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Is socio-economic inequality in childhood undernutrition increasing in urban India?

Divya Kumari[1]

Abstract

This paper examines the trends of socioeconomic inequality in childhood undernutrition in urban India using data from all three rounds of the National Family Health Survey conducted during 1992-2005. We analyzed the prevalence of underweight (weight-for-age) among children less than three years old. The socioeconomic predictors were: household wealth and maternal education. Principal component analysis was used to compute a separate wealth index for urban India for all three rounds of the survey. Descriptive statistics, concentration index, and pooled logistic regression technique was used to analyze the data. In general, the prevalence of underweight has declined constantly in urban India, but the current level is still high. Moreover, the decline was greater during 1992-98 than 1998-05. Socio-economic inequality in childhood undernutrition has either widened or stagnated over the study period. Result of pooled regression analysis suggests that decline in the prevalence of underweight was higher among children of the richest quintile compared to the poorest quintile, among most educated mothers compared to uneducated mothers in urban India during 1992-2005. The salient findings of this study call for separate program targeting the children of lower socio-economic groups of urban population.

[1] Divya Kumari is Doctoral candidate at International Institute for Population Sciences (IIPS), Mumbai-400088 mishradivya08@gmail.com

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Introduction

In developing countries, "urban advantage" over rural areas in utilization of maternal and child health care (MCH) services, maternal mortality, and childhood mortality is well documented. Childhood nutritional status is no exception to this. Several studies have clearly demonstrated that urban children are better nourished, and they are less likely to be stunted and underweight than their rural counterparts (von Braun *et al.* 1993; Ruel *et al.* 1998; Menon *et al.* 2000; Ruel 2000; Sahn and Stifel 2003; Smith *et al.* 2005; Fotso 2006). This urban health advantage is mainly attributed to well-equipped urban healthcare system coupled and its better accessibility – which facilitates public health interventions, such as campaigns to control epidemic diseases, vaccination, and maternal and child health programs—compared to rural areas (Fosto *et al.* 2007). Apart from an improved health care system, urban areas also offer greater availability of food, better housing, electricity, water and sanitation facilities, and rapid transportation than in rural areas (Garrett and Ruel 1999). Additionally, urban and rural populations differ in terms of literacy levels, economic status, employment opportunities, and other socio-cultural aspects that have an important bearing upon child health (Defo 1996; Lalou and Legrand 1997; Sastry 1997).

Meanwhile, there is a growing argument that the "urban health advantage" is diminishing in developing countries with their rapidly changing urban population (Harpham 2009). At the beginning of the 21st century, total urban population of the world surpassed the rural population. This growth is mostly contributed by developing countries where the poverty led massive rural to urban migration has resulted in proliferation of slums and informal settlements in many cities and towns (Harpham 2009; Matthews 2010; UN-HABITAT 2011). These settlements are characterized by severe deprivation, inadequate housing, poor sanitation and health services, poor public infrastructure, and hazardous environmental conditions. Moreover, the health and social services of urban centers have not kept pace with rapid growing urban population of developing countries (Fosto *et al.* 2007; Montgomery 2009). Consequently, the hazardous living conditions coupled with poverty have worsened the health susceptibility of marginalized urban subgroups than the rest of the urban dwellers in the developing countries (Madhiwalla 2007; UN-HABITAT 2011).

Recent studies have noted large economic inequality in child health status and utilization of MCH services in urban areas of developing countries. There is increasing inequality in utilization of maternal health care services between urban poor and the rest of the urban residents of developing countries (Shah *et al.* 2009; Zhao *et al.* 2009; Matthews *et al.* 2010). Similarly, child and maternal mortality among slums dwellers is much higher than non-slums dwellers (African Population and Health Research Centre 2002; Bartlett 2003; IIPS & Macro International 2007; Ziraba *et al.* 2009). Childhood nutritional status is no exception to this.

Many previous studies show that the socio-economic gradient in childhood nutritional status is higher in urban areas than rural areas of developing countries (Haddad *et al.* 1999; Bitran *et al.* 2005). Using Demographic and Health Survey (DHS) datasets from ten developing countries, a study has shown that the socioeconomic gradient in childhood stunting is indeed higher in urban areas (Menon *et al.* 2000). Another study from Sub-Saharan African countries has also documented similar findings (Fotso 2006). The worse childhood nutritional status among the urban poor is attributed due to their dismal living condition, income constraints, price barriers which limit the advantage that poor can reap from the better food supply in urban areas (Van de Poel *et al.* 2007).

Similar to other developing countries, there is evidence of urban divide in income, living conditions, and health status in India (Madhiwalla 2007; Topalova 2008). Consiquently, several studies have noted enormous and growing disparities in utilization of MCH services between economic groups of urban areas of the country (Gupta *et al.* 2008; Pathak and Mohanty 2010; Pathak *et al.* 2010; Kumar and Mohanty 2011). However, little is known about such disparity in in childhood malnutrition in urban India. A study provides a synoptic view of socio-economic gradient in childhood nutrition status in urban India (Arokiasamy *et al.* 2012), but it is unable to answer how the pattern of socio-economic inequality in childhood malnutrition has been changing over the period. Another study examines the poor/non-poor gap in childhood malnutrition in urban India at two points of time, but it basically focuses only on poor and non-poor and leaves other dimensions of the socio-economic status untouched (Kumar and Mohanty 2011). Importantly, the study has used poor/non-poor ratio which not only mask the information on inequality gradient but also has serious methodological limitations.

The main aim of the present study is to examine the patterns in socio-economic inequality in childhood malnutrition in urban India over the period 1992-2006. Though the average prevalence of underweight – an indicator of childhood malnutrition – among urban children is lower than rural children – 38% in urban areas compared to 46% in rural areas (IIPS and ORC Macro 2007), this lower prevalence cannot warrant for lower social-economic gradient in childhood malnutrition in urban India. Due to rapid urbanization in recent decades, India, like many other developing countries, is now facing numerous problems arising due to mounting number of urban poor living in abysmal living conditions (Census of India 2011). According to the Urban Poverty in India report (2009), about 26 percent of total urban population in India lives below the poverty line. Moreover, the ratio of urban poverty in some of the populous states is higher than that of rural poverty (NSSO 2001).

The present study, therefore, aims to examine the trends and patterns in childhood malnutrition with respect to socio-economic groups in urban India using the three rounds of the National Family Health Survey conducted during 1992-93, 1998-99, and 2005-06. The study considers two indicators of socioeconomic status – household economic status and maternal education. We focus on childhood malnutrition because it is one of the major public health problems in India. 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 in the country (Aadir and Guilkey 1997; Gragnolati *et al.* 2005; FOCUS 2006). In addition, childhood malnutrition is sensitive to poverty and associated attributes such as low income, poor education, poor environment and housing, inadequate access to foods, to safe water, and to healthcare services (Aadir and Guilkey 1997; ACC/SCN 1997; UNICEF 1998; Gopalan 2000; Pen and Bacalloa 2002). Moreover, the MDG1 exclusively calls for reduction in the proportion of underweight children under age five years.

Materials and methods

Data

Data for this study has been taken from three successive rounds of the National Family Health Survey (NFHS) of India conducted during 1992-2005. NFHS is large scale and multi-round survey conducted on the sampled households of the states of India. The multiple rounds of the survey are mainly facilitated by the International Institute for Population Sciences (IIPS), Mumbai with a collaborative assistance from several national and international organizations. The main purpose of the survey is to provide reliable estimates of fertility, infant and childhood mortality, nutritional status of children, utilization of maternal and child health care services, at national level, state level, and separately for urban and rural area.

All three rounds of the survey adopted multi-stage sampling design – two stage sampling design in rural areas and three-stage in urban areas. The sampling design remained similar in all the three rounds of the surveys which allow a comparison with the estimates of the consecutive rounds (Mishra *et al.* 2004; Ram and Roy 2004). The details of sampling design and sample size estimation are given in the reports of the various rounds of the NFHS (IIPS and ORC Macro 1995, 2000; 2007). The NFHS collected data using different interview schedules – household schedule and eligible women/individual schedule. The contents of the interview schedule remained similar in all the three rounds of the survey. The household response rate was 96% in the first round, 98% each in the second and third rounds of the survey. Similarly, the individual response rate was 96% each in the first and second rounds, while it was 94% in the third round of the survey.

Outcome variable

Three most widely used anthropometric indicators to measure childhood malnutrition are – weight-for-age (underweight), height-for-age (stunting), and weight-for-height (wasting). The present study focuses on underweight only. Underweight is a composite indicator of childhood malnutrition and reflects both acute and chronic nutritional deficiencies (World Health Organization Working Group 1986; IIPS & ORC Macro 2007). When a single indicator of childhood malnutrition to be used, it has been suggested in previous studies that underweight (weight-for-age) deserves to be given priority over other indicators (Deaton and Drèze 2009). Recent studies have also preferably used underweight to measure the trends in socio-economic inequality in childhood malnutrition (Pathak and Singh 2011). In addition, weight-for-age is the only anthropometric indicator which is comparable at national level in

all rounds of the NFHS. In NFHS–1, the information on stunting and wasting is not collected from few states - such as, Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Tamil Nadu, and West Bengal - which together make up about one third of Indian urban population. In the absence of such a big population, the estimates at national level cannot be said to represent urban population of India.

We considered underweight children the one 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 have used the term "underweight" and "undernutrition" 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 of age only. The final analytical sample size (number of children aged less than three years) of this study was 7547, 6771, and 8875 after excluding the missing & flagged cases which together account 19%, 11%, and 19% of the total sample during NFHS 1992-93, NFHS 1998-99, and NFHS 2005-06 respectively.

Predictor variables

Household wealth and maternal education are the main predictor variables in the study. In the absence of data on the income and expenditure in NFHS, the present study uses household wealth index as a proxy for household's economic status. The wealth index computed based on the economic proxies such as housing quality, household amenities, consumer durables, and size of land holding (Filmer and Pritchett 2001; Montgomery *et al.* 2000; Rutstein and Johnson 2004; Vyas and Kumaranayake 2006; Gwatkin *et al.* 2007; O'Donnell *et al.* 2008). The third round of the NFHS computed a wealth index using Principal Component Analysis (PCA) and the index is divided into five quintiles – poorest, poorer, middle, richer, and richest. But, the first two rounds of the survey computed Standard of Living Index (SLI) based on the arbitrary scoring of the economic proxies and the index was divided into three categories – low, medium, and high. Therefore, in the present study, a separate wealth index (divided in five quintiles) for urban area is computed based on selected economic proxies of households for all the three rounds of the survey. The Principal Component Analysis is used to compute the wealth index. This is done to make the wealth index comparable over the years.

Maternal education is computed using the data on the number of years of schooling and divided into four categories – uneducated (0 years of schooling), primary (1-5 years of schooling), secondary (6-12 years of schooling), and >secondary (>12 years of schooling).

Grouping of years of schooling into "level of education" is standard practice to classify maternal education from health survey data (Subramanyam *et al.* 2010).

We controlled a list of socio-demographic variables in the analysis, which in previous studies, have been found to be significantly associated with childhood underweight in India. These controlled variables are – sex of the child (male; female), age of the child (<12 months; 12-23 months; ≥24 months), birth order & preceding birth interval (first order; ≤24months; >24 months), size of the child at birth (large; average; small), mother's age at births (≤19 years; 20-29 years; and ≥30 years), father education (uneducated; primary; secondary; >secondary), utilization of antenatal care services (yes; no), religion (Hindu; Muslims; Others), caste (Scheduled caste/Scheduled Tribe – SC/ST; Other Backward Castes – OBC; Others), mother's exposure to media (yes; no), current working status of mother (yes; no) and region of the country (north; east; central; northeast; west; south). The region is classified following the regional classification of NFHS (IIPS and ORC Macro 2007).

Statistical analysis

Bivariate analyses were carried out to examine the level and trends in childhood undernutrition across the household wealth and maternal education. Chi-square test was used to examine the significant association between underweight and socio-economic indicators. We calculated absolute and relative differences to understand the pattern in socio-economic inequality in childhood undernutrition over the period. Concentration index (CI) was used to measure economic inequality in childhood undernutrition in urban India over time. The CI is widely used to examine the extent of socio-economic inequality in any health outcome. It is defined as twice the area between the concentration curve and the line of equality (Wagstaff *et al.* 1991; van Doorslaer *et al.* 1992; Kakwani *et al.* 1997; O'Donnell et al. 2008). The value of CI varies between –1 to +1. A negative value implies that considered health variable is concentrated among the poor population, while a positive value indicates the opposite condition. A value of zero implies that a health outcome is equally distributed within the economic groups. We used factor score of household wealth, obtained from the principle component analysis, to measure the concentration index.

Wagstaff (2005) has shown that the lower and upper bounds for CI can depend on the mean values in case of dichotomous outcome variables (as in our case). This implies that the extent of inequality as measured by the CI can get affected considerably if the mean of the outcome variable changes from one survey round to the other. One solution to address this problem is to normalize the CI or to divide it by the reciprocal of the mean. We have addressed this issue in the present analysis by normalizing the CI values.

In the present study, underweight is considered as a binary outcome (1=if underweight, 0=otherwise), therefore binary logistic regression is used. The regression analysis is performed on the pooled dataset of all the three rounds of the NFHS. This is done to examine the interaction effect of time with household wealth and maternal education. The results obtained from the regression analysis have been presented in form of predicted probabilities

to make the interpretation more meaningful. 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 into pooled logistic regression analysis.

Results

Trends in childhood undernutrition in urban India

In general, prevalence (%) of underweight among children age less than 3 years have decreased in urban India over the period (Figure 1). It has decreased from 44% in 1992-93 to 38% in 1998-99 and further to 37% in 2005-06. Thus the reduction in prevalence was 6 percentage points during 1992-98; however, it could not reduce further with the same pace and the reduction recorded between 1998 and 2005 was only one percentage point.

Table 1 shows trends in the prevalence of underweight across household economic status and maternal education during last 14 years. The prevalence of underweight has declined across household economic status over the period. For instance, among poorest wealth quintile, the prevalence has declined from 61% in 1992-93 to 56% in 1998-99 and to 54% in 2005-06. Among children from the richest wealth quintile, the prevalence has declined from 30% in 1992-93 to 19% in 1998-99, but it has increased to 22% in 2005-06. The trends remained more or less similar across the other wealth quintiles. The table also shows decreasing trends in childhood undernutrition across the maternal education. Among uneducated mothers, the prevalence of underweight has declined from 57% in 1992-93 to 52% in 1998-99 and further to 50% in 2005-06. Similarly, among mothers with above secondary level, the prevalence has declined from 23% in 1992-93 to 20% in 1998-99 and to 19% in 2005-06.

Though the prevalence of underweight has declined across household wealth quintiles and levels of maternal education, the decline was higher among better-off groups compared to least affluent groups over the study period (Table 2). For instance, the percentage decline in the prevalence of underweight was 12% among the poorest quintile compared to 27% among the richest wealth quintile during 1992-05. Similarly, the decline was 13% among uneducated mother compared to 20% among most educated mothers.

Socio-economic inequality in childhood undernutrition in urban India

To measure the trends in socio-economic disparity in the prevalence of childhood underweight, we calculated absolute and relative differences (Table 3). We also calculated concentration index (CI) to measure the economic inequality in childhood undernutrition. The absolute differences between poorest and richest economic groups have first increased (30% in 1992-93, increased to 37% in 1998-99) then decreased (from 37% in 1998-99 to 32% in 2005-06). Similarly, the differences between uneducated and most educated mother has decreased over the period, though it was minimal – 34% in 1992-93, 32% in 1998-99, and 31% in 2005-06.

Relative differences in childhood undernutrition have increased across household wealth quintiles as well as levels of maternal education over the time. For instance, the relative difference across the household wealth has increased from 2.03 in 1992-93 to 2.93 in 1998-

99, and 2.47 in 2005-06. Similarly, the difference across the maternal education has increased from 2.45 in 1992-93 to 2.65 each in 1998-99 and 2005-06. The concentration index indicates that the economic inequality in childhood undernutrition has increased over the study period – value of CI has increased from 0.143 ($p<0.01$) in 1992-93 to –0.171 ($p<0.01$) in 2005-06.

Multivariate analysis

The findings of the descriptive analysis and concentration index suggest that socio-economic inequality in childhood undernutrition has either widened or stagnated in urban India over the time. However, it is worth noting here that these findings may be biased as they were not adjusted for the other social-demographic determinants which might have a strong influence on childhood malnutrition. Owing to this limitation of the descriptive analysis, we applied the regression analysis using the pooled datasets of the three rounds of the NFHS. Table 4 presents the results of the regression analysis (predicted probability with 95% confidence intervals) showing the interaction effect of time with household wealth and maternal education on the prevalence of childhood undernutrition in urban India during 1992-2005. The findings of the regression analysis confirm the result obtained from the descriptive analysis. We found a clear economic gradient in probability of underweight over the time. For instance, the probability of underweight was 0.479 among children of the poorest wealth quintile during 2005-06. The corresponding probability for the richest wealth quintile was 0.186 in 2005-06. Similarly, the probability of underweight was 0.467 among children of the uneducated mothers and the corresponding value was 0.159 among the children of most educated mothers in 2005-06. The pattern remained similar over the time.

The changes in the probability of underweight over three rounds of the NFHS across household wealth and maternal education are presented in table 5. The result is adjusted for the other relevant socio-demographic variables. The results show that decline in the prevalence of underweight was about twice higher (30%) among the richest quintile compared to the poorest quintile (16%) during 1992-2005. Similarly, the decline was more than double (27%) among most educated mothers compared to uneducated mothers (12%) over the period. The findings clearly show that socio-economic inequality in childhood underweight has increased over the period after adjusting for confounders.

Discussion

This study examined the pattern of socio-economic inequality in underweight among children less than three years in urban India over last 14 years. The socio-economic factors were: household wealth and maternal education. The study appeared with three specific findings. First, the prevalence of underweight among children aged 0-35 months has declined in urban India over the period. Second, though the prevalence of underweight has declined but there is stark and persisting disparity across household wealth and maternal education. Third, the decline in the prevalence of underweight is greater among better-off socioeconomic groups compared to the least affluent groups over the study period.

The findings of this study show that the prevalence of childhood underweight has declined in urban area over the study period. The decline in the prevalence of underweight may be a combine effect of rapid economic growth with the implementation of the New Economic Policy in early 1990's, improved living conditions, and maternal and child health interventions and programs implemented during the period, but the data do not permit us to assess the program effect on the decline in the prevalence of underweight among the children. Though the prevalence of underweight has decreased over the study period,there is a clear indication of stagnation in average childhood undernutrition between 1998-99 and 2005-06. It is worth nothing here that the current prevalence of underweight among children in urban India is still much higher than the average level of underweight of many of the South-East Asia and most of the African countries (UNICEF, 2006).

Like national average, the prevalence of underweight has also declined across the household wealth and maternal education. However, a great disparity, unfavourable to the children of lower socio-economic groups, still persists. Many previous studies have noted considerable pro-rich economic inequality in utilization of maternal health care services and child health status in urban India (Gupta *et al.* 2008; Pathak and Mohanty 2010; Kumar and Mohanty 2011). Our findings are in tune with these studies. The higher prevalence of underweight among the children of poorest wealth quintile could be explained by their poor living conditions, detrimental environment conditions which are more susceptible to infectious diseases, low affordability to purchase the quality foods, and low level of utilization of health care services. These conditions may lead to inappropriate physical growth, poor nutritional status and frequent attacks of infectious diseases like diarrhoea which may propel the risk of under-nutrition among the children belonging to the lower socioeconomic groups (Caulfied *et al.* 2004).

Inequality in childhood undernutrition across the maternal education is similar to that of household wealth. The level of childhood under-nutrition is higher among children of illiterate mothers compared than those born to highly educated mother. This low level of malnutrition among children of most educated mothers may reflect, in part, the health advantages conferred by higher household economic status along with greater access and use of health care services. The effect of maternal education on her child nutritional status may also be channelized through mothers' health knowledge, nutritional practices, and her empowerment within the household (Miller and Rodgers 2009; Aslam and Kingdon 2010).

The results of the multivariate analysis show that socio-economic inequality in childhood undernutrition has widened over the study period. Inequality across household wealth has progressively increased between 1992-93 and 2005-06. Economically better-off household have experienced a greater decline in the prevalence of underweight with compared to households of the poorest quintile. These findings suggest that economically better-off households have benefited more from the economic growth and on-going maternal and child health interventions than poor households during 1992-05 (Subramaniyam *et al.* 2010). The inequality in childhood undernutrition is also growing across levels of maternal education. The decline in the prevalence of underweight is higher among the children of most educated

mothers compared to the children of uneducated mothers between 1992 and 2005. It may be said that children of most educated mothers have benefited to a greater extent form the maternal and child health interventions and economic growth during the period (Subramanyam *et al.* 2010).

This study addresses the socio-economic inequality in childhood malnutrition in urban India for a period when the country has gone under rapid economic transformation with the introduction of the New Economic Policy in the early 1990's. In addition, the country has made several maternal and child health interventions during the period to improve the health status of mother and children. These multifaceted economic and social developments have lowered down the average childhood malnutrition in the urban India over the period, but the fruit of socio-economic development is not equally benefited to the disaggregated socio-economic groups of urban population of the country. Over the period, the socially and economically better-off segment of the urban population has reaped the advantages at a greater extent than marginalized and poor counterparts. This could be a cause of persistent and growing socio-economic inequality in childhood undernutrition in urban India.

The findings of the study may guide the existing health policies in the country. Acknowledging the greater health needs of rural population, the Government of India launched a nationwide scheme - the National Rural Health Mission (2005-2012) – with an aim to make architectural corrections in the public (government) health care system in rural areas and to ensure provision of high-quality health services to the rural masses in general, and the poor and the marginalized in particular. Unfortunately, the health needs of the urban population have been overlooked probably under the impression that the availability and accessibility of health facilities are better in the urban than in rural areas. This could have happened due to lack of systematic evidence on socio-economic inequalities in health status in urban India. This study proposed to adopt a similar approach under the ongoing National Urban Health Mission (NUHM) to formulate a comprehensive health system response towards growing urban health needs of urban populations, particularly to the children belonging to the poorest socio-economic groups. In addition, the findings of the study also suggest for the expansion of the Integrated Child Development Services (ICDS) – a sole government scheme to help poor people better nutrition in urban India. The coverage of ICDS has been highly inadequate in urban areas of India. According to the Department of Women and Child Development, Government of India (2005), there are 360 urban ICDS projects catering to about 90 million urban poor. This highlights a need to expand the ICDS coverage in urban areas particularly in the slums and among most vulnerable urban population in the country.

Conclusions

This study concludes with the two key messages emerging from the analysis. First, though the proportion of malnourished children has declined in urban India over the period, the current level is still high. Second, the socio-economic inequality in childhood underweight is increasing in the urban India keeping the abysmal health condition of children belonging to the poor and deprived household. Our findings clearly show higher levels of child

malnutrition and the widening inequality between the better-off and less affluent urban population. Based on the findings, the study suggests for specific policy, in line with those already in exists in rural India, to address the high and increasing socio-economic inequality in childhood malnutrition in urban India. As India is going to be overwhelmingly urban, the salient findings of this study suggest the need for a multifaceted policy to improve the average health as well as to arrest the burgeoning socio-economic inequality in childhood malnutrition in urban India.

Limitations

This study address trends in socio-economic inequality in childhood underweight in urban India. The findings of the study are subject to certain limitations, which is important to address. The first round of NFHS did not collect data from the state of Sikkim, thus the estimate from the first round may be a matter of caveat. Nevertheless, looking at the contribution of Sikkim in a national sample (0.05% in NFHS-2 and 0.04% in NFHS-3), we believe that our findings are not affected considerably and the estimates are comparable over the study period. Secondly, although multiple births are susceptible to poor child health outcomes, we have not accounted for them in this study considering the small number of such cases in the dataset.

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Figure 1 Trends in prevalence of underweight among children aged less than 36 months in urban India, 1992-05

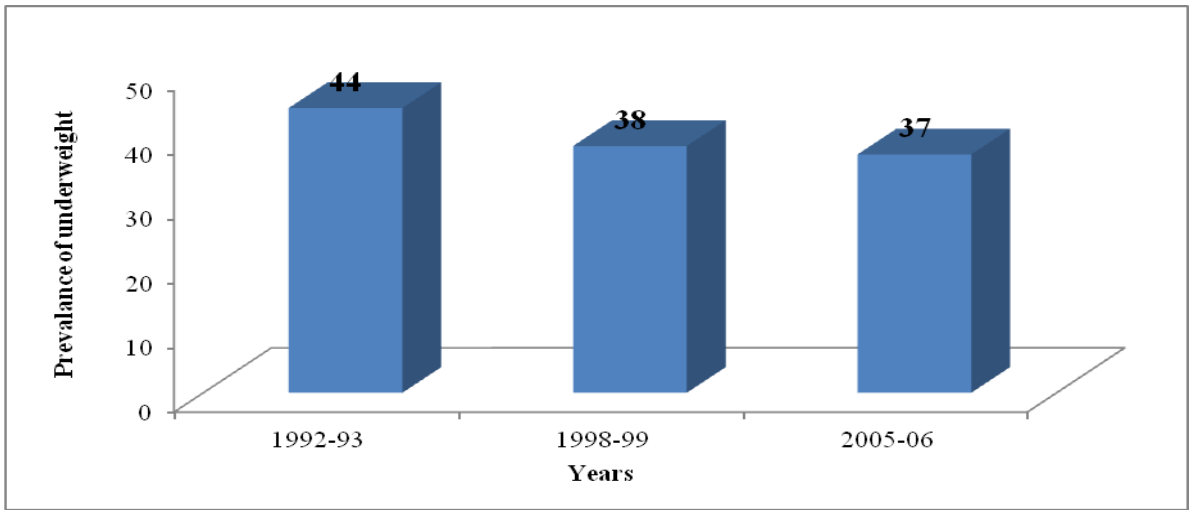

Table 1 Socio-economic differentials in prevalence of underweight among children aged less than 36 months in urban India, 1992-05

	1992-93	1998-99	2005-06
Household wealth	(361.079)***	(451.901)***	(444.620)***
Poorest	60.6	56.1	53.5
Poor	51.3	47.0	42.1
Middle	45.8	40.0	40.5
Rich	35.9	31.3	28.9
Richest	29.9	19.2	21.7
Maternal education	(392.281)***	(361.413)***	(430.822)***
Uneducated	57.2	52.0	49.5
Primary	45.9	45.1	42.2
Secondary	37.1	32.6	34.5
>Secondary	23.4	19.6	18.7

Note: Figures in parentheses are the Chi-square statistic; x^2 test applied for each variable.
Level of significance: ***p<0.01.

Table 2 Percentage change in prevalence of underweight among children aged less than 36 months across household wealth and maternal education in urban India, 1992-05

	1992-98	1998-05	1992-05
Household wealth			
Poorest	7.5	4.6	11.8
Poor	8.4	10.3	17.9
Middle	12.6	-1.3	11.5
Rich	12.9	7.5	19.5
Richest	35.9	-13.2	27.4
Maternal education			
Uneducated	9.2	4.7	13.4
Primary	1.7	6.3	7.9
Secondary	12.1	-5.8	7.0
>Secondary	16.1	4.7	20.0

Table 3 Absolute and relative differentials in prevalence of underweight among children aged less than 36 months across household wealth and maternal education in urban India, 1992-05

	1992-93	1998-99	2005-06
Absolute differentials[1]			
Household wealth	30.8	36.9	31.8
Maternal education	33.9	32.4	30.9
Relative differentials[2]			
Household wealth	2.03	2.93	2.47
Maternal education	2.45	2.65	2.65
Concentration Index	**-0.143*** **	**-0.191*** **	**-0.171*** **

[1]Difference between Maximum to Minimum within the group
[2]Ratio of Minimum to Maximum within the group
***p<0.01

Table 4 Predicted probabilities (95% confidence interval) of underweight among children aged less than 36 months across household wealth and maternal education in urban India, 1992-05

	1992-93		1998-99		2005-06	
	PP[†]	95% CI	PP[†]	95% CI	PP[†]	95% CI
Household wealth						
Poorest	0.572	(0.096, 0.903)	0.538	(0.086, 0.906)	0.479	(0.068, 0.841)
Poor	0.479	(0.054, 0.868)	0.453	(0.047, 0.881)	0.385	(0.053, 0.803)
Middle	0.415	(0.040, 0.839)	0.364	(0.033, 0.809)	0.336	(0.035, 0.727)
Rich	0.339	(0.034, 0.794)	0.304	(0.029, 0.769)	0.271	(0.030, 0.700)
Richest	0.266	(0.034, 0.781)	0.182	(0.016, 0.627)	0.186	(0.016, 0.595)
Maternal education						
Uneducated	0.530	(0.096, 0.930)	0.497	(0.057, 0.906)	0.467	(0.048, 0.841)
Primary	0.435	(0.060, 0.889)	0.437	(0.437, 0.869)	0.371	(0.046, 0.777)
Secondary	0.330	(0.041, 0.805)	0.300	(0.021, 0.852)	0.299	(0.030, 0.801)
>Secondary	0.216	(0.034, 0.582)	0.166	(0.016, 0.698)	0.159	(0.016, 0.554)

Note: The models have been adjusted for sex of the child, age of the child, birth order & preceding birth interval, size of the child at birth, age of the mother at birth, father education, access to antenatal care, caste, religion, exposure to media, current working status of mother, and region of the country.
[†]All the predicted probabilities (PP) were significant at p<0.05.
PP: Predicted probability;
CI: Confidence interval;

Table 5 Percentage change in predicted probabilities of underweight among children aged less than 36 months across household wealth and maternal education in urban India, 1992-05

	1992-98	1998-05	1992-05
Household wealth			
Poorest	6.1	11.0	16.4
Poor	5.5	14.9	19.6
Middle	12.2	7.8	19.0
Rich	10.4	10.8	20.0
Richest	31.5	-1.9	30.2
Maternal education			
Uneducated	6.3	6.1	12.0
Primary	-0.5	15.0	14.6
Secondary	9.0	0.6	9.5
>Secondary	22.9	4.7	26.6