

# Trends & Patterns of Child Malnutrition in India: A Disaggregated Analysis

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*Using National Family Health Survey (NFHS) data, this paper examines in detail the trends and patterns in child malnutrition at the national and state levels during 2005-06 and 2015-16. It analyses the regional variations in the nutritional status of children below five years and attempts to provide explanations for the observed pattern. In addition, the study examines the socio-economic inequalities in child malnutrition. At the all-India level, the study finds a limited improvement in the nutritional status of children between NFHS-3 and NFHS-4. The socio-economic inequalities in child malnutrition continue to persist during this period implying that a relatively greater proportion of malnourished children are concentrated in poor households in both rural and urban India.*

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## **Introduction**

Children of today represent the human capital of tomorrow (Nair, 2007) and therefore, no country can afford to neglect the health and well-being of children. Previous studies have found a positive association between human capital and economic growth (Barro, 2001; Collin & Weil, 2018). This implies that neglecting the nutritional and well-being aspects of children may have negative effects on overall economic growth and development. The literature has also established that child malnutrition is likely to have an adverse effect on cognitive development, learning outcomes in school, labor productivity, and wage earnings (e.g. Strauss & Thomas, 1998; Grantham-McGregor et. al., 1999; Hoddinott, 2009; Niti Aayog, 2017).

India ranks at 103 out of 119 countries in the Global Hunger Index 2018 and accounts for the highest number of stunted children (nearly 47 million) in the world (Global Nutrition Report, 2018). Child malnutrition rates in India exceed those in sub-Saharan Africa and are about five times more than in China (Gragmolati et. al., 2006; Kumar, 2007;

World Bank, 2013). In 2015-16, more than one-third of children below five years were stunted and underweight in India (IIPS& ICF, 2017). This dismal performance by India in child nutrition coupled with strong economic growth has led to considerable research in this area (Nie, Rammohan, Gwozdz, Sousa-Poza, 2016; Haddad, 2009). Scholars have used the term “South Asian enigma” (Ramalingaswami et al., 1996) to explain India’s paradoxical case. At the all-India level, child malnutrition rates vary by place of residence (rural/urban), caste, and wealth. For example, in 2015-16, 38.3 percent children (below five years) were underweight in rural India whereas about 29 percent children were underweight in urban India (IIPS& ICF, 2017).

There are considerable disparities in industrial and economic development across the Indian states (Sharma, 2017). The trends in child malnutrition at national level do not reveal the considerable disparities across different states. For example, in 2015-16 about 12 percent of children below five years were underweight in Sikkim whereas this figure was 47.8 percent for Jharkhand (IIPS& ICF, 2017). The proportion of stunted children across states also ranges from 20 percent (in case of Goa) to about 48 percent (in case of Bihar). It is generally believed that a mere focus on economic growth is likely to reduce the incidence of child malnutrition in various states. However, the poor nutritional performance of economically advanced states such as Gujarat, Maharashtra, and Karnataka does not provide support to this argument. On the other hand, low income north-eastern states

such as Manipur, Nagaland, Mizoram, and Arunachal Pradesh have shown better performance with respect to child malnutrition. These observations warrant a detailed analysis of child malnutrition at the regional level.

Several studies have attempted to analyze and explain the extent of child malnutrition in India. Majority of the existing studies focus on explaining the regional disparities in child malnutrition in India over last few decades (e.g. Nair, 2007; Radhakrishna & Ravi, 2004; Kumar, 2007; Cavatorta, Shankar & Flores-Martinez, 2015; Yadav, Ladusingh & Gayawan, 2015). However, most of the existing studies are restricted to 2005-06 and therefore do not provide any information about the child malnutrition at state level during recent years. The present study examines in detail the trends and patterns of child malnutrition at regional level. The study also examines the socio-economic inequalities in child malnutrition during 2005-06 to 2015-16.

### **Related Literature on Child Malnutrition**

Using NFHS data, several studies find the existence of significant inter-state and rural-urban disparities in child malnutrition in the case of India. One of the important findings of these studies is that

**Middle income states have shown better performance with respect to child nutrition than high-income states.**

middle income states have shown better performance with respect to child nutrition than high-income states. These studies also argue that poverty reduction has not led to substantial improvement in nutritional outcomes of Indian children (e.g. Radhakrishna, Rao, Ravi & Reddy, 2004; Nair, 2007; Deaton & Dreze, 2009).

Studies have attempted to provide several explanations for the prevalence of inter-state disparities in child malnutrition. Cavatorta et. al., (2015) have extensively reviewed the two strands of literature which explain these variations. The first strand of literature argues that states differ with respect to nutritional achievements because of differences in endowments (UNICEF, 1990; Nair, 2007; Kumar & Kumari, 2014). These endowments include factors such as availability of health facilities, hospitals, maternal literacy, agricultural production and household wealth. Nair (2007) finds that these disparities have increased between NFHS-1 (1992-93) and NFHS-3 (2005-06). He argues that economically underdeveloped and populous states such as Uttar Pradesh (U.P.) and Bihar have witnessed an increase in the extent of child malnutrition which cannot be tackled by merely emphasizing on achieving high economic growth. In order to achieve better nutritional outcomes, the study suggests measures like increasing women's age at first child birth, implementing timely lactating practices and improving maternal literacy. Other studies at the regional level have also reached similar conclusions on the extent of inter-state and rural-urban disparities with respect to child malnutri-

tion in India (e.g. Kumar, 2007; Pathak & Singh, 2011).

On the other hand, second strand of literature argues that similar endowments in some states may give rise to drastically different nutritional results (Harriss & Kohli, 2009; Cavatorta et. al., 2015). This may happen because states differ in terms of quality of public services, institutions, and policies. Cavatorta et. al., (2015) analyze the interstate disparities in child malnutrition (measured by height for age) by comparing the performance of Bihar, Uttar Pradesh, Madhya Pradesh and Gujarat (poor performing states) with that of Tamil Nadu (good performing state). Their results highlight that differences in stunting across states are not significantly explained by differences in endowments. Other studies have also examined the role of institutions and policies in affecting child malnutrition in India (Walton, 2009; Balarajan & Reich, 2016).

**Differences in stunting across states are not significantly explained by differences in endowments.**

It is argued that interaction of social and economic factors affects the extent of child malnutrition. Studies have established that there exists a close link between the socio-economic factors and child health (Wagstaff, 2000; Kumar, Kumari & Singz, 2015; Pulok, Sabah & Enemark, 2016). There are several studies for developing countries which have examined the extent of socioeconomic inequalities in child malnutrition

(e.g. Wagstaff, 2000; Subramanyam, Kawachi, Berkman & Mazumdar, 2010; Kumar et. al., 2015; Prakash & Jain, 2016; Pulok et. al., 2016; Nie et. al., 2016). The relationship between poverty and socioeconomic inequalities and child malnutrition is analyzed by Mazumdar (2010) using NFHS-3 data (for 2005-6). He finds importance of poverty in explaining the observed disparities in child malnutrition among different sections of the society. His results also highlight that the poor sections of the population bear a relatively greater burden of child malnutrition. However, this study is restricted to a single point of time and does not analyze the how these inequalities have changed over time.

There exist studies which have examined the trend of socioeconomic inequalities in child malnutrition during NFHS-1 (1992-93) and NFHS-3 (2011-12). Majority of these studies find that these inequalities have witnessed an increase in India over the last two decades (e.g. Subramanyam et. al., 2010; Pathak & Singh, 2011; Kumar et; al., 2015; Prakash & Jain 2016). A study by Pathak & Singh (2011) which studies only the trends of economic inequalities with regard to child malnutrition finds an increase between NHFS-1 (1992-93) and NFHS-3 (2011-12). This study also argues that poor children are at a greater disadvantage and suffer from severe malnutrition. In addition to economic inequalities (measured by household wealth), Subramanyam et. al., (2010) analyze the trends of social disparities in child malnutrition by examining factors such as caste, gender, and maternal education. This study finds no inequali-

ties in child malnutrition by caste and gender. It also asserts that inequalities in malnutrition by maternal education are significantly lesser than those by household wealth. However, for urban India Kumar et. al. (2015) find exactly the opposite result. They find evidence of increasing socioeconomic inequalities in India during the last two decades and advocate the implementation of policies specific to urban areas of the country.

**Household wealth and maternal literacy explain the prevalence of socio-economic inequalities in child malnutrition.**

In addition to the trend analyzes of inequalities in malnutrition, various scholars have also attempted a detailed examination by doing a decomposition analysis of the inequalities (e.g. Joe, Mishra & Navaneetham, 2009; Kumar & Kumari, 2014; Cavatorta et. al., 2015; Prakash & Jain 2016; Nie et. al., 2016). Using concentration indices and concentration curves, these studies find that household wealth and maternal literacy explain the prevalence of socio-economic inequalities in child malnutrition. On the basis of NFHS-3 (2005-06) data, Mazumdar (2010) finds that household wealth and maternal education predominantly explains the disparity in child malnutrition. He argues that policymakers should aim at achieving social and economic development which may reduce the prevalence of child malnutrition in India. Similar conclusions are obtained by Prakash & Jain (2016) who analyze the socio-economic inequalities in child malnutrition between

NFHS-1 (1992-93) and NFHS-3 (2005-06). They advocate the need for continuous review of target-based schemes and increasing the focus on parental education. Several studies have exclusively analyzed the determinants of socio-economic inequalities in child malnutrition for urban India (Kumar et. al., 2015) whereas others have focused on rural India (Cavatorta et. al., 2015). These studies also point out the existence of significant rural-urban differentials with respect to child malnutrition.

Some studies have also argued that children belonging to scheduled castes (SCs) and scheduled tribes (STs) have poor nutritional status as compared to other children (e.g. Van de Poel & Speybroeck, 2009; Yadav et. al., 2015). However, scholars find that the link between caste and nutritional status of children become weak once household wealth and maternal education are taken into consideration (Subramanyan et. al., 2010). This supports the findings of decomposition-based studies which argue that both these factors significantly contribute to socio-economic inequalities in child malnutrition.

The present study focuses on examining the interstate disparities in child malnutrition in India between NFHS-3 (2005-06) and NFHS-4 (2011-12). It examines the trends and patterns at regional level across caste, residence and gender and attempts to provide possible explanations for the observed patterns. In addition, this paper analyses the socioeconomic inequality trends in child malnutrition in India.

## **Data Sources & Methods**

National Family Health Survey (NFHS) data of the two rounds carried out in 2005-06 (NFHS-3) and 2015-16 (NFHS-4) is the major database used in this study. NFHS is administered and coordinated by International Institute of Population Sciences (IIPS), Mumbai under aegis of Ministry of Health & Family Welfare, Government of India. NFHS has a broader coverage of states, covering 99% of population in 29 states (Nair, 2007; IIPS & ICF, 2008). NFHS provides useful information related to health and family welfare with an objective to analyze the performance of health sector (IIPS & ICF, 2017).

This study examines the nutritional status of children aged below five years on the basis of three anthropometric measures: 'weight-for-age', 'weight-for-height', and 'height-for-age'. Children are classified as underweight, wasted and stunted when the respective z-score is below minus two standard deviations of median values of international reference group (Dibley et. al., 1987; WHO, 2010; Kumar & Kumari, 2014). However, following the literature we examine in detail the level of child nutrition in terms of 'weight-for-age' (i.e. percentage of underweight children). This is done because 'weight-for-age' comprehensively measures both long-term and short-term nutritional performance (Nair, 2007; Deaton & Dreze, 2009) and it is the only information which is comparable across rounds (Kumar & Kumari, 2014; Prakash & Jain, 2016).

In this study, we compare the child malnutrition performance across different states to examine the inter-state disparities during the ten year period between NFHS-3 (2005-06) and NFHS-4 (2015-16). We also compare the performance of states with India as a whole to see which states have performed below the national average. Following Nair (2007), we compute the relative state malnutrition index (RSMI) by comparing the level of child malnutrition in a state with the national level. The formula used is:  $RSMI = (MN_S/MN_N) * 100$  where  $MN_S$  and  $MN_N$  denotes malnutrition in a state and nation respectively. The percentage change in RSMI between NFHS-3 and NFHS-4 indicates the convergence/divergence in malnutrition performance across states.

Further, the study attempts to examine the socio-economic inequalities in child malnutrition (by place of residence) between NFHS-3 (2005-06) and NFHS-4 (2015-16). This is done by using study 'concentration curve' (CC) and 'concentration index' (CI). Previous studies on health and nutrition have extensively used these to study socio-economic inequalities in child malnutrition (Wagstaff et. al., 1991; Kakwani et. al., 1997; Kumar et. al., 2015). CC graphically depicts the socio-economic inequalities in child malnutrition (Pulok et. al., 2016). It plots the cumulative percentage of population (ordered by wealth/income) against the cumulative percentage of health variable (Wagstaff et. al., 1991; Pulok et. al., 2016). This curve is analogous to the 'Lorenz curve' with diagonal representing the line of equality. Closer this curve

is to the line of equality, lesser is the inequality in health and vice-versa.

However, scholars argue that CC is a graphical illustration and does not give any information about the magnitude of socio-economic inequalities in health (Pulok et al., 2016; Prakash & Jain, 2016). CI gives a quantitative measure of socio-economic inequalities in health. It is defined as twice the area between CC and line of equality with values ranging from -1 to +1 (Wagstaff et. al., 1991; Mazumdar, 2010). The negative values indicate the uneven concentration of health variable among economically weaker sections of the population. We compute the CI for three measures (underweight, wasting, and stunting) for NFHS-3 (2005-06) and NFHS-4 (2015-15) by place of residence (rural and urban). Following Wagstaff et. al. (1991) and Kakwani et. al. (1997), CI is computed by the formula:

$$\text{Concentration Index (CI)} = 2 \text{ Cov}(y, h) / \mu$$

Where  $\text{Cov}(y, h)$  is the covariance between relative rank in terms of wealth index,  $y$  and health variable,  $h$  and  $\mu$  is the mean of health variable.

## Findings & Discussion

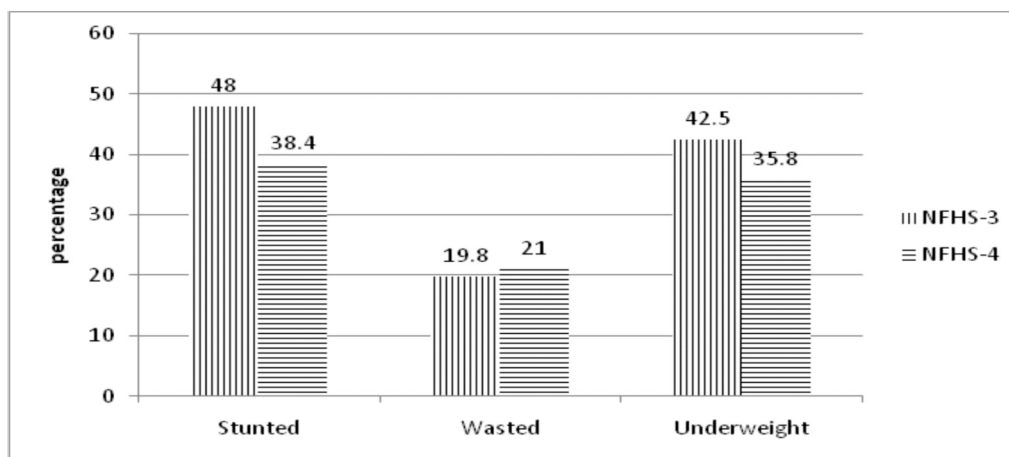
First, we examine the trends and pattern of child malnutrition at the national level during the ten year period covering NFHS-3 (2005-06) and NFHS-4 (2015-16). This analysis is done by residence (urban/rural) and caste categories. We explain the performance and

state of child health in India by studying the condition of basic health services such as vaccination of children, facilities related to maternity care etc. Then, we examine the inter-state disparities in child malnutrition in terms of stunted, wasted and underweight children between the two rounds of NFHS. We also look at rural-urban and caste-wise differentials in child malnutrition at the regional level. Finally, this section discusses the trend in socio-economic inequalities in child health by residence between NFHS-3 and NFHS-4.

The proportion of children below five years who were stunted, wasted, and underweight at the all-India level are shown in Fig. 1. According to NFHS-4, about 38 percent children were stunted, 21 percent children were wasted, and

36 percent children were underweight in 2015-16. The proportion of Indian children who are stunted is matched by underdeveloped countries such as Sudan, Mali, Chad, and Zambia. Even India's neighboring countries such as Bangladesh, Bhutan, Nepal, and Sri Lanka perform better with respect to this indicator (International Food Policy Research Institute, 2016). Figure 1 also shows that India has not been able to achieve significant gains in nutritional performance during the ten-year period between NFHS-3 and NFHS-4. In addition, the proportion of wasted children has increased from 19.8 percent in NFHS-3 (2005-06) to 21 percent in NFHS-4 (2015-16). The proportion of underweight children is reduced by less than 7 percent during the ten-year long period.

Fig. 1 Nutritional Status of Children Below 5 Years (in percentage) in NHFS-3 & NFHS-4



Source: NFHS-4 Fact Sheets (2015-16)

Table 1 shows that rural areas of the country are at a comparatively disadvantageous position than the urban areas. The proportion of stunted and under-

weight children below five years in rural India exceeds those in urban India by about 10 percent. However, the divergence is much less with respect to the

proportion of wasted children. The poor state of child health in rural regions of

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India would affect the future productivity and economic performance of these regions. The comparatively dismal state of child nutrition in rural India is the result of continuous neglect of health facilities and infrastructure which requires drastic policy reforms from the government.

**Table 1 Child Malnutrition by Place of Residence (All India) (Percentage of Stunted, Wasted & Underweight Children) NFHS-4 (2015-16)**

Children under five years who are	NFHS-4 (2015-16)			NFHS-3 (2005-06)	All- India	% Change	Remarks
	Urban	Rural	India	India			
Stunted	31	41.2	38.4	48		-9.6	Improves
Wasted	20	21.5	21	19.8		1.2	Deteriorates
Underweight	29.1	38.3	35.8	42.5		-6.7	Improves

Source: NFHS-3 & NFHS-4

Some scholars argue that women belonging to scheduled castes (SCs), scheduled tribes (STs), and other backward classes (OBCs) are in a disadvantageous position with respect to availability and utilization of health care services (e.g. Navaneetham & Dharma-lingam, 2002). This is likely to have a significant effect on child health and well-being. Table 2 depicts the nutritional status of children belonging to different social groups. The proportion of stunted, wasted, and underweight children among SCs, STs, and OBCs is higher than those in the 'Other' category. For example, in NFHS-4, about

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39 percent children were underweight in SC group, 35 percent in ST group, and 36 percent in OBC group, whereas about 27 percent children were underweight in the Other group. The relatively disadvantageous social groups have not witnessed a significant improvement between NFHS-3 and NFHS-4. Table 2 highlights this limited improvement in nutritional status of children among the social groups between the two NFHS rounds.

Previous studies have pointed out the crucial role of maternal health, child immunization, and access to basic health services in affecting child health (Joe et al., 2009; Kumar, 2007). Table 3 clearly shows the limited progress with respect to indicators related to child feeding practices and maternal care. For example, the percentage of children under age 6 months who were exclusively breastfed increased

**Table 2 Nutritional Status of Children by Caste in NFHS-3 & NFHS-4**

Percentage of Children Below 5 Years Who Are	SC		ST		OBC		Other	
	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
Stunted	50.38	43.24	46.61	39.6	45.7	39.33	35.84	30.56
Wasted	19.92	21.71	20.38	21.71	19.09	20.86	15.59	17.96
Underweight	44.11	39.42	39.2	34.84	39.76	36.15	29.28	26.93

Source: Calculated from NFHS-3 and NFHS-4 data

from about 46 percent in NFHS-3 to 55 percent in NFHS-4. This increase of only 9 percentage points over a period of ten years appears quite insignificant. On the other hand, there has been a decline in the proportion of children aged 6-8 months receiving solid/semi-solid food and breast milk. Access and availability of facilities related to mother's health are also a primary determinant of child health and well-being. Table 3 highlights the limited

progress with respect to maternity care indicators. For example, the proportion of women receiving full antenatal care increased to 21 percent in NFHS-4 from about 12 percent in NFHS-3. This implies about one-fifth of the pregnant women had access to full-antenatal care.

**One-fifth of the pregnant women had access to full-antenatal care.**

**Table 3 State of Basic Health Services (All India) in NFHS-3 & NFHS-4**

Parameters	NFHS-3	NFHS-4
Child immunization and Vitamin A supplementation (percent)		
Children age 12-23 months fully immunized (BCG, Measles, and three doses each of polio/DPT)	43.5	62
Children age 12-23 months who have received BCG	78.2	91.9
Children age 12-23 months who have received three doses of polio vaccine	78.2	72.8
Children age 12-23 months who have received three doses of DPT vaccine	55.3	78.4
Children age 12-23 months who have received measles vaccine	58.8	81.1
Children age 9-59 months who have received Vitamin A dose in last 6 months	16.5	60.2
Child Feeding practices (percent)		
Children under age 3 years breastfed within one hour of birth	23.4	41.6
Children under age 6 months exclusively breastfed	46.4	54.9
Children age 6-8 months receiving solid or semi-solid food and breastmilk	52.6	42.7
Maternity Care (percent)		
Mothers who had antenatal check-up in the first trimester	43.9	58.6
Mothers who had at least 4 antenatal care visits	37	51.2
Mothers who had full antenatal care	11.6	21

Source: NFHS-3 & NFHS-4

The trends at the national level do not reveal the inter-state disparities in nutritional status of children. Tables 4 to 7 at-

tempt to highlight the child malnutrition scenario at the regional level. Table 4 reveals the percentage of children under five

who are malnourished (stunted, wasted, and underweight) across the states based on NFHS-4 data. The percentage of stunted children under five ranges from below 25 percent in Goa, Tripura and Punjab to above 45 percent in Bihar, Jharkhand and Uttar Pradesh. Except, Meghalaya, the north-eastern states have performed better than the national average in this indicator. Similarly, Table 4 highlights considerable variation across states with respect to the proportion of wasted

children. For example, the proportion of wasted children is close to 6 percent in a relatively economically underdeveloped state like Mizoram whereas this figure is close to 26 percent in a relatively developed state like Karnataka. The proportion of underweight children also vary drastically across the different states with lowest proportion in Sikkim and highest in Bihar. The coefficient of variation reveals that the variation across states is largest in proportion of underweight children.

**Table 4 State-wise Child Malnutrition in NFHS-4 (2015-16)**

State	Percentage of Stunted Children	Percentage of Wasted Children	Percentage of Underweight Children
Andhra Pradesh	31.4	17.2	31.9
Arunachal Pradesh	29.4	17.3	19.4
Assam	36.4	17	29.8
Bihar	48.3	20.8	43.9
Chhattisgarh	37.6	23.1	37.7
Goa	20.1	21.9	23.8
Gujarat	38.5	26.4	39.3
Haryana	34	21.2	29.4
Himachal Pradesh	26.3	13.7	21.2
Jammu & Kashmir	27.4	12.1	16.6
Jharkhand	45.3	29	47.8
Karnataka	36.2	26.1	35.2
Kerala	19.7	15.7	16.1
Madhya Pradesh	42	25.8	42.8
Maharashtra	34.4	25.6	36
Manipur	28.9	6.8	13.8
Meghalaya	43.8	15.3	28.9
Mizoram	28.1	6.1	12
Nagaland	28.6	11.3	16.7
Odisha	34.1	20.4	34.4
Punjab	25.7	15.6	21.6
Rajasthan	39.1	23	36.7
Sikkim	29.6	14.2	14.2
Tamil Nadu	27.1	19.7	23.8
Telangana	28	18.1	28.4
Tripura	24.3	16.8	24.1
Uttar Pradesh	46.3	17.9	39.5
Uttarakhand	33.5	19.5	26.6
West Bengal	32.5	20.3	31.6
Coefficient of Variation (C.V.)	22.31	29.51	34.25

Source: NFHS-4

**Table 5 State-wise Underweight Children (%) by Place of Residence in NFHS-4 (2015-16)**

State	Urban	Rural	Overall	Rural-Urban ratio
Andhra Pradesh	28.4	33.1	31.9	1.17
Arunachal Pradesh	13.8	20.9	19.4	1.51
Assam	21.4	30.8	29.8	1.44
Bihar	37.5	44.6	43.9	1.19
Chhattisgarh	30.2	39.6	37.7	1.31
Goa	25.3	21.2	23.8	0.84
Gujarat	32	44.2	39.3	1.38
Haryana	28.5	29.9	29.4	1.05
Himachal Pradesh	17.1	21.6	21.2	1.26
Jammu & Kashmir	17	16.5	16.6	0.97
Jharkhand	39.3	49.8	47.8	1.27
Karnataka	31.5	37.7	35.2	1.20
Kerala	15.5	16.7	16.1	1.08
Madhya Pradesh	36.5	45	42.8	1.23
Maharashtra	30.7	40	36	1.30
Manipur	13.1	14.2	13.8	1.08
Meghalaya	22.9	29.9	28.9	1.31
Mizoram	8.5	15.7	12	1.85
Nagaland	13.6	17.9	16.7	1.32
Odisha	26.2	35.8	34.4	1.37
Punjab	22.4	21.1	21.6	0.94
Rajasthan	30.7	38.4	36.7	1.25
Sikkim	12	15.4	14.2	1.28
Tamil Nadu	21.5	25.7	23.8	1.20
Telangana	22.1	33.1	28.4	1.50
Tripura	21.7	25	24.1	1.15
Uttar Pradesh	33.7	41	39.5	1.22
Uttarakhand	25.6	27.1	26.6	1.06
West Bengal	26.2	33.6	31.6	1.28
Coefficient of variation (C.V.)	33.08	34.50	34.25	

Source: NFHS-4

Several studies have argued that rural areas of India are at a greater disadvantage in comparison to the urban areas with respect to the nutritional performance of children (Smith et. al., 2005; Kumar, 2007; Cavatorta et. al., 2015). The data shown in Table 5 supports this view. In all the states (except Jammu & Kashmir, Goa, and Punjab), the proportion of underweight children under five in rural areas is considerably higher than in urban areas. The rural-urban differ-

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ential is highest in Mizoram, Arunachal Pradesh, and Telangana. It is important to examine the reasons for differential nutritional performance at the state level.

The health facilities related to child and maternal care play a vital role in influencing child health. Table 6 compares the indicators related to child and maternal care in four top-ranked (Mizoram, Manipur, Sikkim, and Kerala) and four bottom-ranked (Jharkhand, Bihar, Madhya Pradesh, and Uttar Pradesh) child malnutrition (in terms of proportion of underweight children under five)

states. This comparison makes it clear that indicators of child and maternal care are significantly better in the four top-ranked states. For example, the proportion of women whose body mass index (BMI) is below normal ranges from 25 to 43 percent in the four bottom-ranked states. On the other hand, this figure ranges from 8 to 18 percent in the four top-ranked states.

**Table 6 Health Indicators in Low & High Child Malnutrition States (Percentage of Underweight Children Below Five Years)**

Best and worst performing states	Underweight children below five years	Some Indicators of Child care			Some Indicators of Maternal care		
		Children under three years breastfed within one hour of birth	Children of 6-8 months receiving solid or semi-solid food and breast milk	Children with diarrhoea in the last 2 weeks who received ORS	Mothers who had at least four antenatal care visits for their last birth	Births assisted by a trained birth attendant	Women whose BMI is below normal
Four top-ranked states							
Mizoram	12	70.3	68.2	70	61.4	83.6	8.4
Manipur	13.8	65.4	78.8	60.2	69	77.2	8.8
Sikkim	14.2	66.5	61.8	NA	74.7	97.1	11.2
Kerala	16.1	64.3	63.1	49.4	90.1	99.9	18
Four bottom-ranked states							
Jharkhand	47.8	33.1	47.2	44.8	30.3	69.6	42.9
Bihar	43.9	34.9	30.8	45.2	14.4	70	30.4
M.P.	42.8	34.4	38.1	55.2	35.7	78	28.4
Uttar Pradesh	39.5	25.2	32.6	37.9	26.4	70.4	25.3

Source: NFHS-4

The four bottom-ranked states also have a relatively lower per capita income in 2015-16. Table 7 shows that these states also lie at the bottom in terms of per capita income. This points out to the fact that economic growth and child health are strongly associated. However, it is also clear from Table 7 that economically advanced states such as

Maharashtra, Gujarat, and Haryana have shown a dismal performance with respect to child nutrition. Therefore, this study confirms the findings of previous studies which argue that a high rate of economic growth does not necessarily bring improved nutritional outcomes for children (Deaton & Dreze, 2009; Subramanyam et. al., 2010).

**Table 7 Comparison of Per Capita Income & Child Malnutrition: State-wise**

State	Child malnutrition, NFHS-4 (% of under-weight children)	Rank by malnutrition	Per capita income (Rs.) in 2015-16 (at 2011-12 prices)	Rank by income
Goa	23.8	10	278601	1
Sikkim	14.2	3	195066	2
Haryana	29.4	16	133591	3
Uttarakhand	26.6	13	126306	4
Maharashtra	36	22	122588	5
Gujarat	39.3	25	120683	6
Kerala	16.1	4	119665	7
Tamil Nadu	23.8	11	114581	8
Karnataka	35.2	21	113303	9
Himachal Pradesh	21.2	8	112723	10
Telangana	28.4	14	112267	11
Punjab	21.6	9	100141	12
Mizoram	12	1	91845	13
Andhra Pradesh	31.9	19	86118	14
Arunachal Pradesh	19.4	7	83536	15
Rajasthan	36.7	23	68048	16
Tripura	24.1	12	64173	17
Chhattisgarh	37.7	24	63791	18
Nagaland	16.7	6	60663	19
Jammu & Kashmir	16.6	5	59924	20
Odisha	34.4	20	58165	21
West Bengal	31.6	18	57255	22
Meghalaya	28.9	15	56039	23
Assam	29.8	17	50642	24
Madhya Pradesh	42.8	27	47646	25
Manipur	13.8	2	46389	26
Jharkhand	47.8	29	44524	27
Uttar Pradesh	39.5	26	36923	28
Bihar	43.9	28	23987	29

Source: NFHS-4 & ESO, Punjab

Next, we compare the extent of child malnutrition (in terms of proportion of underweight children below five years) in different states with the all-India level. This is shown in Table 8 by computing the RSMI for 2005-06 (NFHS-3) and 2015-16 (NFHS-4).

According to NFHS-3 data, Madhya Pradesh shows the worst performance in comparison to the all-India level. Out of

the 27 states listed in Table 8, 13 states show a child malnutrition level which exceeds the national average. Sikkim and Mizoram show best performance in child malnutrition. Table 8 also shows that economically developed states such as Gujarat, Haryana, Uttarakhand, and Karnataka perform worse than the national average. In 2015-16 (NFHS-4) Madhya Pradesh is replaced by Bihar as it shows the worst relative position.

**Table 8 State-wise Relative Child Malnutrition (% of Underweight Children Below Five Years) in NFHS-3 (2005-06) & NFHS-4 (2015-16)**

State	Value of RMN in NFHS-3 (2005-06)	Value of RMN in NFHS-4 (2015-16)	Percentage change in RMN
Arunachal Pradesh	86.13	54.19	-37.08
Assam	85.39	83.24	-2.52
Bihar	144.40	122.63	-15.08
Chhattisgarh	121.54	105.31	-13.35
Goa	72.29	66.48	-8.04
Gujarat	118.88	109.78	-7.66
Haryana	106.34	82.12	-22.77
Himachal Pradesh	91.50	59.22	-35.28
Jammu & Kashmir	82.29	46.37	-43.65
Jharkhand	144.45	133.52	-7.57
Karnataka	100.55	98.32	-2.22
Kerala	62.86	44.97	-28.45
Madhya Pradesh	149.28	119.55	-19.92
Maharashtra	96.18	100.56	4.55
Manipur	57.67	38.55	-33.16
Meghalaya	127.67	80.73	-36.77
Mizoram	53.80	33.52	-37.70
Nagaland	63.48	46.65	-26.51
Odisha	104.66	96.09	-8.19
Punjab	65.27	60.34	-7.57
Rajasthan	106.12	102.51	-3.40
Sikkim	53.80	39.66	-26.27
Tamil Nadu	78.38	66.48	-15.18
Tripura	103.62	67.32	-35.03
Uttar Pradesh	107.08	110.34	3.04
Uttarakhand	100.61	74.30	-26.15
West Bengal	94.14	88.27	-6.24

Source: Calculated using NFHS-3 & NFHS-4 data

According to NFHS-4, the number of states performing below the national average is reduced from 13 to 8. Despite low income levels, the north-eastern states such as Mizoram, Sikkim, Manipur, and Nagaland continue to perform better than the national average. The inferior performance of states such as Gujarat and Maharashtra provides more support to the argument that economic growth is inad-

equated to lead to significant improvements in health and nutrition.

In agreement with the existing studies, we find that a relatively greater proportion of malnourished children are concentrated in poor households in both rural and urban India. This is shown in parts a, b and c of fig. 2 which depict the concentration curves (CC) for stunting,

wasting, and underweight in rural and urban India for NFHS-3 (2005-06) and NFHS-4 (2015-16). All the curves lie above the line of equality in NFHS-3 and NFHS-4. This implies a larger concentration of malnourished children among the economically weaker sections of the society in both rural and urban areas. The

**Relatively greater proportion of malnourished children are concentrated in poor households in both rural and urban India.**

negative values of CIs shown in Table 9 provide further support to the presence of socioeconomic inequalities in child malnutrition. CI values in Table 9 also reveal that the inequalities in stunting have remained unchanged whereas there appears to be a slight reduction in inequalities with respect to wasted and underweight children during NFHS-3 (2005-06) and NFHS-4 (2015-16). The presence of these inequalities is an obstacle in raising the level of human development and requires appropriate policy reforms from the government.

**Table 9 Concentration Index of Child Malnutrition in India (NFHS-3 & NFHS-4)**

	NFHS-3 (2005-06)	NFHS-4 (2015-16)
Stunting		
Overall (India)	-0.1294	-0.1271
Urban	-0.1095	-0.1051
Rural	-0.0951	-0.1041
Wasting		
Overall (India)	-0.1224	-0.0796
Urban	-0.0728	-0.0563
Rural	-0.0985	-0.0704
Underweight		
Overall (India)	-0.1291	-0.1075
Urban	-0.0979	-0.0836
Rural	-0.0976	-0.0904

Source: Calculated from NFHS-3 & NFHS-4 data

**Fig. 2 (a) Concentration Curves of Stunted Children in Rural & Urban India: NFHS-3 & NFHS-4**

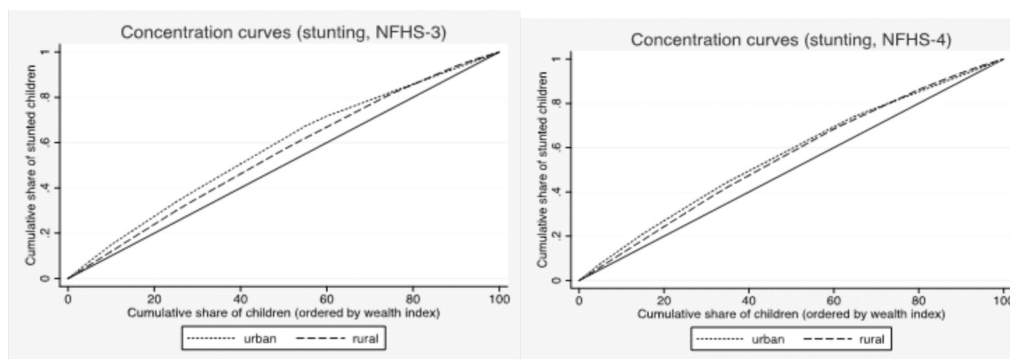


Figure 2: (b) Concentration curves of Wasted children in Rural & Urban India: NFHS-3& NFHS-4

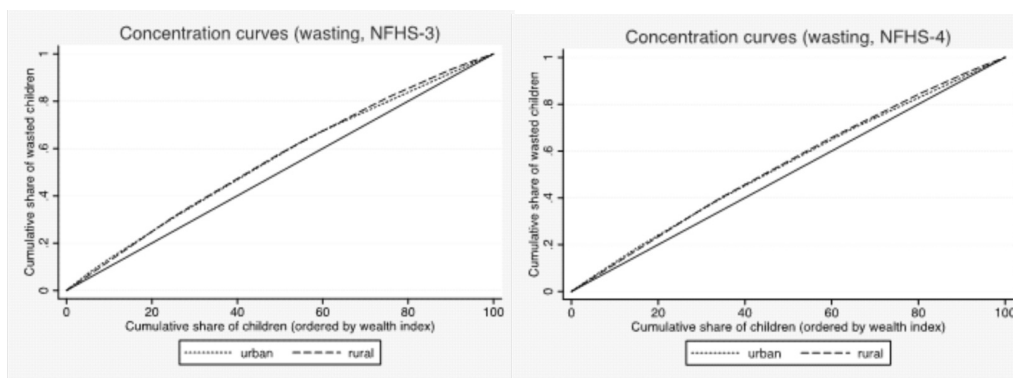
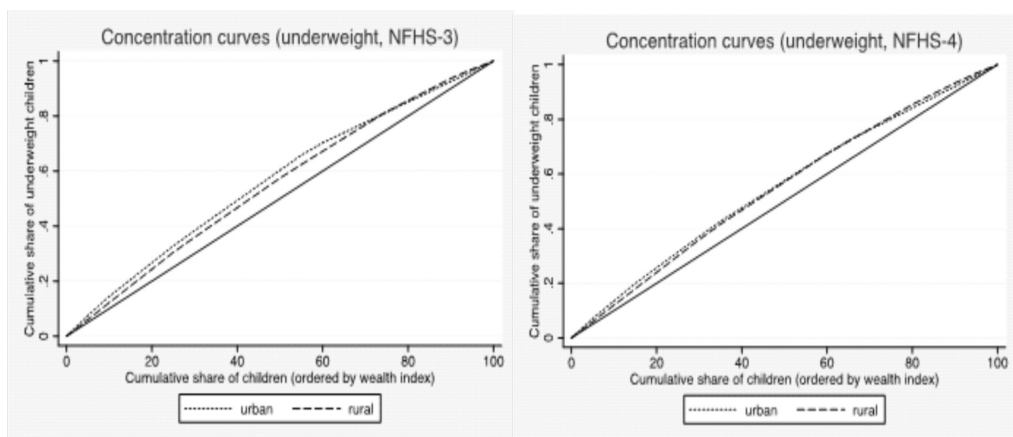


Figure 2: (c) Concentration Curves of Underweight Children in Rural & Urban India: NFHS-3& NFHS-4



### Conclusion & Policy Implications

This study examined the trends and pattern of child malnutrition at the national and state levels during the ten-year period covering NFHS-3 (2005-06) and NFHS-4 (2015-16). At the all-India level, the study finds that about 36 percent children below five years were underweight, 21 percent were wasted, and 38 percent were stunted in 2015-16. Compared to

NFHS-3, these figures reveal a limited improvement in the nutritional status of children over the ten-year period. It is also clear that rural India suffers more severely with a significantly higher proportion of malnourished children.

**The disparities across states have not undergone a significant change during 2005-06 and 2015-16.**

The study finds significant variations in child malnutrition levels across states. The disparities across states have not undergone a significant change during 2005-06 and 2015-16. On an average, the north-eastern states such as Mizoram, Manipur, and Sikkim have low rates of child malnutrition and perform better than other states. Bihar, Jharkhand, Madhya Pradesh and Uttar Pradesh are the worst performers with proportion of underweight children in the range of 40 to 48 percent. We find that the key reason for this differential performance across states appears to be the differing status of child and maternal care indicators. The best-performing states have better health care indicators. The study also finds that states such as Gujarat, Maharashtra, and Karnataka have high rates of child malnutrition despite strong economic performance.

The NFHS data suggests limited access and reach of health infrastructure and related health care services. Therefore, it is important for the government to initiate major reforms in the health sector across states. Further, an effective implementation of the existing nutrition schemes such as National Midday Meal Scheme and Integrated Child Development Services (ICDS) would help in reducing the incidence of severe malnutrition. Several studies have argued that maternal education plays an important role in tackling the problem of child malnutrition (Joe et. al., 2009; Christiaensen & Alderman, 2004; Prakash & Jain, 2016) as it improves the understanding of health and nutrition issues (Miller & Rodgers, 2009). Therefore, it is impor-

tant to accord a high priority to education, especially of rural women. The government should undertake substantial investment in education and literacy programs and carry out a continuous monitoring of the seprograms. Several initiatives of the government such as 'BetiBachao, BetiPadhao', 'Kasturba Balika Vidyalaya', and 'Rajiv Gandhi Scheme for Empowerment of Adolescent Girls' are steps in the right direction. It has also been pointed that ensuring marriage and pregnancy at the right age, adopting healthy breastfeeding practices, and better antenatal care practices would help in tackling the problem of child malnutrition (Nair, 2007; Niti Aayog, 2017). In this regard, sustained and targeted efforts from the policymakers are needed which may lead to an improvement in the nutritional outcomes for children.

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