EXTENDED ABDTRACT

Increasing Disparity in Childhood Malnutrition across the Ethnic Groups in India: Trends between 1992-2006

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Abstract

This paper examines disparity in childhood malnutrition (underweight) across the ethnic groups in India and its region using three rounds of the National Family Health Survey conducted during 1992-2006. Descriptive statistics and pooled logistic regression analysis were applied to measure the disparity in childhood malnutrition across the ethnic groups. The prevalence of underweight differs considerably between the Scheduled castes/Scheduled tribes (SC/ST) and other caste; underweight among the SC/ST in India being substantially higher than other caste. The prevalence has declined among the other caste while it has stagnated among SC/ST over the study period. Pooled logistic regression results suggest that the disparity in underweight has increased across the ethnic groups in India over the last two decades. The findings call for dedicated policies, in line with those already existing to improve the socio-economic status of the SC/ST in India, to tackle the rampant childhood malnutrition among the SC/ST in India.

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1. **Introduction**

In India, the caste system, with its societal stratification and social restrictions, continues to have a major impact on the country. There are four castes in the Hindu society of India – Scheduled caste (SC), Scheduled Tribe (ST), Other Backward Caste (OBC), and others. The Schedule caste includes "untouchables" or *Dalits* – a group that is socially segregated and economically disadvantaged by their lower status in the traditional Hindu society. The schedules Tribes are geographically isolated and with limited economic and social interaction with the rest of the population. The other backward caste is intermediate caste and considered as low in traditional caste society but above to the SCs and STs. Other caste is the remaining population and characterized with better socio-economic status than the SCs, STs, and OBC population. They also called as upper caste or generals.

In India the SCs/STs have been excluded from the Hindu society for thousands of years. These communities had traditionally been relegated to the most menial labor with no possibility of upward mobility, and subject to extensive social disadvantage and exclusion, in comparison to the wider community (Val de Poe and Speybroeck, 2009; Dunn, 1993). Therefore, they have been given the special priority by the Indian constitution, which designated disadvantaged tribal and caste populations as Scheduled Tribes and Castes (hereafter referred to as ST/SC) and accorded them special protections (Parikh 1997, Planning Commission India 2002). As per the census of India 2011, the proportion of SCs and STs together constitutes more than one-third of the Indian population. This larger section of India population (much higher of the total population of many of the countries) is economically deprived and socially excluded from the main Indian Hindu society. Considering the status of SCs/ STs the government of India and India constitutions have provided the reservation to SC/ST population in education, employment opportunities. But in this process the health disadvantages of SC/ST are completely overlooked. This could have happened due to lack of systematic evidence on caste disparity in health status in India. While one could argue that the socio-economic vulnerability of SC/ST may propel them into health vulnerability too. The third round of the National Family Health Survey (2005-06) reports that infant mortality rates are 44 per 1000 among SCs, 51 among STs, compared to 36 for the rest of the population (IIPS and ORC Macro, 2007). Furthermore, Subramanian et al. (2006b) illustrate the larger adult mortality rates in ST/SC as compared to the remaining population (odds-ratio of 1.28 for the ST and 1.23 for the SC). There is clear notion that SC/ST bears the maximum burden of health in general and maternal and child health in particular in India. It may be because of the availability and accessibility of health services to the SC/ST population.

The literature search yielded only one study that has investigated the factors responsible for persisting disparity in childhood malnutrition between SC/ST and other caste in India (Van de Poe & Speybroeck, 2009). But there is published study that has examined the trends in disparity in childhood malnutrition between SC/ST and other caste in India. This is despite the fact that malnutrition is one of the major public health challenges India is facing today.

The burden of malnourished children in India is amongst the highest in the world and virtually twice that of Sub-Saharan African countries. Nearly 60 million Indian children are estimated to be underweight (Deaton & Dreze, 2009; FOCUS, 2006; Gragnolati et al., 2005). India ranked 96 out of 119 countries in the Global Hunger Index (GHI) developed by the International Food Policy Research Institute (IFPRI) in 2006, and where child malnutrition is concerned; it ranked 117 among 119 countries (Braun et al., 2008). The present study, therefore, aimed to investigate the disparity in childhood malnutrition between SC/ST and other caste groups in India during 1992-93, 1998-99, and 2005-06.

1.2 Objective

To investigate the trends in ethnic disparity in childhood malnutrition in India and its region over last two decades.

2. **Data and Methods**

2.1 *Data*

Data for this study is drawn from three successive rounds of the National Family Health Survey (NFHS) conducted in India during 1992-93, 1998-99, and 2005-06. The NFHS is similar to the Demographic and Health Survey (DHS) in other countries. The NFHS is a large scale and multi-round survey conducted in representative sample of households spanning across the states and union territories of India. The NFHS covered more than 99% of the India's population in each of the survey rounds. The main purpose of the NFHS is to provide reliable estimates on fertility, infant and childhood mortality, family planning, utilization of maternal and child health care services, and childhood nutritional status in the country and state levels. The NFHS also provides these estimates by urban-rural residence.

The NFHS adopted similar sampling design in each of the three survey rounds. A two-stage sampling design was adopted in rural areas – villages were selected at the first stage using probability proportional to size (PPS) sampling scheme followed by selection of households at the second stage using systematic sampling scheme. The sample in urban areas was selected in three stages. The first stage comprised of selection of urban wards using PPS sampling scheme. Census enumeration blocks (CEB) containing approximately 15-200 households were selected at the second stage. Households were selected at the third stage using systematic sampling scheme. The similarity in the sampling design of the three survey rounds allows for a comparison of the estimates obtained from the three consecutive rounds (Mishra et al., 2004; Ram and Roy, 2004). The details of sampling design are given in the reports of the various rounds of NFHS (IIPS and ORC Macro, 1995, 2000; 2007).

2.2 *Outcome variable*

The outcome variable in the present analysis is underweight (weight-for-age). Underweight is a composite indicator of childhood malnutrition and reflects both acute and chronic nutritional deficiencies (World Health Organization Working Group, 1986). This argument is

also supported by previous studies which suggested that underweight (weight-for-age) deserves special attention as it is a comprehensive indicator of child's nutritional status, because it incorporates other two measures– stunting and wasting (Deaton and Drèze, 2009). Despite the theoretical premises, weight-for-age is the only anthropometric indicator which is comparable in all rounds of the NFHS. In NFHS–1, information on stunting and wasting is not collected from few states such as, Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Tamil Nadu, and West Bengal. Thus, the national estimates for those indicators may be biased up to a certain extent.

Underweight is defined as children whose weight-for-age Z-score is less than minus two standard deviations (-2SD) below to the median values of the United States National Centre for Health Statistics (US-NCHS) international reference population as recommended by the World Health Organization (Dibley et al., 1987a; Dibley et al., 1987b). We used US-NCHS reference population due to its comparability in all three rounds. We could not use new reference population of the World Health Organization (WHO Multicenter Growth Reference Study Group, 2006) because it was not available in the first and second round of the survey. We used the term "underweight" and "malnutrition" interchangeably in the study. Weight-for-age is measured with a varying age – group of children in successive rounds of the survey. For example, NFHS–1 collected information from children below four years of age and NFHS–2 collected information from children below three years of age, while NFHS–3 collected information from children below five years of age. Therefore, to make the estimates comparable, we restricted our analysis to the children less than 3 years only.

2.3 *Exposure variables*

Caste is used as the main predictors in the analysis. Caste is based on the respondent's self-identification as belonging to scheduled caste, scheduled tribe, other backward class, and other caste. All three rounds of the NFHS collected information on the caste of the respondents, but category of ethnic groups from NFHS-1 to other rounds of the NFHS. In NFHS-1 (1992-93) information on caste is collected under three categories – Scheduled caste (SC), Scheduled Tribe (ST), and Other caste. While each in the NFHS-2 (1998-99) and NFHS-3 (2005-06) information about caste group is collected in four categories – SC, ST, Other Backward caste, and (OBC). In the present analysis, we clubbed the SC and ST under one category and named as SC/ST (SC and ST share same socio-economic characteristics in the Indian society and more or less similar at the deprivation level) and other caste group is "other category". Thus the whole analysis is carried out for SC/ST and other caste. We excluded OBC from the analysis because it is not comparable over the period because of lack of information in the first round of the survey. Moreover, the prevalence of underweight among the OBC children is closer to the prevalence of SC/ST's children. We used the term "caste" and "ethnic" interchangeably in the study.

A number of other socio-economic and demographic variables have also been shown to have a significant effect on childhood malnutrition in India. Accordingly, we controlled a number of important socio-economic and demographic variables in the analysis. The variables that

were controlled in the pooled logistic regression analysis are – sex of the newborn, birth order & preceding birth interval (first birth order; higher birth order and birth interval ≤ 24months; higher birth order and birth interval > 24 months), size of the newborn at birth (smaller than average; average; larger than average), mother's age at birth of the newborn (≤19 years, 20-29 years, and ≥30 years), maternal schooling (no schooling; 1-5 years of schooling; 6-12 years of schooling; >12 years of schooling), household wealth quintile (poorest; poorer; middle; rich; richest), medical assistance at delivery (yes; no), mother's exposure to media (yes; no), current working status of mother (yes; no) and geographic region of residence (north; east; central; northeast; west; south). The geographic regions were based on the regional classification of NFHS (IIPS and ORC Macro 2007).

2.4 *Statistical analysis*

Descriptive statistics is carried out to understand the differences in prevalence of underweight by caste groups in each round of the NFHS. The chi-square test is applied to examine the significant association between underweight and caste groups. This is done to simply give the levels and trends in prevalence of childhood malnutrition by caste groups in India. The absolute and relative difference is also calculated to understand the pattern in disparity across the caste groups over the study period.

Binary logistic regression analysis is used to examine the ethnic disparity in underweight after adjusting for important socio-economic and demographic variables. In the regression analysis, we pooled the data from the three rounds of NFHS to examine the interaction effect of time. We present the pooled logistic regression results as predicted probabilities for better interpretation. The analyses presented in the subsequent sections were carried out in STATA 10.0. The exposure variables were tested for possible multi-collinearity before putting them together in the pooled logistic regression analysis.

3. Preliminary findings

3.1 *Trends in underweight among the children across different ethnic groups in India*

Figure 1 presents the trends in prevalence (%) of underweight among the children aged less than three years across the ethnic groups in India during 1992-2006. The prevalence of underweight in India has declined across both SC/ST and other ethnic groups. The prevalence of underweight among SC/ST children has declined from 57% in 1992-93 to 54% in 2005-06. Likewise, the prevalence of underweight among children of other ethnic groups has declined from 52% in 1992-93 to 38% in 2005-06. Although the prevalence of childhood malnutrition has declined across both the ethnic groups in India but the pace of decline is higher among other caste groups than SC/STs.

Trends in childhood malnutrition by ethnic groups across the geographic region of the country remained more or less similar to that of the national scenario (Table 1). The prevalence has declined among the other ethnic groups irrespective of the region. For

instance, in the north region the prevalence of underweight among the children of other ethnic groups has declined from 41% in 1992-93 to 33% in 2005-06. The corresponding decline in south region is 44% in 1992-93 to 29% in 2005-06. In contrary, the trends in prevalence underweight have either stagnated or increased among the SC/ST children. This table also suggests that there is variation in prevalence of childhood malnutrition by ethnic groups across the regions. For instance, in 2005-06 the prevalence among the SC/ST was 45% in the northern region, 58% in the central region, 62% in the east region, and 34% in the northeast region. The corresponding prevalence among the other ethnic group was 33% in the northern region, 43% in the central region

3.2 *Trends in ethnic disparity in childhood malnutrition in India and its region*

Figure 2 presents the trends in absolute and relative disparity in childhood malnutrition across the ethnic groups in India 1992-06. Results suggest that disparities in childhood malnutrition between the ethnic groups have increased over the period. For instance, the absolute disparity between SC/ST and other ethnic group has increased from 6% in 1992-93 to 16% in 2005-06. Similarly, the relative disparity has increased from 1.11 in 1992-93 to 1.43 in 2005-06.

Disparity in childhood malnutrition between the ethnic groups across the geographical region of the country is presented in table 2. Results suggest that the absolute and relative disparity has increased in the east region and west region of the country over the period. For instance, in east region the absolute disparity has increased from 4% in 1992-93 to 21% in 2005-06; the relative disparity has increased from 1.06 in 1992-93 to 1.34 in 2005-06. In the central region the disparities have stagnated while in the north, northeast, and southern region there are no clear trends in disparities over the period – increased during 1992-98n and declined between 1998-06.

3.3 *Regression analysis*

The results of the binary logistic regression analysis are shown in Table 3. The results adjusted for other important socio-economic and demographic characteristics clearly suggest a significantly higher probability of underweight among the children of SC/ST compared to that among the other ethnic groups India and across the regions. Among the children of SC/ST the adjusted probability of underweight was 0.434 in 2005-06. This compares with only 0.316 among the children of other ethnic groups. The result remained similar across the geographical region of the country. The pattern remained similar in each of the three survey rounds.

The change in the prevalence of underweight over the three NFHS surveys across the ethnic groups in India and its geographical region is shown in Table 4. The results adjusted for other socio-economic and demographic characteristics suggest that the prevalence of underweight has declined by 34% among the children of other ethnic groups during 1992-2006. The corresponding decline in the prevalence of underweight among the children of SC/ST was

only 15%. These figures clearly suggest that, in India, the decline in the prevalence of underweight among children of other ethnic groups was more than twice as high as that among the children of SC/ST during 1992-2006. Unlike the results based on descriptive statistics, the binary logistic regression results clearly suggest a significant increase in ethnic disparity in childhood malnutrition in India during 1992-2006. The pattern remained similar across the geographical regions of the country. The increase is greater across the central, east, and north region.

4. Discussion and Conclusions

This study examines the trends in ethnic disparity in the prevalence of underweight among the children aged less than three years in India and its geographical region using the three rounds of the National Family Health Survey data conducted during 1992-06. Our study indicates that the prevalence of childhood malnutrition across the ethnic groups has declined in the country over the period, but the decline was lower among the SC/ST compared to the other ethnic groups in India across the regions. In addition, the prevalence of childhood malnutrition is much higher among the SC/ST keeping that more than half of the children aged less than three years are underweight. The absolute and relative disparity in childhood malnutrition has increased between the ethnic groups in India across the three successive rounds of the NFHS. Regression analysis further suggests that the ethnic disparity in childhood malnutrition has increased over the last two decades in India and across the region; the increase was particularly more pronounced in the central, east, and northeast regions.

Clearly, the prevalence of childhood malnutrition has declined in both SC/ST and other ethnic groups in India during late 1990s and early 2000s. This decline in the prevalence of childhood malnutrition might be the result of interplay of numerous factors such as the rapid economic growth (with the introduction of the new Economic Policy in the early 1990's), improvement in agriculture, medicine, and information technology. In addition the maternal and child health interventions such as Child Survival and Safe-motherhood Program (CSSM, 1992) and Reproductive and Child Health Program (RCH, 1997) might have also played a significant role in lowering the childhood malnutrition in SC/ST and other caste in India. However these have not succeeded in narrowing the ethnic disparity childhood malnutrition in India. In fact, the ethnic disparity has widened during the last two decades. Our findings clearly indicate that the fruits of economic and social development are not being shared equally by the different sections of the Indian society. In India, the SCs/STs are deprived groups since thousands of years the conditions remained similar even in modern India too. It is the other ethnic groups who have derived maximum benefit from the economic and social development taking place in the country. Our findings are consistent with the findings of other studies that have also highlighted the vulnerability of SC/ST children when it comes to childhood malnutrition (Van de Poel and Speybroeck, 2009).

The findings of the study have larger policy implications. The findings indicate towards greater and growing disparity in childhood malnutrition access to ethnic groups in India. There is, therefore, a need for the Government to recognize the fact that a greater section

Indian population are bearing disproportionate burden of childhood malnutrition and that their access basic services is limited. Notably, the Government must use indicators disaggregated by ethnic (social) status instead of only focusing the on the poor (economic status) to formulate policies and programmers in the country. Even the formulation of health policies with special focus on social-cultural status is easier as the ethnic status of a person is easily identifiable with compared to the poverty status. The Government of India has made provisions of reservation in education, employment, and other facilities for SC/ST to improve their socio-economic status and to provide the equal opportunity. In this whole process the Government of India has completely overlooked at the health status of the SCs/STs population in general and women and children in particular. As the SCs/STs population contributes more than one-third of the country's population, the findings of the study call for multifaceted targeted policies to improve the health of the SCs/ST children.

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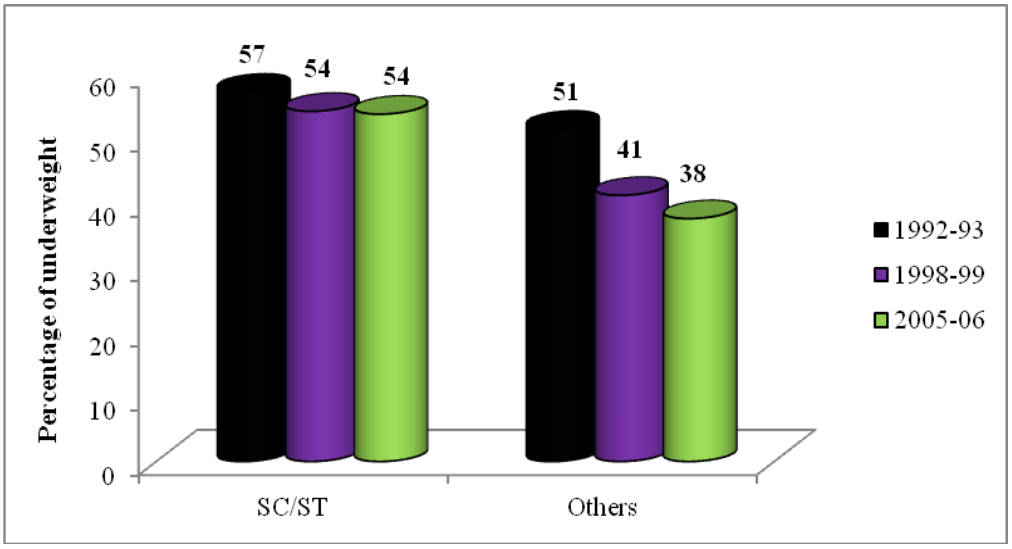
Figure 1 Prevalence of underweight among children aged less than three years by ethnic groups in India, 1992-06

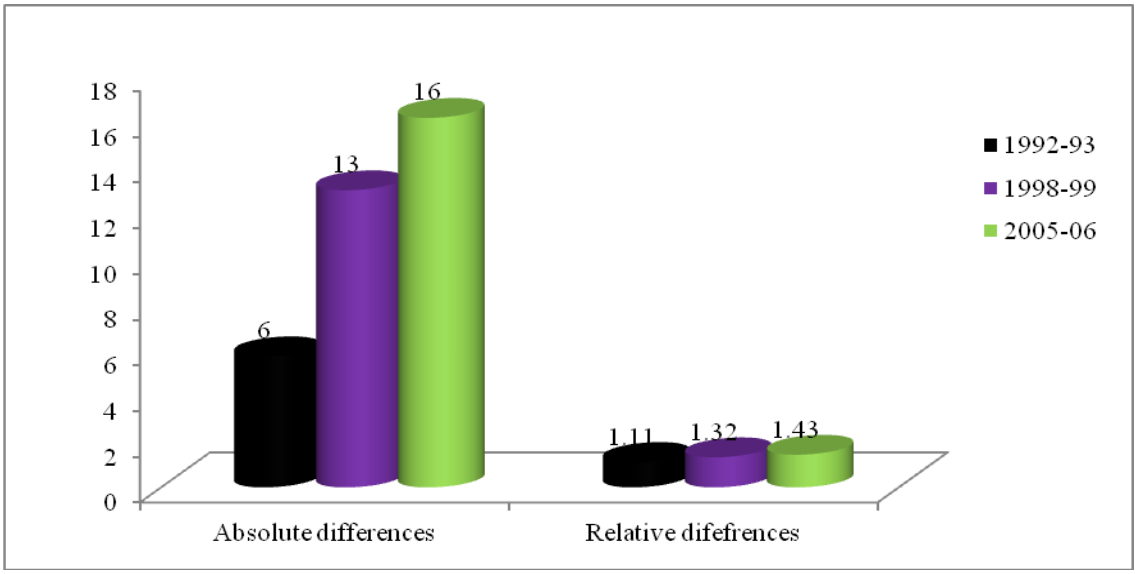


Source: Authors' Calculation from NFHS data

Table 1 Trends in the prevalence of underweight among children aged less than three years by ethnic groups across regions of India, 1992-06

	1992-93	1998-99	2005-06
North			
SC/ST	49.8	50.6	44.9
Others	40.5	35.1	32.7
Central			
SC/ST	61.1	61.0	57.7
Others	57.5	45.6	43.0
East			
SC/ST	62.7	58.5	62.1
Others	58.4	45.3	40.7
Northeast			
SC/ST	38.6	28.9	34.9
Others	49.9	41.4	38.0
West			
SC/ST	60.3	55.4	54.5
Others	48.3	44.6	35.4
South			
SC/ST	54.0	48.0	43.0
Others	44.1	31.7	29.3

Figure 2 Disparity in underweight among children aged less than three years between SC/ST and other ethnic group in India, 1992-06



Note: Absolute difference is the difference between maximum to minimum.
Relative difference is the ration of maximum to minimum.

Table 2 Disparity in underweight among children aged less than three years between SC/ST and other ethnic group across region of India, 1992-06

	1992-93	1998-99	2005-06	Trends
North				
Absolute differences	9.4	15.5	12.3	Not clear
Relative differences	1.23	1.44	1.38	Not clear
Central				
Absolute differences	3.6	15.4	14.7	Stagnated
Relative differences	1.06	1.34	1.34	Stagnated
East				
Absolute differences	4.3	13.2	21.4	Increasing
Relative differences	1.07	1.29	1.52	Increasing
Northeast				
Absolute differences	-11.3	-12.5	-3.1	Not clear
Relative differences	0.77	0.70	0.92	Not clear
West				
Absolute differences	12.0	11.8	19.1	Increasing
Relative differences	1.25	1.24	1.54	Increasing
South				
Absolute differences	10.0	16.3	13.7	Not clear
Relative differences	1.23	1.52	1.47	Not clear

Table 3 Predicted probabilities (95% confidence interval) showing the effect of ethnic groups on underweight among children aged less than three years in India and geographical region, 1992-06

	1992-93				1998-99				2005-06			
	SC/ST		Others		SC/ST		Others		SC/ST		Others	
	PP†	95% of CI	PP†	95% of CI	PP†	95% of CI	PP†	95% of CI	PP†	95% of CI	PP†	95% of CI
India	**0.512**	**(0.034, 0.895)**	**0.476**	**(0.036, 0.890)**	**0.482**	**(0.017, 0.888)**	**0.373**	**(0.018, 0.864)**	**0.434**	**(0.028, 0.875)**	**0.316**	**(0.022, 0.817)**
North	0.491	(0.060, 0.824)	0.397	(0.038, 0.785)	0.505	(0.043, 0.865)	0.333	(0.017, 0.810)	0.423	(0.032, 0.829)	0.304	(0.030, 0.802)
Central	0.617	(0.152, 0.875)	0.574	(0.090, 0.883)	0.605	(0.071, 0.879)	0.461	(0.035, 0.849)	0.543	(0.066, 0.870)	0.371	(0.040, 0.829)
East	0.623	(0.085, 0.900)	0.563	(0.056, 0.904)	0.589	(0.045, 0.896)	0.418	(0.027, 0.852)	0.575	(0.066, 0.922)	0.345	(0.039, 0.847)
Northeast	0.338	(0.020, 0.787)	0.434	(0.022, 0.867)	0.283	(0.021, 0.703)	0.350	(0.027, 0.770)	0.293	(0.018, 0.808)	0.283	(0.018, 0.796)
West	0.581	(0.051, 0.931)	0.445	(0.020, 0.930)	0.529	(0.039, 0.942)	0.396	(0.028, 0.895)	0.490	(0.075, 0.882)	0.323	(0.051, 0.793)
South	0.543	(0.061, 0.906)	0.422	(0.026, 0.900)	0.488	(0.063, 0.853)	0.317	(0.031, 0.837)	0.420	(0.060, 0.871)	0.257	(0.034, 0.743)

Note: The models have been adjusted for sex of the child, birth & preceding birth interval, size of the child at birth, age at birth, maternal education, safe delivery, religion, exposure to media, current working status of the mother.
†: Predicted probability
CI: Confidence intervals
All the predicted probabilities (PP) were significant at $p<0.05$.

Table 4 Percentage change in predicted probability of underweight across the ethnic groups in India and geographical region, 1992-06

	1992-1998		1998-2006		1992-2006	
	SC/ST	Others	SC/ST	Others	SC/ST	Others
India	**5.9**	**21.6**	**10.0**	**15.3**	**15.2**	**33.6**
North	-2.9	16.1	16.2	8.7	13.8	23.4
Central	1.9	19.7	10.2	19.5	12.0	35.4
East	5.5	25.8	2.4	17.5	7.7	38.7
Northeast	16.3	19.4	-3.5	19.1	13.3	34.8
West	9.0	11.0	7.4	18.4	15.7	27.4
South	10.1	24.9	13.9	18.9	22.7	39.1