each group interval.

Achievement trading off inequality and the mean

The measure of 'achievement' proposed by Wagstaff (2002) reflects the average level of health and the inequality in health between the poor and the better-off. It is defined as a weighted average of the health levels of the various strata in the sample, in which higher weights are attached to poorer people (poorest wealth quintile) than to better-off people (richest wealth quintile).

Thus achievement might be measured by the index:

$$I(v) = \frac{1}{n} \sum_{i=1}^{n} h_i v (1 - R_i)^{(v-1)}$$

This index can be shown to be equal to the following:

$$I(v) = \mu(1 - C(v))$$

So, $I(v)$ could be defined as a weighted average of health failure levels in a society where the failures among the poorer individuals get a higher weight compared with the richer ones. The weighting mechanism ensures that if ill-health is concentrated among the poor then the $I(v)$ value will increase to suggest a worsening of mean achievement in a given population. Thus $I(v)$ reflects both the average health failures (I) and wealth-related health inequality [$C(v)$] in its distribution. The principle involved stipulates that the cumulative proportions of ill-health must match with the cumulative population shares and any mismatch between the two sets is defined as inequity.

In the index $C(v)$, varying attitudes to inequality aversion are accommodated by employing an inequality-aversion parameter v; $v > 1$. So, for example, two states of India might have the same value of $I(v)$, however one might have a higher mean but an equal distribution across wealth groups while the other might have a lower mean but an unequal distribution across wealth groups (wealth quintiles) to the disadvantage of the poor. Alternatively, suppose that the mean remains unchanged over time but the distribution of health becomes more pro-rich. In this case, even though the *mean* has not changed, $I(v)$ rises, assuming that $v > 1$. If ill-health declines monotonically with wealth group, the greater the degree of inequality aversion, the greater the wedge between the mean and the value of the index $I(v)$.

If v is raised above 1, the health of the poor is weighted more and the weight attached to the health of people who are above the 55th percentile decreases. When $v = 2$, the poorest person has his or her health share weighted by a number close to two; the weights decline in a stepwise fashion, reaching a number close to zero for the richest person. $C(v)$ ranges between +1 and −1 and it takes negative values when ill-health outcomes (mortality) are disproportionately concentrated among the poor. If, for example, the indicator of full immunization represents good health, a positive concentration index indicates that full immunization is concentrated among the rich and thus children from poor households are constrained in terms of obtaining full immunization compared with their richer counterparts. The larger the value of the concentration index, the greater is the degree of inequality.

Results

Results are presented in terms of adjusted achievement scores derived for the five child health indicators: under-2 mortality, full immunization coverage, prevalence of stunting, of underweight and of wasting among children by state and for India. Four degrees of inequality aversion are used from $v = 2$, 3, 4 and 5. The tables present unadjusted average score ($v = 1$) values also for comparison.

Achievement in under-2 child mortality

The need to take account of wealth-related health inequality as well as the average level of health in the assessment of health achievement is clearly evident from the results in Table 1. Overall, the adjusted under-2 child mortality scores increase with the increasing value of v, indicating that a major proportion of under-2 child deaths were concentrated among poor households. The average/mean ($v = 1$) under-2 child mortality score varies from a high of 104 per 1000 live births for Uttar Pradesh to a low of 22 for Kerala. However, the adjusted scores derived with the incorporation of various degrees of inequality aversion reveal considerable changes to state rankings for the values of I(1) to I(5). For example, in terms of average under-2 child mortality score, Mizoram's rank is 3 but with the incorporation of the wealth-related health inequality component [i.e. C(2)] the state is ranked 5. In other words, the mean under-2 child mortality score is the same for Himachal Pradesh and Mizoram, but the adjusted under-2 child mortality score [I(2)] is higher for Mizoram than for Himachal Pradesh, implying that adjusted scores have changed on account of wealth inequality in under-2 child mortality.

We have attempted to assess the level of health inequalities in terms of state-level rank differences from I(1) to I(5). Negative deviations imply that states have increased their rank due to higher levels of health inequalities. This applies to Uttarakhand, Delhi, Nagaland, Tripura, Meghalaya, Gujarat, Maharashtra, Andhra Pradesh and Goa, which have all increased their ranks on account of higher levels of health inequalities. In contrast, the states of Jammu & Kashmir, Haryana, Bihar, Sikkim, Arunachal Pradesh, West Bengal, Jharkhand and Tamil Nadu have lowered their ranks from I(1) to I(5) as a result of lower levels of health inequalities.

In order to assess the equity dimension, the relative changes from the mean values are estimated. Results suggest substantial deviation (more than 25%) from the mean values for 12 states: these include Jammu & Kashmir, Uttarakhand, Delhi, Nagaland, Manipur, Tripura, Meghalaya, Gujarat, Maharashtra, Andhra Pradesh, Goa and Kerala. Such deviations illustrate evidence of an increase in adjusted under-2 child mortality scores with increasing value of aversion parameter v. In eight states—Himachal Pradesh, Rajasthan, Uttar Pradesh, Bihar,

Table 1 Inequality-adjusted achievement index scores for under-2 mortality by states in India, 2005–06

	Mean		**Degree of wealth-related health inequality aversion[a]**									
	$v=1$		$v=2$		$v=3$		$v=4$		$v=5$		**Rank diff.**	**Relative % change[b]**
States	I(1)	R1	I(2)	R2	I(3)	R3	I(4)	R4	I(5)	R5	R1 − R5	
Jammu & Kashmir	54.58	12	64.17	12	67.43	13	68.45	11	68.61	10	2	26
Himachal Pradesh	37.41	4	40.11	4	40.09	3	39.23	3	37.91	3	1	1
Punjab	47.39	8	54.88	8	57.18	8	58.19	8	58.62	8	0	24
Uttarakhand	63.23	16	73.88	17	77.91	17	79.34	17	79.37	18	−2	26
Haryana	59.39	15	65.08	13	66.47	11	66.84	10	66.74	9	6	12
Delhi	45.18	7	56.03	9	61.62	9	66.05	9	69.57	11	−4	54
Rajasthan	94.92	26	102.91	25	104.80	25	104.48	27	102.72	27	−1	8
Uttar Pradesh	103.74	29	113.39	28	115.61	28	115.07	29	112.84	29	0	9
Bihar	88.21	23	96.21	23	97.48	24	96.07	24	93.22	21	2	6
Sikkim	37.65	5	38.35	2	37.04	2	35.32	2	33.46	2	3	−11
Arunachal Pradesh	80.18	21	90.88	21	92.05	21	90.52	20	88.12	19	2	10
Nagaland	59.38	14	69.49	15	73.30	15	75.03	15	75.82	16	−2	28
Manipur	42.94	6	50.87	6	54.72	7	56.98	7	58.42	7	−1	36
Mizoram	37.37	3	41.30	5	42.57	4	43.49	4	44.32	4	−1	19
Tripura	70.36	20	83.18	20	88.46	19	91.50	21	93.48	22	−2	33
Meghalaya	49.58	10	60.73	10	67.20	12	71.56	14	74.61	14	−4	50
Assam	81.09	22	92.36	22	95.17	22	95.07	23	93.60	23	−1	15
West Bengal	63.77	17	73.36	16	76.47	16	76.68	16	75.04	15	2	18
Jharkhand	90.95	24	99.76	24	97.06	23	89.03	19	78.45	17	7	−14
Orissa	92.80	25	104.73	26	105.40	26	101.02	25	93.78	24	1	1
Chhattisgarh	94.93	27	106.93	27	107.41	27	102.91	26	95.58	26	1	1
Madhya Pradesh	103.35	28	115.79	29	116.30	29	111.94	28	104.86	28	0	1
Gujarat	69.97	19	82.81	19	88.80	20	92.32	22	94.52	25	−6	35
Maharashtra	52.38	11	61.33	11	66.41	10	70.04	12	72.70	13	−2	39
Andhra Pradesh	69.45	18	81.23	18	85.67	18	87.65	18	88.61	20	−2	28
Karnataka	57.74	13	66.69	14	69.61	14	70.68	13	70.87	12	1	23
Goa	31.40	2	39.24	3	43.50	5	46.69	5	49.16	5	−3	57
Kerala	21.81	1	26.62	1	29.08	1	30.71	1	31.79	1	0	46
Tamil Nadu	47.88	9	52.89	7	53.44	6	52.72	6	51.72	6	3	8
India	79.28	–	92.09	–	96.79	–	98.30	–	97.99	–	–	

[a] $v=1$ gives an equal weight on all individuals and correspond to the under-2 mortality rates; $v=2$ uses the implicit weight of the standard concentration ratio; $v=5$ gives most weight to the lowest wealth quintile. Wealth quintiles are calculated on the basis of asset-based wealth scores.
[b] Estimated as $\{[I(5)-I(1)]/I(1)\}*100$.

Orissa, Chhattisgarh, Madhya Pradesh and Tamil Nadu—the adjusted under-2 child mortality scores have not changed substantially with higher values of v from the mean values. The evidence seems to suggest a more equitable distribution of child mortality concentration both among the poorer and the wealthier households in these eight states. However, with the exception of Himachal Pradesh, all these states are well known for high average child mortality (>80), where wealth-based inequalities are likely to be less prominent. Surprisingly, the adjusted under-2 child mortality score [I(5)] for Jharkhand and Sikkim is lower than the mean score, suggesting, with the increased value of the aversion parameter, that under-2 child deaths were concentrated more in wealthier households than in poor households. The reason for this could be that the concentration of under-2 child deaths may not differ greatly among the two lower wealth quintiles of Q1 and Q2.

In summary, the adjusted under-2 child mortality scores have not changed considerably from the mean values in Himachal Pradesh, Orissa, Chhattisgarh and Madhya Pradesh. By implication, under-2 child deaths were not concentrated among the poor in these states which are a combination of states with high (Madhya Pradesh: 92) and low (Himachal Pradesh: 37) under-2 child mortality rates. In contrast, the adjusted under-2 child mortality scores vary considerably with the increasing value of v in the states of Maharashtra, Delhi, Tripura, Gujarat, Meghalaya and Manipur, indicating that under-2 child deaths were more densely concentrated among the poorer households. Surprisingly, even in Kerala and Goa, the states most advanced

in the health transition with under-2 child mortality rates of under 30, the level of inequality score increases substantially with the increasing value of *v,* suggesting that child deaths were disproportionately concentrated among the poor.

Achievement in full immunization coverage

Similar to the pattern of achievement index scores for child mortality, the increasing adjusted scores for full immunization coverage of children aged 12–23 months for lower values of *v* indicate that wealthier households benefited most from the average rise in full immunization rate (Table 2). Such a trend is seen for most of the states. The adjusted score for full immunization rate declined linearly for most of the southern states, where full immunization rates have reached the top end of the scale.

Negative changes to rank [rank differences from I(1) to I(5)] suggest that the states of Punjab, Haryana, Arunachal Pradesh, Tripura, Goa and Kerala have higher levels of health inequalities in child immunization coverage. The adjusted full child immunization rate scores deviate substantially from their respective mean scores (average health). Also the relative percentage change from I(1) to I(5) shows that the adjusted full immunization coverage scores decline by more than 40% for the states of Punjab, Haryana, Rajasthan, Uttar Pradesh, Bihar, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam, Jharkhand, Madhya Pradesh and Gujarat,

Table 2 Inequality-adjusted achievement index scores for full immunization coverage for children aged 12–23 months by states in India, 2005 – 06

	Mean		**Degree of wealth-related health inequality aversion[a]**									
	$v=1$		$v=2$		$v=3$		$v=4$		$v=5$		**Rank diff.**	**Relative % change[b]**
States	I(1)	R1	I(2)	R2	I(3)	R3	I(4)	R4	I(5)	R5	R1 – R5	
Jammu & Kashmir	66.93	6	59.21	7	52.83	7	48.24	7	44.76	7	−1	33
Himachal Pradesh	74.23	4	70.36	3	65.78	3	62.15	3	58.93	3	1	21
Punjab	60.00	11	50.03	12	42.33	12	38.14	13	35.36	13	−2	41
Uttarakhand	60.09	10	50.69	11	44.63	11	41.29	10	39.08	10	0	35
Haryana	65.33	7	53.83	9	46.31	9	41.23	11	37.17	12	−5	43
Delhi	62.93	9	54.98	8	46.71	8	43.01	8	41.57	8	1	34
Rajasthan	26.20	27	19.61	26	16.70	26	15.07	26	13.92	25	2	47
Uttar Pradesh	23.09	28	17.28	28	15.15	27	14.00	27	13.15	27	1	43
Bihar	32.70	24	23.73	25	20.04	24	17.75	24	16.06	24	0	51
Sikkim	70.00	5	67.90	5	66.67	2	66.25	2	66.13	2	3	6
Arunachal Pradesh	28.03	26	18.66	27	14.08	28	11.36	28	9.50	28	−2	66
Nagaland	20.86	29	11.88	29	8.23	29	6.31	29	5.14	29	0	75
Manipur	46.76	17	36.44	19	30.20	18	25.90	18	22.72	18	−1	51
Mizoram	46.36	18	35.11	20	28.77	20	25.13	19	22.39	19	−1	52
Tripura	49.17	15	37.74	17	29.32	19	23.41	20	19.47	21	−6	60
Meghalaya	32.75	23	26.79	22	22.72	23	20.04	23	18.31	22	1	44
Assam	31.54	25	23.79	24	19.16	25	16.02	25	13.79	26	−1	56
West Bengal	64.37	8	59.86	6	56.65	6	54.02	6	51.55	6	2	20
Jharkhand	34.30	22	26.63	23	23.39	22	20.61	22	17.77	23	−1	48
Orissa	51.90	14	45.55	14	41.18	14	37.59	14	34.15	15	−1	34
Chhattisgarh	48.95	16	41.70	15	38.43	16	35.67	16	32.86	16	0	33
Madhya Pradesh	40.20	21	29.52	21	25.34	21	22.88	21	20.84	20	1	48
Gujarat	45.13	20	36.56	18	31.37	17	28.42	17	26.44	17	3	41
Maharashtra	58.83	12	51.47	10	45.82	10	42.41	9	40.02	9	3	32
Andhra Pradesh	46.06	19	40.89	16	38.99	15	38.16	12	37.68	11	8	18
Karnataka	55.10	13	47.09	13	41.53	13	37.45	15	34.28	14	−1	38
Goa	78.54	2	72.36	2	64.68	4	60.95	4	58.92	4	−2	25
Kerala	75.34	3	69.04	4	61.53	5	56.91	5	53.43	5	−2	29
Tamil Nadu	80.76	1	79.96	1	77.99	1	76.39	1	75.10	1	0	7
India	43.55	–	34.54	–	30.12	–	27.58	–	25.80	–	–	

[a] $v=1$ gives an equal weight on all individuals and correspond to the percentages given for full immunization; $v=2$ uses the implicit weight of the standard concentration ratio; $v=5$ gives most weight to immunization in the lowest wealth quintile. Wealth quintiles are calculated on the basis of asset-based wealth scores.

[b] Since full immunization is a positive health outcome, relative percentage change is estimated as $\{[I(1)-I(5)]/I(1)\}*100$.

Note: Since full immunization is a positive health outcome, states have been arranged (for ranking of states) in descending order.

suggesting that such wealth-based inequalities in child health need to be addressed with effective policy interventions.

The states of Jammu & Kashmir and Haryana have similar levels of average health in terms of full immunization coverage, but with the increased level of the aversion parameter (value of extended concentration indices), the rank for Jammu & Kashmir changes from 6th to 7th and the rank for Haryana changes from 7th to 12th. This change signifies that with the same level of average health, the achievement index value varies with the varying levels of wealth-related inequalities. In other words, full immunization coverage is strongly disproportionately low among the poorer section of the population in Haryana but less so in Jammu & Kashmir.

Achievement in child nutrition indicators

Results on the equity and efficiency dimensions of health inequalities with respect to three child nutritional outcome indicators—stunting, underweight and wasting—among children under 5 years are presented in Tables 3, 4 and 5.

Child nutrition: stunting

Table 3 shows that the adjusted scores for prevalence of stunting among children under 5 years increase with the increasing value of the aversion parameter in 12 states: these include Jammu & Kashmir, Himachal Pradesh, Punjab, Uttarakhand, Haryana, Delhi, Manipur, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Goa. The percentage relative changes from I(1) to I(5) show that the adjusted scores have increased by more than 30% in the states of Punjab, Uttarakhand, Goa and Kerala. Such rises in the adjusted scores for stunting as a measure of the prevalence of poor nutritional status indicate that stunting is disproportionately concentrated among children in poor households (lowest wealth quintile) in these states. These results demonstrate the need for a specific policy agenda to address equity as a priority in Kerala and Goa, which are top ranking states in health achievement in India. Contrastingly, the adjusted scores for child stunting declined with increasing values of v in Meghalaya, Jharkhand, Chhattisgarh and Madhya Pradesh. The improvement in the rankings of these states suggests that child stunting prevalence is more evenly distributed among the lower wealth quintiles of Q1 and Q2.

Child nutrition: underweight

The results in Table 4 highlight the degree of inequality in the prevalence of underweight among children, with both equity and efficiency dimensions. The adjusted scores for child underweight dramatically increase with the increasing values of aversion parameter for the states of Jammu & Kashmir, Punjab, Uttarakhand, Delhi, Manipur, Mizoram, Karnataka, Goa and Kerala. Rank differences from I(1) to I(5) were negative for 10 states: Jammu & Kashmir, Himachal Pradesh, Punjab, Uttarakhand, Rajasthan, Bihar, Gujarat, Maharashtra, Karnataka, Goa and Kerala. The negative values with the increasing values of v indicate higher levels of health inequalities in these states.

The adjusted scores did not change significantly for the states of Bihar, Sikkim, Assam, Chhattisgarh and Madhya Pradesh, an indication that the distribution of child underweight as a measure of ill-health is less likely to be uneven. Interestingly, in Jharkhand and Madhya Pradesh the adjusted scores for I(5) were lower than the mean scores of the respective states. This suggests that the prevalence of child underweight is evenly distributed across different wealth quintiles of the population.

In sum, the results indicated mixed outcomes: several states of both low and high average health achievement had higher levels of wealth-related health inequalities, and a few states of poor average health achievement had lower levels of wealth-related health inequalities.

Child nutrition: wasting

Unlike the mixed pattern of results for stunting and underweight, the adjusted scores for child wasting presented in Table 5 do not change radically with the increasing value of v. Most of the states retain their ranks with the increasing values of the aversion parameter. Also the relative percentage changes were marginal for most states. The main exceptions are Punjab, Haryana, Mizoram and Goa where the adjusted scores increased by more than 30% from their respective mean scores. This points to the failure to address equity in child health interventions in these four states in particular. The results suggest that the prevalence of wasting is less likely to be concentrated among the poorer section of population than stunting or underweight.

Discussion and conclusion

In this paper, we have presented new evidence on the equity and efficiency dimensions of health achievements in Indian states based on five child health indicators: under-2 child mortality, full immunization coverage, and prevalence of stunting, of underweight and of wasting among children. Overall, the pattern of evidence provides comparative insights which are helpful for determining and prioritizing child health interventions among the various states in India. The evidence suggests that the states fall into three broad categories in terms of health intervention priorities with respect to the three domains of: a) equity, b) efficiency and c) equity and efficiency.

First, in a large number of Indian states, the inequality-adjusted achievement scores for various child health indicators (except child wasting) increase with the increasing value of inequality aversion (v) indicating that poor child health is largely concentrated among poor households. In other words, the average child health improvement has largely benefited the richer households in a number of states, including Jammu & Kashmir, Punjab, Haryana, Uttarakhand, Haryana, Delhi, Manipur, Tripura, Meghalaya, Gujarat, Maharashtra, Andhra Pradesh and Karnataka. Evidence of large inequalities in child health achievement have emerged even in states advanced in the health transition such as Kerala and Goa, and in economically more developed states of Punjab and Haryana. In particular, the results demonstrate the need for a policy agenda to concentrate on equity, with a priority being to narrow wealth-based child health inequalities in these states.

The second group of six less developed states, comprising Rajasthan, Uttar Pradesh, Bihar, Orissa, Chhattisgarh and

Table 3 Inequality-adjusted achievement index scores for stunting (height-for-age) among children under 5 years of age by states in India, 2005–06

	Mean		**Degree of wealth-related health inequality aversion**[a]									
	$\nu=1$		$\nu=2$		$\nu=3$		$\nu=4$		$\nu=5$		**Rank diff.**	**Relative % change**[b]
States	I(1)	R1	I(2)	R2	I(3)	R3	I(4)	R4	I(5)	R5	R1 − R5	
Jammu & Kashmir	35.00	4	40.97	6	43.25	7	44.24	7	44.67	8	−4	28
Himachal Pradesh	38.64	9	43.62	8	45.90	9	47.38	9	48.34	11	−2	25
Punjab	36.66	7	44.30	10	47.22	10	48.60	11	49.21	16	−9	34
Uttarakhand	44.43	17	52.93	21	56.11	26	57.54	26	58.17	27	−10	31
Haryana	45.69	20	52.23	17	54.46	21	55.46	24	55.89	24	−4	22
Delhi	42.32	12	47.93	12	49.55	14	51.21	15	52.72	21	−9	25
Rajasthan	43.72	15	48.39	15	49.52	13	49.47	14	48.72	14	1	11
Uttar Pradesh	56.85	29	61.82	29	62.87	29	62.65	29	61.70	29	0	9
Bihar	55.62	28	60.37	28	60.63	28	59.53	27	57.74	26	2	4
Sikkim	38.21	8	41.58	7	42.34	6	42.46	5	42.32	6	2	11
Arunachal Pradesh	43.25	14	48.18	13	49.09	12	48.74	12	47.85	10	4	11
Nagaland	38.81	10	43.65	9	44.96	8	45.24	8	45.08	9	1	16
Manipur	35.58	5	40.64	5	42.23	5	42.73	6	42.77	7	−2	20
Mizoram	39.74	11	46.22	11	48.35	11	48.79	13	48.34	12	−1	22
Tripura	35.82	6	39.73	4	39.71	4	39.18	3	38.68	3	3	8
Meghalaya	55.10	27	56.95	26	55.98	25	54.66	23	53.39	22	5	−3
Assam	46.48	22	52.53	19	53.72	19	53.35	20	52.32	18	4	13
West Bengal	44.60	18	52.24	18	54.22	20	54.03	22	52.57	19	−1	18
Jharkhand	49.82	23	53.94	24	52.15	17	47.69	10	41.91	5	18	−16
Orissa	44.96	19	53.18	22	54.91	22	53.60	21	50.49	17	2	12
Chhattisgarh	52.85	26	56.34	25	55.27	24	52.54	19	48.84	15	11	−8
Madhya Pradesh	49.98	24	53.38	23	53.18	18	51.36	16	48.44	13	11	−3
Gujarat	51.68	25	57.38	27	59.40	27	60.46	28	61.02	28	−3	18
Maharashtra	46.33	21	52.82	20	55.26	23	56.52	25	57.20	25	−4	23
Andhra Pradesh	42.70	13	48.33	14	50.92	15	52.47	18	53.48	23	−10	25
Karnataka	43.74	16	49.48	16	51.46	16	52.30	17	52.60	20	−4	20
Goa	25.60	2	32.94	2	36.83	3	39.45	4	41.26	4	−2	61
Kerala	24.54	1	28.65	1	30.77	1	32.51	1	33.90	1	0	38
Tamil Nadu	30.90	3	35.33	3	36.39	2	36.60	2	36.59	2	1	18
India	48.04	–	54.09	–	55.87	–	56.18	–	55.69	–	–	

[a] $\nu=1$ gives an equal weight on all individuals and corresponds to the percentages given for stunting; $\nu=2$ uses the implicit weight of the standard concentration ratio; $\nu=5$ gives most weight to the stunting in the lowest wealth quintile. Wealth quintiles are calculated on the basis of asset-based wealth scores.

[b] Estimated as $\{[I(5)-I(1)]/I(1)\}*100$.

Madhya Pradesh, are known for their overall poor average health achievement. However, the level of wealth-related inequalities varies among these states for different indicators of child health, suggesting a mixed pattern. The health policy agenda for these states requires a significant focus on efficiency. The improvement of average population health is crucial for population health improvement in these states, but interventions focusing on equity will be an important additional strategy for overall health achievement.

Third, many smaller states like Jharkhand, Sikkim, Manipur and Arunachal Pradesh show evidence of better achievement in equity but of comparatively lower average achievement in child health indicators. These states also require a health policy push for improving average population health.

Lastly, very few states, for instance Tamil Nadu and Himachal Pradesh, have shown progress in both equity and efficiency dimensions of health achievement. However, these states are not consistently top ranking in all indicators of health achievement. They need to focus on specific health indicators for overall health improvement.

The results suggest that the prevalence of wasting as a measure of poor nutritional status among children is relatively evenly spread among households including those better off, which is similar to the widespread problem of child under-nutrition, even in economically more developed states such as Punjab, Haryana etc.

The evidence of poor–rich inequalities based on wealth quintiles provides insights into the consequences of poverty

Table 4 Inequality-adjusted achievement index scores for prevalence of underweight among children under 5 years of age by states in India, 2005–06

	Mean		**Degree of wealth-related health inequality aversion**[a]									
	$\nu=1$		$\nu=2$		$\nu=3$		$\nu=4$		$\nu=5$		**Rank diff.**	**Relative % change**[b]
States	I(1)	R1	I(2)	R2	I(3)	R3	I(4)	R4	I(5)	R5	R1 − R5	
Jammu & Kashmir	25.60	8	31.48	8	34.55	8	36.50	8	37.84	9	−1	48
Himachal Pradesh	36.54	14	41.35	14	43.40	14	44.61	14	45.30	17	−3	24
Punjab	24.87	5	31.31	7	34.41	7	36.27	7	37.46	7	−2	51
Uttarakhand	37.99	17	45.56	21	48.56	22	50.07	23	50.89	25	−8	34
Haryana	39.60	20	44.78	17	46.61	17	47.42	18	47.71	20	0	20
Delhi	26.15	9	30.29	6	32.14	6	34.03	6	35.79	6	3	37
Rajasthan	39.92	21	45.50	20	47.59	20	48.23	20	47.94	22	−1	20
Uttar Pradesh	42.36	23	47.25	22	48.52	21	48.58	22	47.96	23	0	13
Bihar	55.93	27	61.29	27	62.19	28	61.51	28	59.93	29	−2	7
Sikkim	19.85	1	19.68	1	19.80	1	19.96	1	20.02	1	0	1
Arunachal Pradesh	32.47	11	38.13	12	39.44	11	39.43	10	38.87	10	1	20
Nagaland	25.21	7	29.02	5	30.41	5	31.14	4	31.60	4	3	25
Manipur	22.12	3	26.16	3	27.95	3	28.94	3	29.57	3	0	34
Mizoram	19.87	2	24.87	2	27.31	2	28.56	2	29.11	2	0	47
Tripura	39.58	19	44.83	18	45.28	15	45.23	15	45.28	15	4	14
Meghalaya	48.83	26	52.95	26	53.85	26	53.91	25	53.62	26	0	10
Assam	36.41	13	41.25	13	41.59	13	40.71	12	39.47	11	2	8
West Bengal	38.68	18	45.08	19	46.61	18	46.31	16	44.95	14	4	16
Jharkhand	56.47	28	61.46	28	59.50	27	54.41	26	47.81	21	7	−15
Orissa	40.64	22	48.05	23	49.49	23	48.19	19	45.29	16	6	11
Chhattisgarh	47.08	25	52.44	25	52.45	24	50.32	24	47.00	18	7	0
Madhya Pradesh	60.03	29	64.85	29	64.99	29	62.92	29	59.42	28	1	−1
Gujarat	44.61	24	50.74	24	53.30	25	54.64	27	55.32	27	−3	24
Maharashtra	37.00	15	43.38	15	45.89	16	47.06	17	47.58	19	−4	29
Andhra Pradesh	32.49	12	37.55	11	39.64	12	40.77	13	41.42	12	0	28
Karnataka	37.57	16	44.01	16	46.76	19	48.27	21	49.12	24	−8	31
Goa	24.97	6	32.48	9	36.61	9	39.50	11	41.56	13	−7	66
Kerala	22.92	4	27.60	4	29.90	4	31.50	5	32.61	5	−1	42
Tamil Nadu	29.82	10	35.17	10	36.77	10	37.38	9	37.68	8	2	26
India	42.48	–	49.22	–	51.57	–	52.29	–	52.10	–	–	

[a] $\nu=1$ gives an equal weight on all individuals and corresponds to the percentages given for underweight; $\nu=2$ uses the implicit weight of the standard concentration ratio; $\nu=5$ gives most weight to the underweight in the lowest wealth quintile. Wealth quintiles are calculated on the basis of asset-based wealth scores.

[b] estimated as $\{[I(5)-I(1)]/I(1)\}*100$.

on different indicators of child health achievement across the states. The early childhood period is especially sensitive to poverty and consequent household environmental influences. Household poverty and its resultant stresses are strongly associated with heightened levels of acute under-nutrition, and with the effects of infectious diseases in the absence of preventive and curative care leading to large early childhood mortality. Evidentially, the early effects of poverty are stronger on child immunization and nutrition indicators underweight and wasting, and the late effects are stronger on childhood mortality and stunting among children.

This analysis further provides methodological insights on the importance of evidence-based assessment of health achievement involving both equity and efficiency. The first point to emerge is that the levels of inequality and ranking of states can both be sensitive to how much deviation there is from the implicit value judgements underlying the concentration index. In states, where the health of the poor is very much worse than the rest of the population, the increase in measured inequality can be quite marked when the health of the poor is weighted more highly. This suggests that in future empirical work on health inequalities, especially in contexts where there is a specific concern with the health of the poor, more attention should be paid to the sensitivity of results—including state rankings—to the weighting scheme used in the health inequality measures.

Table 5 Inequality-adjusted achievement index scores for wasting among children under 5 years by states in India, 2005–06

	Mean		**Degree of wealth-related health inequality aversion**[a]									
	$\nu=1$		$\nu=2$		$\nu=3$		$\nu=4$		$\nu=5$		**Rank diff.**	**Relative % change**[b]
States	I(1)	R1	I(2)	R2	I(3)	R3	I(4)	R4	I(5)	R5	R1 − R5	
Jammu & Kashmir	14.84	10	15.86	9	16.61	10	17.29	11	17.87	11	−1	20
Himachal Pradesh	19.37	20	21.03	18	21.09	18	20.85	17	20.52	19	1	6
Punjab	9.21	3	11.34	4	12.28	4	12.85	5	13.22	4	−1	44
Uttarakhand	18.79	18	21.97	23	23.29	23	23.94	23	24.22	22	−4	29
Haryana	19.14	19	21.23	19	22.72	22	23.93	22	24.86	23	−4	30
Delhi	15.36	12	14.90	8	13.82	6	13.58	6	13.76	7	5	−10
Rajasthan	20.43	23	21.87	21	22.53	21	22.76	21	22.62	21	2	11
Uttar Pradesh	14.81	9	15.91	10	15.99	9	15.77	9	15.40	8	1	4
Bihar	27.10	26	28.97	26	29.16	26	28.71	26	27.88	27	−1	3
Sikkim	9.71	4	9.45	1	9.01	1	8.56	1	8.11	1	3	−16
Arunachal Pradesh	15.26	11	18.31	13	19.35	15	19.68	15	19.66	15	−4	29
Nagaland	13.31	6	14.36	7	14.83	8	15.26	8	15.67	9	−3	18
Manipur	9.05	1	10.37	2	10.72	2	10.73	2	10.62	2	−1	17
Mizoram	9.17	2	10.60	3	11.69	3	12.71	3	13.66	6	−4	49
Tripura	24.60	25	27.24	25	27.25	25	27.02	25	26.88	25	0	9
Meghalaya	30.68	27	32.39	27	32.28	27	31.84	28	31.32	28	−1	2
Assam	13.76	7	14.14	6	13.99	7	13.74	7	13.42	5	2	−2
West Bengal	16.90	15	18.84	15	19.27	14	19.00	13	18.35	12	3	9
Jharkhand	32.27	28	34.57	28	33.43	28	30.59	27	26.89	26	2	−17
Orissa	19.47	22	21.96	22	22.36	20	21.71	20	20.39	18	4	5
Chhattisgarh	19.44	21	21.44	20	21.86	19	21.31	18	20.11	17	4	3
Madhya Pradesh	35.01	29	37.33	29	37.26	29	36.00	29	33.95	29	0	−3
Gujarat	18.69	17	20.24	17	21.03	17	21.56	19	21.87	20	−3	17
Maharashtra	16.50	14	18.48	14	19.01	13	19.12	14	19.03	13	1	15
Andhra Pradesh	12.22	5	13.20	5	13.15	5	12.84	4	12.46	3	2	2
Karnataka	17.60	16	19.15	16	19.61	16	19.89	16	20.09	16	0	14
Goa	14.11	8	16.53	11	17.63	12	18.50	12	19.13	14	−6	36
Kerala	15.89	13	16.91	12	17.04	11	17.25	10	17.37	10	3	9
Tamil Nadu	22.12	24	24.79	24	25.74	24	26.15	24	26.33	24	0	18
India	19.81	–	22.13	–	22.97	–	23.21	–	23.09	–	–	

[a] $\nu=1$ gives an equal weight on all individuals and corresponds to the percentages given for wasting; $\nu=2$ uses the implicit weight of the standard concentration ratio; $\nu=5$ gives most weight to the wasting in the lower wealth quintile. Wealth quintiles are calculated on the basis of asset-based wealth scores.

[b] estimated as $\{[I(5)-I(1)]/I(1)\}*100$.

A second issue is the potential scope to explore the possible use of stochastic dominance to establish a partial ordering of states based on the outcome that the cumulative health distribution by income is always greater in one state than another. The degree of aversion to income-related health inequality only matters when the cumulative distributions of two states cross at some point. The potentially large additional volume of results was a serious constraint leading us not to incorporate this, though it is an area that researchers may wish to integrate into their analysis.

The third crucial point is that noteworthy changes, including major rank changes, result when shifting focus from an assessment of achievement based solely on the average to an index of achievement that captures both the average and the extent of inequality between the poor and the better-off. These changes are especially pronounced when the weight attached to the poor is increased substantially above the weight implied by the standard concentration index, and when ill health is found highly concentrated among the poor. This suggests that if it is indeed a concern to ensure that improvements in health are disproportionately concentrated among the poor, it would make sense to move away from the use of population averages toward the use of an index of achievement that captures both average health levels and often large inequalities in health between poor and better-off households.

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Conflict of interest

The authors have no conflict of interest.

Endnotes

[1] Inequality is conventionally thought to be a relatively straightforward concept. Most of the previous studies define health inequality as a simple descriptive numerical comparison, in contrast to the more complex inequity, which involves normative judgments regarding justice and fairness (Deaton 2002; Thomson *et al*. 2006). For example, Kawachi and Kennedy (2002) define health inequalities by stating that 'inequality and equality' are dimensional concepts, simply referring to measurable quantities. 'Inequity and equity', on the other hand, are political concepts, expressing amoral commitment to social justice.

[2] The weighted average of the health levels of various strata in the sample, in which higher weights are attached to poorer people (poorer wealth quintiles) than to better-off people (richest wealth quintile).

[3] The 33 household asset variables used in the construction of wealth quintiles are: household electrification; type of windows; drinking water source; type of toilet facility; type of flooring; material of exterior walls; type of roofing; cooking fuel; house ownership; number of household members per sleeping room; ownership of a bank or post-office account; and ownership of a mattress, a pressure cooker, a chair, a cot/bed, a table, an electric fan, a radio/transistor, a black and white television, a colour television, a sewing machine, a mobile telephone, any other telephone, a computer, a refrigerator, a watch or clock, a bicycle, a motorcycle or scooter, an animal-drawn cart, a car, a water pump, a thresher, and a tractor.

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Appendix 1

Table A1 Definition of child health outcome variables used for calculation of adjusted scores, 2005–06

Variables	Definition
Under-2 mortality (child died within 23 months of birth)	Under-2 child mortality calculated using 15 years birth history. This covers births during years 2–15 with censoring of births of first 23 months. Censoring is done to avoid births which are not fully exposed to risk of under-2 child mortality in the first 24 months.
Percentage of children fully immunized (age 12–23 months)	Percentage of children aged 12–23 months who received BCG, 3 doses of DPT and polio, and measles vaccines. Information is collected for living children born in the last 5 years.
Percentage of children stunted (age 0–5 years)	Percentage of children whose height-for-age Z-score[a] is below minus two standard deviations (-2SD) from the median of the 2006 WHO international reference population. The figures are based on a sample of living children under age 5.
Percentage of children underweight (age 0–5 years)	Percentage of children whose weight-for-age Z-score is below minus two standard deviations (-2SD) from the median of the 2006 WHO international reference population. The figures are based on a sample of living children under age 5.
Percentage of children wasted (age 0–5 years)	Percentage of children whose weight-for-height Z-score is below minus two standard deviations (-2SD) from the median of the 2006 WHO international reference population. The figures are based on a sample of living children under age 5.

[a] $Z - score = \frac{\text{(Observed value)}-\text{(Median value of the reference value)}}{\text{Standard deviation of the reference population}}$

Table A2 Basic statistics (mean and sample size) for child health indicators by state and India, 2005–06

	Under-2 mortality		Children fully immunized		Nutritional status of the children			
States	Probability of deaths per 1000 live births	No. of births	%	No. of children aged 12–23 months	Stunting (%)	Underweight (%)	Wasting (%)	No. of children under age 5
Jammu & Kashmir	55	3518	66.5	251	35.0	25.5	14.8	1038
Himachal Pradesh	38	3075	74.2	194	38.6	36.5	19.3	955
Punjab	48	3883	60.0	240	36.7	24.9	9.2	1162
Uttarakhand	63	3670	60.0	220	44.4	38.0	18.9	1044
Haryana	59	3603	65.5	226	45.6	39.6	19.1	1113
Delhi	45	3454	63.2	204	42.2	26.0	15.4	741
Rajasthan	95	5984	26.5	374	43.7	40.0	20.4	1807
Uttar Pradesh	104	21 200	23.0	1364	56.8	42.4	14.8	5684
Bihar	88	6472	32.8	478	55.6	55.9	27.1	2208
Sikkim	38	2127	69.8	139	38.3	19.7	9.7	548
Arunachal Pradesh	80	2459	28.5	158	43.2	32.5	15.3	733
Nagaland	59	5642	20.9	465	38.8	25.2	13.3	1941
Manipur	43	4961	46.9	354	35.6	22.1	9.0	1735
Mizoram	37	2142	46.4	151	39.8	19.9	8.9	761
Tripura	70	1804	49.6	121	35.6	39.5	24.6	564
Meghalaya	50	2944	32.9	228	55.2	48.8	30.7	765
Assam	81	4795	31.5	279	46.4	36.4	13.7	1365
West Bengal	64	7449	64.2	495	44.6	38.7	16.9	2479
Jharkhand	91	4595	34.1	305	49.8	56.5	32.3	1416
Orissa	93	5095	51.8	342	45.0	40.7	19.6	1615
Chhattisgarh	95	4909	48.6	286	52.9	47.0	19.5	1488
Madhya Pradesh	103	9560	40.4	602	50.0	60.0	35.0	2910
Gujarat	70	4358	45.3	307	51.7	44.6	18.7	1374
Maharashtra	52	9756	58.7	669	46.3	37.0	16.5	2465
Andhra Pradesh	69	7344	46.0	433	42.7	32.5	12.2	1809
Karnataka	58	6236	55.0	413	43.7	37.6	17.6	1525
Goa	31	2516	78.6	206	25.6	25.1	14.1	793
Kerala	22	2843	75.3	219	24.5	22.9	15.9	925
Tamil Nadu	48	5198	81.0	290	30.9	29.8	22.2	1478
India	**79**	**159 462**	**43.5**	**10 419**	**48.0**	**42.5**	**19.8**	**46 655**