

Multidimensional Poverty in India: An Analysis Based on NSSO Unit Level Data

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“Poverty is not just a lack of money; it is not having the capability to realize one's full potential as a human being”. ----Amartya Sen

Abstract

The present paper estimates and analyses the multidimensional poverty in India during 2004-05 and 2011-12 and examines the role of Public Distribution System (PDS) along with socio-economic characteristics of the households on the degree of multidimensional poverty based on NSSO unit level data. In order to estimate multidimensional poverty, we have used the Alkire and Foster methodology and have considered three dimensions namely, education, food & nutrition and living condition. The study reveals that households are more deprived in the food & nutrition dimension. Multidimensional poverty was found to be 53 per cent in 2004-05 which reduced to 34 per cent in 2011-12. Rural located households and the households belonging in the weaker section of the society suffer from a high degree of multidimensional poverty. The majority of them are still deprived of education, suffer in severe food & nutrition insecurity and live without basic amenities. Besides, the degree of multidimensional poverty is significantly low for the self and regular employed households. It was further found that PDS has played a favourable role in reducing the degree of multidimensional poverty in India.

Key Words: Multidimensional Poverty, Dimensional Deprivations, Food and Nutrition, PDS, India

JEL Classification: I3, I32, I38, O5

1. Introduction

The methods of analyses of poverty (especially official estimates of poverty) in India usually suffer from a uni-dimensional limitation. They refer to only a unique proxy of poverty, namely equivalent consumption. They fail to capture many aspects of deprivations. Sen's Capability Approach has been crucial in promoting fundamental reconsideration of concepts of poverty. This approach perceives human progress, ultimately, as 'the progress of human freedom and capability to lead the kind of lives that people have reason to value (Dreze and Sen 2013). Well-being should be defined and assessed in terms of the functionings and capabilities people enjoy. Defining poverty in the space of capabilities has multiple implications for measurements: multidimensionality and value judgements. World Bank (2000) has also defined poverty as the deprivations in various aspects of life that affecting the well-being and cause the inability of an individual to satisfy the basic necessities of survival. Furthermore, levels and trends of income poverty are not highly correlated with trends in

other basic variables such as child mortality, primary school completion rates, undernourishment etc. (Bourguignon et al 2010).

Relevant Literature

Alkire and Foster (2011) attempted to offer a practical approach to identify the poor and measured aggregate poverty. They analyzed the strength, limitations, and misunderstandings of multidimensional poverty measurement in order to clarify the debate and catalyze further research. They established the general definitions of uni-dimensional and multidimensional methodologies for measuring poverty and provided an intuitive description of their measurement approach, including a 'dual cutoff' identification step that views poverty as the state of being multiply deprived, and an aggregation step based on the traditional Foster, Greer and Thorbecke (FGT) measures.

Atagub, Lchoku and Fonta (2013) compared the assessment of poverty and deprivation using different conceptions including money-metric measure and different forms of multidimensional constructs based on household surveys conducted in Nsukka and Nigeria. They found substantial mismatch between income poverty and multidimensional poverty. Suppa (2016) also observed substantial mismatch between Germany's official income-based poverty measure and multidimensional poverty index based on the Alkire-Foster method. He suggested that additional individual income reduces multidimensional poverty, if only at a decreasing rate. Whelan et al. (2004) documented a similar level of mismatch in cross section and panel data analysis. In case of China Wanget. al. (2016) found that 69 per cent of multidimensionally poor households were not considered poor in terms of income poverty. On the basis of panel household survey data for the years 2007, 2008 and 2010 Tran, Alkire and Klasen (2014) showed that, in the case of Vietnam, the monetary poor (or non-poor) are not always multidimensionally poor (or non-poor). Monetary poverty is more sensitive to the changes in a household's characteristics than multidimensional poverty. Moreover, improvements in multidimensional poverty are attributed mainly to the reduction in the incidence of poverty rather than the intensity of poverty. The study conveyed that the effects of rapid economic growth are greater and more elastic on monetary poverty than on multidimensional poverty.

Alkire and Seth (2013) analysed the change in multidimensional poverty in India between 1999 and 2006 using National Family and Health Surveys. They found a strong reduction in national poverty driven relatively more by some of the standard of living indicators, such as electricity, housing conditions, access to safe drinking water and improved sanitation facilities, than other social indicators. Dehury and Mohanty (2015) estimated and decomposed the multidimensional poverty dynamics in 84 natural regions of India using the Indian Human Development Survey (IHDS) 2004-05. They included consumption expenditure to quantify the living standard dimension. Examining micro-level evidence from two slums in Delhi, Bisiaux (2013) explored the differences in practice of different definitions of poverty - monetary poverty, primary good deprivation and lack of capabilities - to measure the extent of poverty according to each approach. The results showed little evidence of a perfect match between the three definitions of poverty.

The estimates of multidimensional poverty index (MPI) are published for over 100 developing countries in the UNDP's Human Development Reports since 2010. It is developed by OPHI and the measurement is based on Alkire-Foster (AF) Methodology where they have considered three dimensions, viz. education, health and standard of living (HDR 2010, 2015).

Statement of Problem

From the brief review of the existing literature on the measurement of poverty it is revealed that there is hardly any study which explores the measurement of multidimensional poverty in India on the basis of NSSO data. This estimation of multidimensional poverty is important because the Government of India estimates monetary poverty on the basis of monthly per capita consumption expenditure using the same NSSO data. We can easily compare monetary poverty with our estimated multidimensional poverty. From the estimation of multidimensional poverty by different researchers from different countries it is evident that the dimensions are not unique. It mainly depends on the availability of data and objectives of the estimation. In case of India, food and nutrition insecurity is a serious problem. About 75 percent of people living in India suffered from food and nutrition insecurity in 2004-05 (Deaton and Dreze, 2009). The problem still persists and in Global Hunger Index 2019, the position of India is 102th out of 117 countries of the world which is a serious issue of concern (GHI 2019). The present study incorporates 'food and nutrition' as a new dimension to estimate multidimensional poverty. None of the study before incorporated 'food and nutrition' as a dimension of multidimensional poverty. To overcome the problems of food and nutritional insecurity, central and state governments of India introduced a number of social protections programmes among them the Public Distribution System (PDS) is the important one. In NSSO unit level data of '*Level and Pattern of Consumption Expenditure*' the information of PDS benefits is available. This gives us an opportunity to study the role of PDS on multidimensional poverty of the households.

Objectives

The present study has twofold objectives. First, it estimates and analyses the multidimensional poverty in India during 2004-05 and 2011-12. Second, it examines the role of PDS along with the characteristics of the households on the degree of multidimensional poverty.

2. Methodology

2.1 Data

For the estimation of multidimensional poverty, we have used the Unit Level data of National Sample Survey Organization (NSSO) relating to the '*Level and Pattern of Consumption Expenditure*' of 61st round (2004-05) and 68th round (2011-12). To compare with multidimensional poverty we have also estimated monetary poverty on the basis of monthly per capita consumption expenditure (MPCE) with recall period Mixed Reference Period (MRP) and Tendulkar Methodology. In addition to estimate the status of food security we have considered the budget share of food items of the poverty line class which is considered as a food insecurity line (Planning Commission 2014). The food insecurity line is the minimum amount of monetary value for a person's minimum food requirement during a month. The calorie value of all the listed food items is also given by NSSO. To find out the calorie intake we have multiplied the amount of consumption of each of the items with their specific calorie value. The calorie intakes of 124644 and 101662 sample households in the years 2004-05 and 2011-12 respectively have been calculated. Households obtained benefits of PDS in kinds, for e.g. in terms of rice, wheat, sugar, kerosene oil etc. Since they cannot be added together therefore, we have converted the quantity of benefits to its value term in market price and thereafter added them.

2.2 Estimation of Multidimensional Poverty

Alkire-Foster (2011) method (*HDR 2010, 2015*) has been used to estimate the multidimensional poverty in India which is stated as follows:

Deprivation Matrix

Let X_{ij} be the achievement matrix of i -th household in indicator j and Z_j is the deprivation cut-off. We have obtained a deprivation matrix D such that

$$D_{ij} = 1 \text{ when } X_{ij} < Z_j \\ = 0 \text{ otherwise}$$

for all $j = 1, \dots, d$ (number indicators) and $i = 1, \dots, n$ (number of households)

Scoring and weight

- Each household is assigned a deprivation score (1 for deprived and 0 for non-deprived) according to her deprivation status in each indicator.
- Each of the three dimensions is equally weighted; thus the maximum score in each dimension is 33.3 per cent. The maximum score is 100 per cent and minimum score is 0.
- The education and food & nutrition dimensions have two indicators each, so each indicator is worth 33.3/2, or 16.7 per cent.
- The living condition dimension has six indicators, so each indicator is worth 33.3/5, or 6.7 per cent.

Cut-off for Poverty, Vulnerability and Severity

- To identify the multidimensionally poor, the deprivation scores for each household are summed to obtain the household deprivation, c .
- A cut-off of 33.3 per cent, which is the equivalent of one-third of the weighted indicators, is used to distinguish between the poor and the non-poor.
- Households with a deprivation score (c) greater than or equal to 20 per cent but less than 33.3 per cent are vulnerable to or at risk of becoming multidimensionally poor.
- If c is 33.3 per cent or greater the household is multidimensionally poor because she deprived at least one dimension.
- Households with a deprivation score of 50 per cent or higher are severely multidimensionally poor.

Multidimensional Poverty Indicators

- *Multidimensional Headcount Ratio* (H) is the proportion of the population who are multidimensionally poor and $H = \frac{q}{n}$, where q is the number of persons who are multidimensionally poor and n is the total population.
- *Multidimensional Intensity of Poverty* (A) reflects the proportion of the weighted component indicators in which, on average, poor people are deprived. For poor households only, for whom c is greater than or equal to 33.3 per cent, i.e., $c_i(k)$, the deprivation scores are summed and divided by the total number of poor persons. That is $A = \frac{1}{q} \sum_{i=1}^q c_i(k)$.
- The Multidimensional Poverty Index (MPI) can be expressed as the product of H and A , i.e., $MPI = H \times A$.

2.3 The Dimensions and Indicators of Multidimensional Poverty

The dimensions and indicators which have been used to estimate multidimensional poverty in India are given in Table 1. The first column reports three dimensions: education, food & nutrition and living condition whereas the second column reports the nine indicators. The dimensions and the indicators within each dimension are assigned equal weights. The third column reports the criteria of the deprivation cutoff of each of the nine indicators. The indicators and their deprivation cutoffs are discussed as follows:

Table 1 Dimensions, Indicators, Deprivation Cut-offs and Weights of the Multidimensional Poverty

Dimension	Indicator (Weight)	Deprivation Cut-off
Education (1/3)	Schooling (1/6)	No one with age 15 years and above has completed six years of schooling
	School Attendance (1/6)	At least one school-age child (4 to 14 years) did not attend school
Food & Nutrition (1/3)	Food Security (1/6)	The level of food consumption of the household is less than food security line
	Nutritional Security (1/6)	The level of calorie consumption of the household is less than calorie line (2400 kcl in rural area and 2100 in urban area)
Living Condition (1/3)	Electricity (1/15)	Household has no electricity
	Cooking Fuel (1/15)	Households with no access to electricity, liquefied gas, or natural gas for cooking
	Own House (1/15)	The household has not owned any house
	Own Land (1/15)	The household doesn't own any land
	Assets (1/15)	Household has no durable assets(e.g., bi-cycle or radio or tape recorder or TV or Motor Cycle or Refrigerator etc.).

Note: The figures in parenthesis are the weights attached with specific dimension and indicators.

Justification of selection of dimensions

UNDP has been used 'Education', Health and 'Living Condition' to measure multidimensional poverty (Alkire and Santos 2010, 2013; HDR 2010, 2015) across countries and this estimation has been reported in Human Development Report (HDR) since 2010. Besides, there is ample evidence that different researchers have been used different dimensions for availability of information (Mishra and Ray, 2013). Present study is based on the NSSO unit level data relating to the '*Level and Pattern of Consumption Expenditure*'. The information regarding health status of the household is not available in this survey. Instead one new dimension 'Food & Nutrition' is being used in the present study which indirectly reflected the status of health of the households. In respect of selection of indicators under different dimensions and there deprivations cut-off we have used UNDP specification.

2.4 Order Logit Model

The status of multidimensional poverty of the households is categorized as non-poor, ordinary poor and severely poor. The ordered logit is applicable here because outcome variable (status of multidimensional poverty) is an ordered variable as non-poor, ordinary poor and severely poor have a hierarchical order. Order Logit Model is used to analyse the degree of Multidimensional Poverty across the sample households in India for pooled data of two years (2004-05 and 2011-12). For individual 'i' with time 't' it is specified as

$$y_{it}^* = x_{it}'\beta + \varepsilon_{it}$$

The ordered outcomes are modeled to arise sequentially as a latent variable, y^* , crosses progressively higher thresholds.

For an m alternative order model, we define

$$y_{it} = j \quad \text{if } \alpha_{j-1} < y_{it}^* \leq \alpha_j$$

where $\alpha_0 = -\infty$ and $\alpha_m = +\infty$

Then

$$\begin{aligned} \Pr(y_{it} = j) &= \Pr(\alpha_{j-1} < y_{it}^* \leq \alpha_j) \\ &= \Pr(\alpha_{j-1} < x_{it}'\beta + \varepsilon_{it} \leq \alpha_j) \end{aligned}$$

$$\begin{aligned}
 &= \Pr(\alpha_{j-1} - x'_{it}\beta < \varepsilon_{it} \leq \alpha_j - x'_{it}\beta) \\
 &= F(\alpha_{j-1} - x'_{it}\beta) - F(\alpha_j - x'_{it}\beta)
 \end{aligned}$$

Where F is the cumulative distribution function of ε_{it} . The regression parameters β , and the $m-1$ threshold parameters, $\alpha_1, \alpha_2, \dots, \alpha_{m-1}$ are obtained by maximizing the log likelihood with $p_{ij} = \Pr(y_{it} = j)$ as defined above (Cameron and Trivedi, 2005).

If β_j is positive, then an increase in x_{ij} necessarily decreases the probability of being in the lowest category ($y_{it} = 1$) and increases the probability of being in the highest category ($y_{it} = m$).

In the present study y^* is an unobserved measure of status of poverty. For very low y^*_{it} (i.e., $y^*_{it} = 1$) the degree of multidimensional deprivation falls and it becomes multidimensional non-poor; for $y^*_{it} > \alpha_1$, degree of multidimensional deprivation increases to ordinary multidimensional poverty; for $y^*_{it} > \alpha_2$, it further increases to severely multidimensional poverty. The values of y^*_{it} , α and j are specified as follows:

Value of y^*_{it}	Value of y_{it}	Degree of Deprivation
$0 \leq y^*_{it} < 33.33$	1	Multidimensional Non-Poor
$33.33 \leq y^*_{it} < 50.00$	2	Ordinary Multidimensional Poor
$y^*_{it} \geq 50$	3	Severely Multidimensional Poor

Marginal effects (MEs)

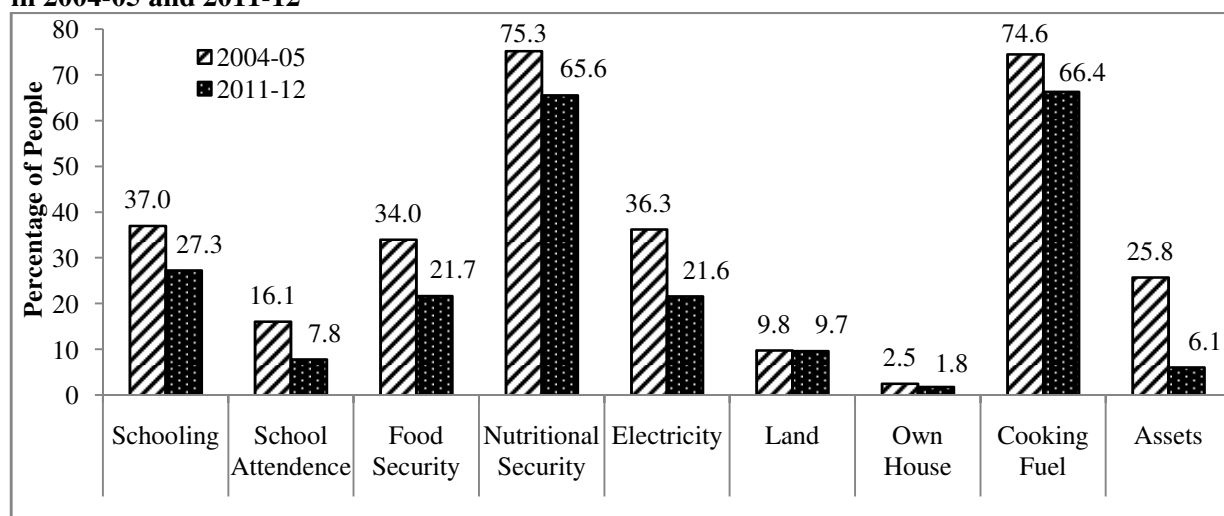
The ME on the probability of choosing alternative j when regressor x_{rit} changes is given by

$$\frac{\delta \Pr(y_{it} = j)}{\delta x_{rit}} = \{F'(\alpha_{j-1} - x'_{it}\beta) - F'(\alpha_j - x'_{it}\beta)\}\beta_r$$

3. Trends Multidimensional Poverty Indicators in India

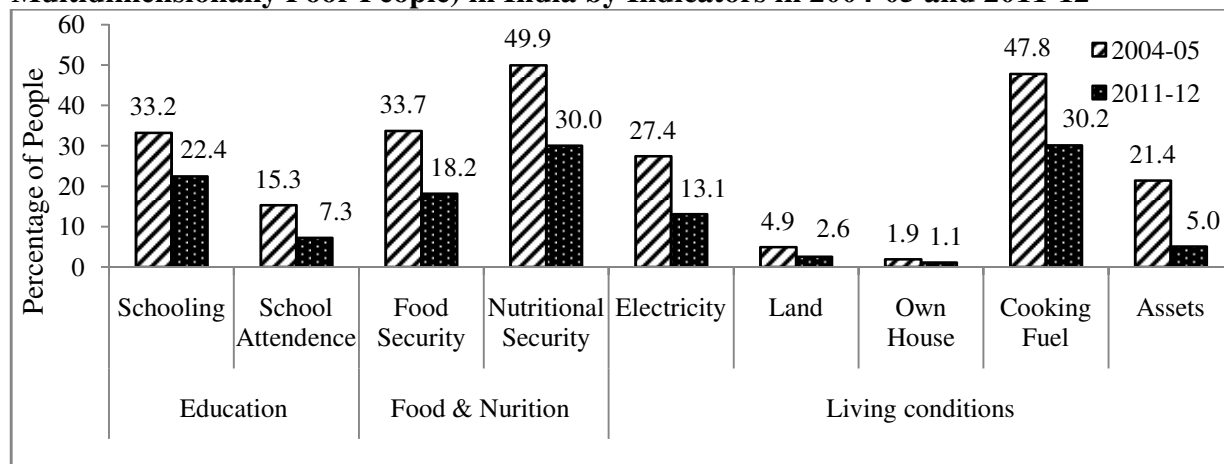
3.1 Uncensored and Censored Deprivation by Indicators

The deprivation of the sample households in the considered nine indicators is depicted in Figure 1. Uncensored deprivation across different indicators is basically the percentage of share of deprived people to total people. The largest absolute reductions have taken place in a number of indicators belonging to ‘living condition’ dimension. The percentage of people living in households were basically deprived in ‘Assets’ and ‘Electricity’ which has gone down by 19.7 percentage points and 14.7 percentage points respectively during 2004-05 and 2011-12 whereas the deprivation in ‘Land’ and ‘Own house’ reduced marginally. In the years 2004-05 and 2011-12, the deprivation in ‘Nutrition’ and ‘Cooking Fuel’ were relatively higher as compared to other indicators. In 2004-05, 75.3 per cent of people were deprived in ‘Nutrition’ which decreased to 65.6 per cent in 2011-12. During the same period, the percentage share of people living in the household who were deprived in ‘Schooling’ also decreased from 37.0 per cent to 27.3 percent. The ‘School Attendance’ (Child having Age 4 to 14) indicator too showed a reduction of 8.3 percentage points over the considered years. In case of food security, as many as 21.7 percent of the people were deprived, that is more than one fifth of the people were below the food security line.

Figure 1 Uncensored Deprivation (Percentage Share of Deprived People) in India by Indicators in 2004-05 and 2011-12

Source: Author's estimation from NSSO Unit Level Data of 'Level and Pattern of Consumer Expenditure Survey', 61st Round (2004-05) and 68th Round (2011-12).

Censored Head Count Ratio is the percentage share of deprived people after poverty cut-off. That is to what extent the multidimensionally poor people are deprived in different dimensions. The censored headcount ratios across nine indicators are shown in Figure 2. In 2004-05, the percentage share of deprived people in the indicator 'Nutritional Security' after using poverty cut-off was highest which stood at 49.9 per cent and it decreased to 30 per cent in 2011-12. It is observed from the figure that in Education more than 10 percentage points reduction in deprivation took place in schooling indicator as it reduced from 33.2 per cent in 2004-05 to 22.4 per cent in 2011-12 followed by school attendance indicator. In case of Food & Nutrition, the percentage of food insecure people reduced from 15.3 per cent in 2004-05 to 7.3 per cent in 2011-12. In case of Standard of Living, it was found that the reduction in the percentage of people was higher in case of deprivation in asset ownership which reduced by 19.7 percentage points followed by electricity indicator where the reduction was by 14.3 percent points. The reduction in the percentage of people having land and own house was very low reduction whereas in case of cooking fuel, the reduction in the deprivation was by 8 percentage points.

Figure 2 Censored Deprivations (Percentage share of Deprivation of Multidimensionally Poor People) in India by Indicators in 2004-05 and 2011-12

Source: As in Figure 1.

3.2 Trend of *H*, *I* and *MPI*

Three important indicators multidimensional poverty viz., multidimensional head count ratio (*H*), multidimensional intensity of poverty (*A*) and multidimensional poverty index (*MPI*) have been estimated for India as a whole as well as separately for the rural and urban areas. In 2004-05, *H*, *A* and *MPI* were 53.0 per cent, 54.6 per cent and 0.28 which reduced to 34.1 per cent, 48.2 per cent and 0.164 in 2011-12 respectively. A comparison of the multidimensional poverty for the rural and the urban areas shows that *H*, *A* and *MPI* in rural India were higher than in urban India (Table 2). The *H* and *MPI* were almost double in rural India as compared to urban India. It is to be noted that although the reduction in *H* and *MPI* were higher in the rural area than the urban area during the period 2004-05 to 2011-12 but the rural urban disparity in multidimensional poverty has gone down. The similar trend has been observed for monetary poverty. The estimated results of monetary poverty based on the MPCE in terms of incidence, depth and severity for the rural and the urban areas of India is given in Box 1.

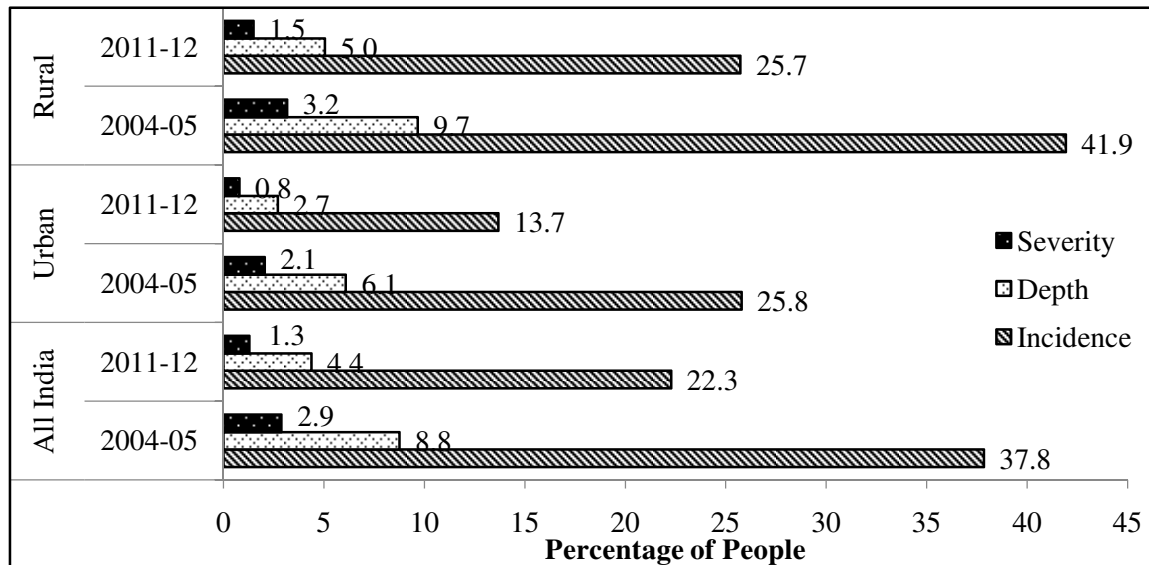
Table 2 Multidimensional Poverty Estimation in India, 2004-05 and 2011-12

	2004-05			2011-12			Change	
	<i>H</i>	<i>A</i>	<i>MPI</i>	<i>H</i>	<i>A</i>	<i>MPI</i>	<i>H</i>	<i>MPI</i>
Rural	60.1	55.6	0.334	41.1	48.9	0.201	-18.9	-0.133
Urban	32.2	48.8	0.157	16.5	44.4	0.073	-15.7	-0.084
All India	53.0	54.6	0.289	34.1	48.2	0.164	-18.9	-0.125

Source: As in Figure 1.

Box 1**Trend of Monetary Poverty in India**

The incidence, that is, the head count ratio by monetary measurement of poverty in India declined from 37.8 per cent in 2004-05 to 22.3 per cent in 2011-12. It is observed that although the poverty ratio in rural India was higher than that of urban India but rural area has experienced a greater reduction of poverty. The head count ratio in rural India decreased from 41.9 per cent in 2004-05 to 25.7 per cent in 2011-12. The poverty gap (depth) and square poverty gap (severity) also decreased during this period in both rural and urban India.

Figure 3 Status of Monetary Poverty in India, 2004-05 and 2011-12

Source: As in Figure 1.

Now to get a glimpse of the variation in the status of multidimensional poverty across the social castes we have categorized the households into four groups viz., ST, SC, OBC and Other. The 'Other' category mainly incorporates general caste people along with a few non-specified people. We have observed from the NSSO sample households that the H, A and MPI of ST and SC were higher than Non-ST/SC in both the years. The reduction of multidimensionally poor people was the highest in the SC category as compared to ST, OBC and 'Other' categories people (Table 3).

Table 3 Trends of Multidimensional Poverty by Castes in India, 2004-05 and 2011-12

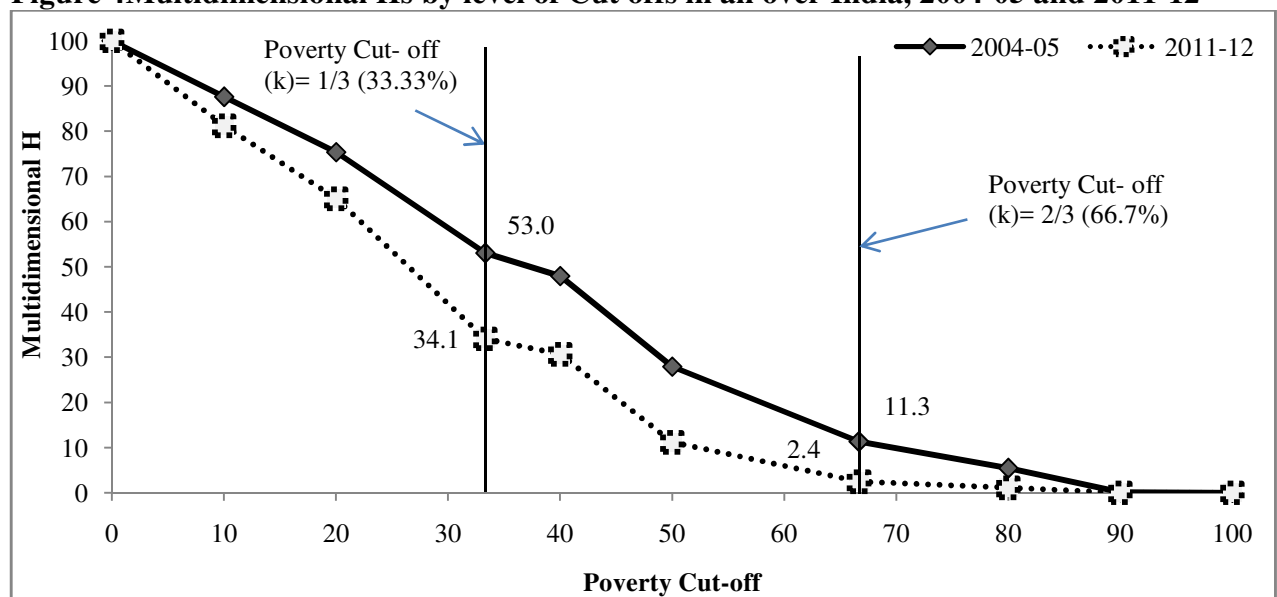
	2004-05			2011-12			Change	
	H	A	MPI	H	A	MPI	H	MPI
ST	74.2	59.7	0.443	53.3	50.5	0.269	-20.9	-0.173
SC	67.1	56.2	0.377	44.7	49.1	0.219	-22.4	-0.157
OBC	55.1	53.9	0.297	34.3	48.2	0.165	-20.8	-0.132
Other	35.3	50.8	0.180	20.4	45.1	0.092	-14.9	-0.088

Source: As in Figure 1.

3.3 Trends of Multidimensional H by different Poverty Cut-offs

Since the measurement of multidimensional headcount ratio (H) is sensitive to poverty cut-off therefore we have shown different multidimensional H by using different multidimensional poverty cut-offs in Figure 4. It also represents the H on the basis of union and intersection methods of poverty (Chakravarty&D'Ambrosio 2006, Jayaraj&Subramanian 2010). By using intersection method which requires aggregate deprivation score to be equal to 100, it was found that there was no multidimensional poor in 2004-05 or 2011-12. This means that none of the households were deprived simultaneously in all the nine indicators. But if multidimensional poverty cut-off is 66.7 per cent ($k = 2/3$) i.e. the people in the household are deprived in any two dimensions, then the multidimensional head count ratio stood at 11.3 per cent in 2004-05 which decreased to 2.4 per cent in 2011-12. Thus, the higher the deprivation cut-off the lesser the multidimensional poverty.

Figure 4 Multidimensional Hs by level of Cut offs in all over India, 2004-05 and 2011-12

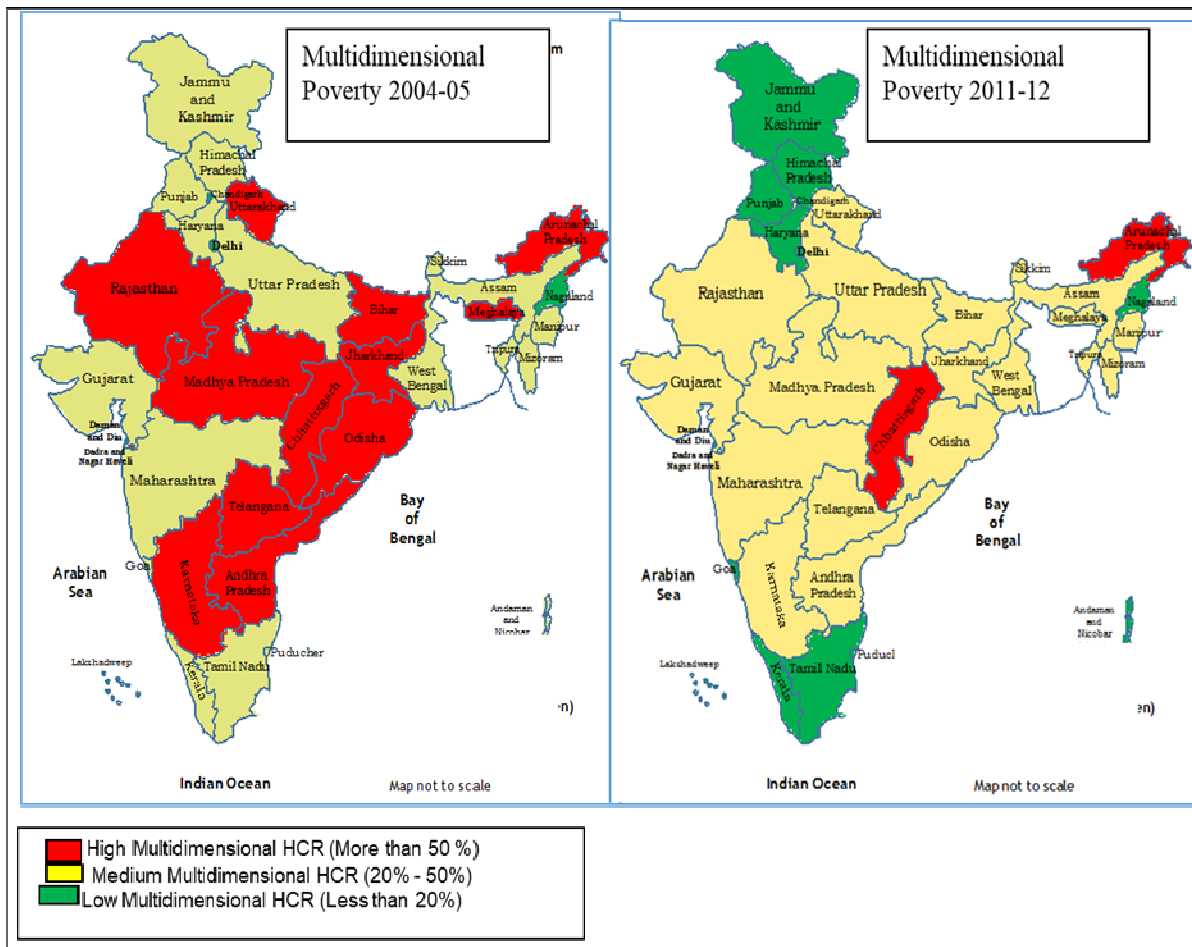


Source: As in Figure 1.

3.4 Multi-dimensional Poverty Mapping in States of India

The change in the status of multidimensional poverty across states in India has been presented in Map 1. It is very clear from the map that there has been significant reduction in multidimensional poverty in 2011-12 compared with 2004-05. As compared to 12 states who inhabited people having multidimensional head count ratio (H) more than 50 percent in 2004-05 the count has reduced to 2 states in 2011-12. Except Chhattisgarh and Arunachal Pradesh, the rest of the states managed to move from high multidimensional poverty to medium multidimensional poverty. At the same time, the number of states having low multidimensional poverty has increased from one in 2004-05 to seven including Jammu and Kashmir, Kerala, Punjab, Tamil Nadu and others.

Map 1: Multidimensional Poverty (H) Mapping across States of India in 2004-05 and 2011-12



Source: As in Figure 1.

4. Status of Multidimensional Poverty in India

To get an outlook of the status of multidimensional poverty of the people living in the households we have categorized the population into four groups on the basis of overall deprivation score of the households. These four groups are named as multidimensionally non-poor, vulnerable to multidimensional poor, ordinary multidimensional poor and severely multidimensional poor. If the deprivation score is 33.3 percent or greater, then that household (and everyone in it) is multidimensionally poor but if the deprivation score is less than 33.33 per cent then that household is multidimensionally non-poor. Households with a deprivation score greater than or equal to 20 per cent but less than 33.3 per cent are considered to be vulnerable to multidimensional poor, households having deprivation score in between 33.3 per cent and 50 per cent are considered as ordinary multidimensional poor whereas households with a deprivation score of 50 per cent or higher are considered to be severely multidimensionally poor.

The degree of multidimensional poverty of people living in the households for the rural and the urban areas in India is shown in Table 4. Among the four categories of multidimensional deprivations, the percentage of severely multidimensional poor was higher in the rural area than the urban area in both 2004-05 and 2011-12 as in the rural area it was 33.06 per cent and 13.78 per cent whereas in the urban area it was 12.71 per cent and 4.62 per cent in 2004-05 and 2011-12 respectively.

Table 4 Distribution of Population by different level of Multidimensional Poverty in Rural, Urban and All India, 2004-05 and 2011-12

Level of Multidimensional Poverty	2004-05			2011-12		
	Rural	Urban	Total	Rural	Urban	Total
Multidimensional Non-Poor ($0 \leq k < 20.00$)	16.07	49.93	24.64	22.58	65.86	34.95
Vulnerable to Multidimensional Poor ($20.00 \leq k < 33.33$)	23.87	17.85	22.35	36.29	17.64	30.96
Ordinary Multidimensional Poor ($33.33 \leq k < 50.00$)	27.00	19.50	25.10	27.35	11.88	22.93
Severely Multidimensional Poor ($k \geq 50.00$)	33.06	12.71	27.92	13.78	4.62	11.16
Total	100	100	100	100	100	100

Note: Figure in the parentheses indicate multidimensional deprivation score

Source: As in Figure 1.

The level of multidimensional poverty of people living in the households across the social castes is represented in Table 5. The percentage of multidimensionally non-poor, vulnerable to multidimensional poor as well as ordinary multidimensionally poor people increased in 2011-12 from 2004-05 across castes. The ST had a larger percentage point increase as compared to other castes. The percentage of severely multidimensional poor declined over years of which SC and ST households managed a larger percentage point decline than the non-SC/ST population between 2004-05 and 2011-12. For STs it declined from 50.3 per cent in 2004-05 to 22 per cent in 2011-12 while for SC households it has substantially declined from 38.5 per cent to 15.9 per cent. It is also observed that the percentage shares of ordinary multidimensionally deprived and the severely multidimensionally deprived ST and SC households were higher than that of non-SC/ST households in 2004-05 as well as in 2011-12. Thus, in general we can say that SC and ST households are relatively more deprived than non-SC/ST households.

Table 5 Distribution of Population by different level of Multidimensional Poverty across Social Castes, 2004-05 and 2011-12

Year	Level of Multidimensional Poverty	ST	SC	OBC	Other
2004-05	Multidimensional Non-Poor ($0 \leq k < 20.00$)	9.6	13.8	21.4	40.1
	Vulnerable to Multidimensional Poor ($20.00 \leq k < 33.33$)	16.2	19.1	23.5	24.6
	Ordinary Multidimensional Poor ($33.33 \leq k < 50.00$)	23.9	28.6	27.2	20.4
	Severely Multidimensional Poor ($k \geq 50.00$)	50.3	38.5	27.9	14.9
	Total	100	100	100	100
2011-12	Multidimensional Non-Poor ($0 \leq k < 20.00$)	17.2	24.0	33.5	50.3
	Vulnerable to Multidimensional Poor ($20.00 \leq k < 33.33$)	29.5	31.3	32.2	29.3
	Ordinary Multidimensional Poor ($33.33 \leq k < 50.00$)	31.3	28.8	23.2	15.7
	Severely Multidimensional Poor ($k \geq 50.00$)	22.0	15.9	11.1	4.6
	Total	100	100	100	100

Source: As in Figure 1.

4. Econometrics Analysis of the Status of Multidimensional Poverty across Households in India

4.1 Theoretical Framework

The degree of multidimensional poverty widely varies from one household to another household. The factors hypothesized to influence the deprivation of the households can be grouped into six categories namely, demographic, social, economic, education, location and social protection.

The *demographic factors* that are used in our analysis are size of the households (HHZ), age of the head of the households (AGEH) and square age of head of the households (SAGEH).

The *social factor* is specified by social castes. There are four social castes viz. ST, SC and OBC and General, therefore we have considered three dummy variables - ST, SC and OBC. ST and SC households have lesser access to physical capital and dynamics of development and therefore they are more deprived and experience high degree of deprivation.

The *education factor* is specified by years of schooling of the head of the households (HEDU). The *economic factor* is specified by status of employment (SEMP). The status of employment is a dummy variable- taking 1 for regular and self-employed, 0 for casual labour. The location of the household is also an important factor to judge whether the household is deprived or not. The location is specified by a dummy variable (RURAL). The rural located households are also lagging behind in respect of accessibility of education and health services. Therefore, the degree of deprivation is relatively high for rural located households.

Apart from the above factors the social protection benefits also play a crucial role in the degree of deprivation of the households. The PDS in India is the World's largest social protection programme (Balani2013). The households have received food grains and non-food grains at subsidized prices¹. The social protection factor is specified by per capita food grains and non-food grains received by the households from the public distribution system (PCPDS). The income saved due to subsidy on food grains is further used by the household to fulfill other means of living. Along with these factors, a time dummy (TD) is considered to assess the change of the degree of multidimensional poverty over time. The notation and specification of the variables are given in Table 6.

Table 6 Notation, Specification, and Descriptive Statistics of Variables used in the Multinomial Logistic Regression Model

Notation	Specification	2004-05		2011-12	
		Mean	Std. Dev.	Mean	Std. Dev.
<i>Dependent Variable</i>					
Y	Order outcomes of degree of multidimensional poverty; where 1 = non poor, 2 = ordinary poor and 3 = severely poor	1.64	0.80	1.33	0.60
<i>Independent Variables</i>					
TD	Time Dummy: 1 for 2011=1, 0 otherwise	0	0	1.0	0.0
HHZ	Size of household	4.9	2.5	4.6	2.2
AGEH	Age of the head of household	45.7	13.6	46.6	13.5
SAGEH	Square age of the head of household	2274.4	1330.7	2354.6	1335.4
HEDU	Years of education of the head of household	4.2	2.8	6.4	3.7
PCPDS	Value of monthly per capita PDS	9.0	21.6	16.8	29.5
RURAL	Whether the household is located in Rural area? Yes = 1, No = 0	0.64	0.48	0.59	0.49
ST	Does the household belong to ST? Yes=1, No=0	0.14	0.33	0.13	0.34
SC	Does the household belong to SC? Yes=1, No=0	0.16	0.37	0.15	0.36
OBC	Does the household belong to OBC? Yes=1, No=0	0.37	0.46	0.39	0.49
SEMP	Does any member of the household employed as self-employed or regular employment? Yes = 1, No=0	0.51	0.48	0.47	0.50

Source: As in Figure 1.

¹Department of Food and Supplies, Government of West Bengal, <https://wbpds.gov.in>

Econometric Framework

Ordered Logit Model is used to explain the degree of multidimensional poverty (y_{it}) across households in India. Along with y_{it} there are a number of explanatory variables like household size (HHSZ), age of head of households (AGEH), square of age of head of households (SAGEH), years of education of the head of the households (HEDU), monthly per capita PDS (PCPDS), location of the household (RURAL), scheduled tribes (ST), scheduled castes (SC), other backward castes (OBC), regular and self-employed households (SEMP) and time dummy (TD). The pooled ordered logistic regression model is specified as follows:

$$y_{it} = \alpha + \beta_1 TD_{it} + \beta_2 HHSZ_{it} + \beta_3 AGEH_{it} + \beta_4 SAGEH_{it} + \beta_5 HEDU_{it} + \beta_6 PCPDS_{it} + \beta_7 RURAL_{it} + \beta_8 ST_{it} + \beta_9 SC_{it} + \beta_{10} OBC_{it} + \beta_{11} SEMP_{it} + \varepsilon_{it}$$

where i = number of households (124644 in 2004-05 & 101662 in 2011-12, and $t = 2$ (2004-05 and 2011-12).

Table 7 Estimated Results of Pooled Ordered Logistic Regression of Degree of Multidimensional Deprivation across Households in India

Number of observation	=	226306		
Wald chi2(11)	=	51363.30		
Prob. > chi2	=	0.0000		
Log pseudo likelihood	=	-165234.61		
Pseudo R2	=	0.1822		
	Coefficient	Robust Std. Err.	z	P>z
TD	-0.36	0.0103	-34.37	0.00
HHSZ	0.07	0.0021	34.16	0.00
AGEH	-0.10	0.0020	-53.49	0.00
SAGEH	0.0007	0.00002	35.22	0.00
HEDU	-0.37	0.002	-189.39	0.00
PCPDS	-0.0006	0.0002	-3.02	0.00
RURAL	0.33	0.011	30.25	0.00
ST	0.62	0.016	39.53	0.00
SC	0.59	0.015	39.35	0.00
OBC	0.37	0.012	30.08	0.00
SEMP	-0.32	0.010	-32.03	0.00
/cut1	-3.693	0.047		
/cut2	-2.131	0.046		

The result of ordered logit regression is given in Table 7. The degree of multidimensional poverty across households is significantly explained by HHSZ, AGEH, SAGEH, HEDU, PCPDS, RURAL, ST, SC, SEMP and TD. The multidimensional poverty has significantly decreased (as the coefficients of TD are negative) in India during 2004-05 to 2011-12. That is, the degree of multidimensional poverty decreased over time. It has also decreased significantly with the increase of age of head of household (as AGEH) but at a decreasing rate (SAGEH). The level of education of head of household also inversely related with the degree of poverty. The degree of multidimensional poverty of households was significantly higher in the rural (RURAL) areas compared to the urban areas. It has increased significantly with the household size (HHSZ). SC, ST and OBC households have experienced higher degree of multidimensional poverty. Regular and self-employed (SEMP) households are able

to reduce the degree of multidimensional poverty. PDS benefit helps the households to overcome multidimensional poverty to a great extent.

Table 8 Marginal Effect at Mean for 3rd Outcome (Severely Multidimensional Poor)

Marginal effects after ordered logit
 $y = \text{Pr}(\text{ordered logit}==3)$ (predict, outcome(3))
 = 0.08187602

variable	dy/dx	Std. Err	z	P>z
ST	0.057	0.0017	33.0	0.000
SC	0.052	0.0015	33.9	0.000
OBC	0.029	0.0010	29.1	0.000
RURAL	0.024	0.0008	31.3	0.000
HHZ	0.006	0.0002	35.9	0.000
SAGEH	0.000053	0.0000	35.5	0.000
PCPDS	-0.000045	0.0000	-3.1	0.002
AGEH	-0.008	0.0002	-52.6	0.000
SEMP	-0.024	0.0008	-32.0	0.000
TD	-0.026	0.0008	-34.8	0.000
HEDU	-0.028	0.0002	-160.4	0.000

The marginal effects of different regressors are given in Table 8. They are also statistically significant. The probability of severely multidimensional poverty decreases as per-capita PDS benefits, age of households' head and year of head's education increases. It increases with increase in households' size. The probability of that degree of deprivation decreases with self and regular employed households and increases with rural located households. The probability is also high for ST, SC and OBC households. For one rupee increase of monthly per capita PDS the probability of the household being poor has decreased by 0.000045. The values of marginal effect are relatively high for the variables ST, SC, OBC and HEDU.

5. Concluding Observations

Among nine indicators of multidimensional poverty households were relatively more deprived in 'nutrition' and 'cooking fuel' compared to other indicators. As in 2004-05, three-fourth of the people living in the households deprived in 'nutrition' where the percentage decreased to 65.6 per cent in 2011-12 whereas one fifth of the households were below the food security line. Multidimensional headcount ratio and intensity of poverty which was found to be more than 50 per cent in 2004-05 has reduced considerably in 2011-12. Moreover, the MPI has also reduced from 0.28 to 0.16 over the considered period. All of these indicators in rural India were higher than that of urban India but the rural area has experienced a greater reduction of poverty. Further, ST and SC are more multidimensionally poor than Non-ST/SC though SC experienced the highest reduction of multidimensional poverty. Based on the deprivation score of the households it was found that in rural areas, the percentage of population was higher in the higher degree of deprivation whereas the opposite situation prevailed in case of urban population in 2004-05. Moreover, the percentage of severely multidimensional poor was found to be higher in the rural area as compared to the urban area. Across social caste although the percentage of vulnerable poor and ordinary poor increased from 2004-05 to 2011-12 but the percentage of severely multidimensionally poor declined and in this case SC and ST households managed to reduce the percentage to a greater extent as compared to the Non SC/ST population. Except Chhattisgarh and Arunachal Pradesh, the rest ten states managed to move from high multidimensional poverty to medium

multidimensional poverty whereas at the same time, number of states having low multidimensional poverty has increased from one to seven including Jammu and Kashmir, Kerala, Punjab, Tamil Nadu and others. The degree of multidimensional poverty has significantly reduced over time in India. But the fact is that it is widely varied across households and this variation is due to the socio-economic background of the households. Rural located households and the households belonging in ST, SC and OBC communities suffer from a high degree of multidimensional poverty. The PDS of India has induced the monthly per capita consumption which played a significant role in reducing the degree of multidimensional poverty of the households. Both Central and State Governments of India have introduced a number of policies and programmes for the better wellbeing of the households, specifically for the households located in rural areas and belonging in the weaker section of the society (e.g., ST, SC and OBC). The study is limited to analyse the impact of these programmes due to unavailability of data in NSSO surveys. But the outcomes of these poverty reducing programmes are reflected in the poverty situation in India. Multidimensional poverty situation reflects the miseries that the majority of them are still deprived in education, suffer in severe food and nutrition insecurity and live without basic amenities. Besides, the degree of multidimensional poverty is significantly low for the self-employed as well as regular employed households. But the fact is that workers of more than 50 per cent households are casual in nature and a significant portion of the households are also deficient with land or other productive assets. Regarding the level of education nearly one third of the population of India is lagging behind from formal education. Therefore, the situation of multidimensional poverty in India is the reflection of Sen's proverbial other side of the story, it is the deficiency of capability to realize one's full potential as a human being, where several darkness loom large.

References

- Alkire, S., and J. E. Foster (2007), 'Counting and Multidimensional Poverty Measurement', *OPHI Working Paper, No. 7*, University of Oxford, <https://www.ophi.org.uk/wp-content/uploads/OPHI-wp32.pdf>.
- Alkire, S. & Seth, S. (2008), 'Measuring Multidimensional Poverty in India: A New Proposal', *OPHI WORKING PAPER NO. 15*, <https://www.ophi.org.uk/wp-content/uploads/OPHI-wp15.pdf>.
- Alkire, S. and J. Foster (2011), 'Counting and multidimensional poverty measurement', *Journal of Public Economics*, vol. 95, pp. 476-487, [http://www.sciencedirect.com/science/article/pii/S0047-2727\(10\)00166-0](http://www.sciencedirect.com/science/article/pii/S0047-2727(10)00166-0).
- Alkire, S. & Seth, S. (2013), 'Multidimensional Poverty Reduction in India between 1999 and 2006: Where and How?', *OPHI Working Paper No. 60. Oxford Dept of International Development, University of Oxford, March 2013*, <https://www.ophi.org.uk/wp-content/uploads/ophi-wp-60.pdf>.
- Alkire, S. and S. Seth (2013), 'Identifying BPL Households A Comparison of Methods' *Economic & Political Weekly*, vol. 48 no 2, <https://pdfs.semanticscholar.org/5179/ee3f90193a65642e4b8a7af2916d1708822e.pdf>.
- Ataguba, John; Fonta, William and Ichoku, Ementa Hyacinth (2011), 'The Determinants of Multidimensional Poverty in Nsukka, Nigeria', *PEP PMMA Working Paper No. 2011-13*, Available at SSRN: <https://ssrn.com/abstract=1937721> or <http://dx.doi.org/10.2139/ssrn.1937721>.
- Bourguignon, F., Bénassy-Quééré, A., Dercon, S., Estache, A., Gunning J. W., Kanbur, R., Klasen, S., Maxwell, S., Platteau, J. and Spadaro, A. (2010), 'Millennium Development

- Goals: An assessment', in Kanbur, R. and Spencer, M. (Eds.), *Equity and Growth in a Globalizing World*, World Bank, Washington DC.
- Bisiaux, R. (2013), 'Understanding the Mismatch among the Three Definitions of Poverty: New Micro-Level Evidence from Delhi Slums', *Economic and Political Weekly*, Vol. XLVIII, No. 01, pp. 51-59.
- Deaton, A. & Dreze, J. (2009), 'Food and nutrition in India: Facts and interpretations', *Economic and Political Weekly*, 44(7), 42-65.
- Dehury, B. & Mohanty, S. (2015), 'Regional Estimates of Multidimensional Poverty in India', *Economics-e Journal*, Vol. 9, No. 2015-36, pp. 1-35.
- Planning Commission (2014), *Report of the Expert Group to Review the Methodology for measurement of Poverty*, Government of India, New Delhi, available at http://planningcommission.nic.in/reports/genrep/pov_rep0707.pdf.
- Suppa, N. (2016), 'Comparing Monetary and Multidimensional Poverty in Germany', *OPHI Working Paper 103*, University of Oxford.
- UNDP (2010), *Human Development Report 2010*, <http://hdr.undp.org/en/content/human-development-report-2010>.
- UNDP (2015), *Human Development Report 2015*, http://hdr.undp.org/sites/default/files/hdr2015_technical_notes.pdf
- Wang, X., Feng, H., Xia, Q. & Alkire, S. (2016), 'On the Relationship between Income Poverty and Multidimensional Poverty in China', *OPHI WORKING PAPER NO. 101*
- Whelan, C.T., Layte, R., & Maître, B. (2004), 'Understanding the mismatch between income poverty and deprivation: a dynamic comparative analysis', *European Sociological Review*, 20(4): 287-302.
- World Bank (2000), *World Development Report 2000/2001: Attacking Poverty*. Washington, DC: World Bank, <https://openknowledge.worldbank.org/handle/10986/11856>.