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Estimation of Aspect Based Multidimensional Poverty in Rural Haryana

Nitin Tanwar^{1*} and B. K. Hooda¹

¹Department of Mathematics, Statistics and Physics, CCS Haryana Agricultural University, Hisar, Haryana, India.

Authors' contributions

This work was carried out in collaboration of both authors. Author NT designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author BKH managed the analyses of the study. Author NT managed the literature searches. Author BKH guided the author NT during whole research period. Both authors read and approved the final manuscript.

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ABSTRACT

The issue of poverty estimation in India has been drawing attention since independence. The process for measuring poverty in India was initiated in early sixties, when a working group from planning commission provided a quantification of minimum food and non-food requirements of individuals for a healthy living. Theoretical developments on poverty measurement have gradually shifted from the traditional unidimensional approach to the multidimensional concept. [1] Pointed out that the study of poverty should identify and analyze attributes than monetary which directly influence the individual welfare. In the present study, estimation of poverty in rural Haryana has been undertaken on the aspects of drinking water, sanitation and housing facilities. For estimation of the poverty, the secondary data on selected indicators of drinking water, sanitation and housing facilities from 69th round of National sample survey office (NSSO) survey have been utilized. The multidimensional poverty index (MPI) using the dual cut-off method based on the counting approach has been applied for estimation of the aspect based multidimensional poverty in rural Haryana. It involves counting the different types of deprivation that individuals experience at the same time. These deprivation profiles are analysed to identify who is poor, and then used to construct a MPI. Using the MPI, the districts Mewat, Rohtak, Palwal, Jhajjar and Fatehabad have

*Corresponding author: E-mail: nitintanwar5@gmail.com;

higher value of MPI and indicating high level of poverty while districts Rewari, Kaithal, Bhiwani, Mahendragarh, Kurukshetra, Faridabad and Ambala were found in better condition. Effective awareness programmes about various schemes provided by government should be conducted so that villagers get to know about various benefits and the ways of approaching for getting benefits given by state/central government.

Keywords: Aspect based poverty; multidimensional poverty measurement; poverty line.

1. INTRODUCTION

Poverty is a global issue and commonly considered as a state of not having enough resources to take care for basic needs such as food, clothing and housing. The monetary value for such requirements is often used to define poverty line. In simple words, poverty is lack of basic amenities. Estimation of poverty has been at the centre of the planning process in every developing country. Till recently, poverty was assessed on the basis of income level. The monetary approach to poverty estimation was pioneered by Booth and Row tree in the late 19th and early 20th centuries. There is a growing realization that poverty not only includes level of income and expenditure but also refers to social, cultural, and political aspects of life.

The criteria developed for estimation of poverty revolve around quantification of minimum food and non-food requirements of individuals for a healthy living. The monetary value for such a requirement is termed as poverty line. Poverty lines are obtained at the state levels with rural-urban classifications.

The theoretical debate on the estimation of poverty in the past few years has led to the shift from the traditional unidimensional view of poverty to the new multidimensional concept of social exclusion [2,3,4].

Batana [5] Measured multidimensional poverty among the women in Sub-Saharan countries using the four dimensions-assets, health, schooling and empowerment. Multidimensional poverty estimates when compared with Human Development Index (HDI), Income poverty, Asset poverty and Gender Development Index (GDI) show a different picture in country rankings. This suggests that inclusion of additional dimensions in multidimensional measure changes the rankings of countries [6]. Measured multidimensional poverty in six Latin American countries by combining indicators from two traditional measures of poverty: income based and unsatisfied basic needs (UBN) approach and

used Alkire-Foster measure of poverty. While measuring poverty, both income based and UBN indicators are relevant and useful in targeting the poor [7,8]. Used the unit level data from NFHS-3 and linked multidimensional poverty with health and health care utilisation. Children belonging to multidimensional poor households are more likely to be deprived of health care and lower survival. [9] And [10] suggested a new method using binary scoring method, which can be updated periodically, to target BPL households in India.

Alkire and Seth [11] Construct MPI, a measure of *acute poverty*, understood as a person's inability to meet minimum international standards in indicators related to the Millennium Development Goals and to core functioning. It constitutes the first implementation of the direct method to measure poverty for over 100 developing countries. A range of robustness tests indicated that the MPI offers a reliable framework that can complement global income poverty estimates [12]. Analyzed the change in multidimensional poverty in India between 1999 and 2006 and find out a strong depletion in national poverty and each of its dimensions, but this has not been uniform across regions, castes, or religions. Probing further, analyzed changes in the distribution among the poor people nationally as well as within population subgroups. Recently, [13] measured multidimensional poverty in China at the national, rural-urban, regional and provincial levels using the China Family Panel Studies data from 2010, and observed that when they adopted four kinds of different methods to measure multidimensional poverty, the variation of weights did not change the results much.

The causes of rural poverty are complex and multidimensional. They involve, among other things, culture, climate, gender, markets, and public policy. In poverty related studies, it is essential to examine the economic and social context, including institutions of the state, households etc. Housing is a basic requirement of human well-being. Along with the requirement of shelter, other facilities in the micro environment

of housing such as type of dwelling unit, drinking water, sanitation, hygiene, etc., form vital components of overall quality of life of the population. Access to drinking water and sanitation is both a human rights issue and a key development challenge that has profound health implications. This paper probes into the current scenario of access to facilities of drinking water, sanitation and housing condition in rural Haryana [9]. Method has been applied for estimation of the aspect based multidimensional poverty in rural Haryana.

2. MATERIALS AND METHODS

2.1 Data

The National Sample Survey Office (NSSO) of the Ministry of Statistics and Programme Implementation (Government of India) headed by a Director General is responsible for conduct of large scale sample surveys in diverse fields on All India basis. Primarily data are collected through nation-wide household surveys on various socio-economic subjects, Annual Survey of Industries (ASI), etc. Besides these surveys, NSSO collects data on rural and urban prices and plays a significant role in the improvement of crop statistics through supervision of the area enumeration and crop estimation surveys of the State agencies. The NSSO adopts two stage stratified sampling design, the first stage units being census villages in the rural sector selected

through circular systematic sampling with probability proportional to size (PPS) and the ultimate-stage units being the households selected circular systematically with independent random starts. For the present study the data on selected indicators of 69th round survey (2012) of NSSO on drinking water, sanitation, hygiene and housing condition in India have been used for the estimation of poverty in rural Haryana. A 'state sample' was surveyed by state government official whereas the 'central sample' was surveyed by NSSO. Number of fsu's (villages/blocks) surveyed for schedule 1.2: NSS 69th round, central sample for Haryana state 76 for rural and 72 for urban area. Second-stage units: For this particular survey, from each sample village and urban block, 12 households were selected respectively for canvassing schedule 1.2. The total number of 1756 households was considered from Haryana out of which 912 in rural Haryana and 844 in urban Haryana. In this study only rural households were studied for estimating aspect based multidimensional poverty in rural Haryana.

In measuring the multidimensional poverty three aspects viz. drinking water, sanitation and housing condition have been considered. These aspects comprise a total of ten indicators. The description of aspects and indicators is given in Table 1. Three indicators are related with the drinking water dimension two with the sanitation dimension and five with the housing condition.

Table 1. The aspects, indicators and deprivation thresholds

Aspect	Indicators	Deprived if...
Drinking water	Principal source of drinking water	The household does not have Principal source of drinking water in the dwelling/yard/plot
	Whether drinking water sufficient	The household does not have sufficient drinking water throughout the year
	Distance of the principal source of drinking water	Principal source of drinking water is outside the premises more than 0.2 K.M.
Sanitation	Access to latrine	Household does not have exclusive use or Household use common latrine in a building or public/community latrine
	Facility of bathroom	Household does not have bathroom
Housing condition	Condition of structure	Household has bad condition of structure
	Type of dwelling	The household does not have independent or own house
	Floor type	The household has a mud, bamboo, wood lime stone floor
	Wall type	The household has bamboo/straw/reeds/grass, mud/unbrunt bricks and other katcha walls
	Roof type	The household has bamboo/straw/reeds/grass, mud/unbrunt bricks, canvas/cloth and other katcha roof

2.2 Methods

2.2.1 Poverty ratio or head count ratio

Head count ratio is one of the most widely used poverty measure. It is also known as poverty Ratio (PR). The Head Count Ratio (HCR) measures the proportion of the population that is counted as poor. It gives the proportion of population which is not above the poverty line. It can be formally defined as:

$$HCR = \frac{P}{N}$$

Where, P is the number of poor people and N is the total population.

Poverty ratio is, thus, simply a head count ratio and it only measures the incidence of poverty. Though it is most commonly used measure of poverty, it suffers from the drawback that it does not take into account the level of poverty within poor people. Poverty ratio is not affected by upward or downward movement of poor people unless they cross the poverty line [14]. Made an attempt to review some of the existing procedures for poverty mapping for estimating poverty indicators at district level in Uttar Pradesh.

2.2.2 Multidimensional poverty index

The multidimensional poverty index (MPI) using the dual cut-off method based on the counting approach was developed by [15,9]. In unidimensional analysis, identification is normally accomplished by the use of a poverty line or threshold value. A poor hold is one of the poor household whose resource or achievement variable level falls below the poverty line. In multidimensional setting, where there are multiple variables, identification of poor hold is more challenging exercise. With the increasing understanding that poverty is of multidimensional and dynamic natures, many studies had responded with new measures and tools that comprehensively measure poverty to the strong demands of governments and international communities [16,17,18,19].

The first partial index is the percentage of the population that is poor, or the multidimensional headcount ratio H . The second is the average intensity A , which calculates the deprivation share for each poor person by dividing the

deprivation count by d , and then averages across all poor persons. The MPI is the product of both i.e.

$$MPI = H \times A$$

Where H is multidimensional head count ratio:

$$H = \frac{q}{n}$$

Here q is the number of people who are multi dimensionally poor and n is the total population and A is Average deprivation share among poor or intensity of poverty:

$$A = \frac{\sum_{i=1}^n c_i(k)}{q}$$

Where $c_i(k)$, is the censored deprivation score of individual i and q is the number of people who are multidimensionally poor.

3. RESULTS AND DISCUSSION

As mentioned in materials and methods poverty ratios have been estimated for each district in rural Haryana as percentage of persons below aspect based poverty lines and then a pooled poverty ratio for each district with respect to each of the dimension have been obtained.

Table 2 presents district-wise percentage of population below poverty line in facility of drinking water in rural Haryana. An examination of district level estimates indicates wide range of variation in different drinking water indicators across districts. The conditions of some districts in terms of drinking water indicators are much better than in other districts. The performance of all districts is not uniform on all the indicators related to drinking water. Also district performed better one indicator. In case of principal source of drinking water, rural households in the districts Rohtak, Palwal, Jhajjar, Jind and Mewat (100, 77.1, 75.0, 64.6 and 60.4 per cent respectively) are deprived. On the other hand rural households found in good condition regarding this variable were Ambala, Sirsa, Rewari, Kurukshetra and Yamuna Nagar. Regarding sufficiency of drinking water the households of Yamuna Nagar (41.0%) district were found most deprived. The households of Rohtak district were most deprived in respect to the distance of the principal source of drinking water followed by Faridabad (83.0%),

Palwal (62.0%) and Jhajjar (56.0%). The performance of districts Jhajjar, Mahendargarh, Panchkula, Panipat and Rohtak are not likely to be uniform on all the indicators related to drinking water facility while district Ambala shows uniformity related to all indicators as given in Table 2.

Analysing the levels of two sanitation facilities separately, the perusal of Table 3 revealed that the rural areas of the districts Panchkula (75.0%), Mewat (70.8%), Yamuna nagar (62.5%) and Palwal (56.3%) appear as the most deprived districts in Haryana, which have used a common latrine facilities in the building. Kaithal and Faridabad districts were found in good condition regarding this indicator. It is also found that with regard to bathroom facility, 50% of the rural households do not have bathroom facility in Mewat followed by Sirsa with 45.83% and Fatehabad with 39.58%.The districts Fatehabad and Hisar are likely to be performing uniform approximately while other districts shows wide range of variation related to sanitation facilities as given in Table 3.

The results of Table 4 showed the district-wise proportion of deprived households in case of quality of house. In case of condition of structure,41.6% households of Fatehabad district

are living in bad condition of structure followed by Gurgaon (37.5%), Panipat (29.2%) and Mewat (27.1%). The households of the districts of Panipat (29.0%), Fatehabad (25.0%) and Sirsa (18.0%) do not have their own house or independent house. In Gurgaon (58.0%), Palwal (47.0%) and Mewat (45.0%) households do not have cemented or pucca floor. In case of wall type, 31.0% households in Mewat found deprived. 45.0 per cent households of Mewat district were also found deprived in case of roof material and have roof prepared by mud, bamboo, canvas or other katcha type roof. The households of Mewat district found most deprived in all cases or indicators of housing condition or quality of house. The only district Panchkula is likely to be performing uniform approximately with respect to all housing condition indicators given in Table 4.

3.1 The Multidimensional Poverty Index (MPI)

The estimation of the poverty with the multidimensional scale provides wider and deeper view of wellbeing and could be efficiently used for the targeted policy interventions. The multidimensional poverty index (MPI) is the product of two measures, multidimensional

Table 2. Estimate of district-wise proportion of deprived households on the aspect of drinking water facilities in rural Haryana

Districts	Principal source of drinking water	Sufficiency of drinking water	Distance of the principal source of drinking water
Ambala	0.000	0.000	0.000
Sirsa	0.104	0.000	0.060
Rewari	0.104	0.000	0.040
Kurukshetra	0.146	0.060	0.120
Yamuna Nagar	0.208	0.410	0.080
Mahendragarh	0.208	0.020	0.200
Faridabad	0.250	0.250	0.830
Kaithal	0.313	0.020	0.100
Bhiwani	0.333	0.000	0.330
Panchkula	0.375	0.080	0.370
Gurgaon	0.375	0.040	0.290
Fatehabad	0.438	0.020	0.370
Karnal	0.479	0.020	0.330
Sonipat	0.479	0.020	0.180
Panipat	0.542	0.000	0.330
Hisar	0.563	0.120	0.410
Mewat	0.604	0.100	0.540
Jind	0.646	0.020	0.540
Jhajjar	0.750	0.000	0.560
Palwal	0.771	0.040	0.620
Rohtak	1.000	0.000	1.000

Table 3. Estimate of district-wise proportion of deprived households on the aspect of sanitation facilities in rural Haryana

Districts	Access to latrine	Facility of bathroom
Kaithal	0.167	0.060
Faridabad	0.167	0.250
Jind	0.229	0.080
Hisar	0.292	0.250
Panipat	0.333	0.250
Karnal	0.354	0.020
Bhiwani	0.354	0.120
Fatehabad	0.375	0.390
Mahendragarh	0.375	0.160
Rewari	0.396	0.200
Ambala	0.417	0.270
Sonipat	0.417	0.040
Rohtak	0.417	0.120
Kurukshetra	0.438	0.270
Jhajjar	0.438	0.100
Sirsa	0.542	0.450
Gurgaon	0.542	0.160
Palwal	0.563	0.310
Yamuna Nagar	0.625	0.250
Mewat	0.708	0.500
Panchkula	0.750	0.330

Table 4. Estimate of district-wise proportion of deprived households on the aspect of Housing conditions in rural Haryana

Districts	Condition of structure	Type of dwelling	Floor type	Wall type	Roof type
Panchkula	0.000	0.040	0.000	0.000	0.000
Jind	0.000	0.000	0.040	0.000	0.330
Rewari	0.000	0.000	0.100	0.000	0.180
Faridabad	0.000	0.000	0.120	0.000	0.250
Kaithal	0.021	0.000	0.180	0.000	0.290
Mahendragarh	0.042	0.000	0.200	0.020	0.100
Kurukshetra	0.083	0.020	0.350	0.000	0.220
Bhiwani	0.083	0.040	0.330	0.000	0.040
Karnal	0.167	0.020	0.020	0.310	0.040
Sirsa	0.167	0.180	0.430	0.080	0.330
Palwal	0.167	0.000	0.470	0.120	0.370
Ambala	0.188	0.000	0.370	0.040	0.370
Rohtak	0.208	0.000	0.000	0.160	0.370
Hisar	0.229	0.020	0.180	0.040	0.200
Yamuna Nagar	0.250	0.000	0.450	0.020	0.020
Jhajjar	0.250	0.060	0.180	0.250	0.430
Sonipat	0.271	0.020	0.140	0.000	0.390
Mewat	0.271	0.100	0.450	0.310	0.450
Panipat	0.292	0.290	0.040	0.020	0.100
Gurgaon	0.375	0.000	0.580	0.250	0.370
Fatehabad	0.417	0.250	0.450	0.120	0.270

headcount ratio (H) and intensity of poverty (A) [9]. The multidimensional headcount ratio is the proportion of multidimensional poor to the total population. The intensity of poverty is the

average weight of deprivations experienced by the multidimensionally poor at a time. Table 5 provides the estimates of H, A and MPI and a ranking of districts according to MPI.

Table 5. Estimate of district-wise multidimensional poverty index (MPI) values in rural Haryana

S. no.	Districts	H	A	MPI = H×A	Rank
1	Panchkula	37.50	42.22	0.158	8
2	Ambala	64.58	23.55	0.152	7
3	Yamuna Nagar	83.33	30.00	0.250	15
4	Kurukshetra	50.00	28.75	0.144	5
5	Kaithal	45.83	24.55	0.113	2
6	Karnal	81.25	30.51	0.248	13
7	Panipat	54.17	36.92	0.200	10
8	Sonipat	62.50	28.33	0.177	9
9	Jind	97.92	23.62	0.231	11
10	Fatehabad	70.83	43.53	0.308	17
11	Sirsa	87.50	27.14	0.238	12
12	Hisar	77.08	32.43	0.250	14
13	Bhiwani	37.50	32.22	0.121	3
14	Rohtak	100.00	39.17	0.392	20
15	Jhajjar	100.00	33.75	0.338	18
16	Mahendragarh	41.67	31.00	0.129	4
17	Rewari	39.58	22.63	0.090	1
18	Gurgaon	87.50	32.86	0.288	16
19	Faridabad	50.00	29.17	0.146	6
20	Mewat	100.00	40.00	0.400	21
21	Palwal	100.00	34.79	0.348	19

The MPI values vary from a low of 0.090 in Rewari district to a high of 0.400 in the Mewat district. On ranking all the districts in ascending order, we found that the districts Mewat, Rohtak, Palwal, Jhajjar and Fatehabad have higher value of MPI and indicating high level of poverty. Districts Rewari (0.090), Kaithal (0.113) Bhiwani (0.121), Mahendragarh (0.129), Kurukshetra (0.144), Faridabad (0.146) and Ambala (0.152) were categorized better according to the aspect based multidimensional poverty index.

4. CONCLUSION

This study made an attempt to estimate the deprived ness of rural households of Haryana in reference to the aspects of drinking water, sanitation and house condition. District level estimates indicate wide range of variation across districts. The households of Rohtak district were found most deprived regarding drinking water facilities while these households were found in better condition in case of sanitation facilities. Households of Ambala district were in better condition in terms of drinking water indicators. In case of sanitation facilities 75 per cent households of Panchkula district were found deprived while house quality of these households were in better condition in comparison to other districts. Using the aspect based multidimensional poverty index we observed that the districts Mewat, Rohtak, Palwal, Jhajjar and Fatehabad have higher value of MPI and

indicating high level of poverty while districts Rewari (0.090), Kaithal (0.113) Bhiwani (0.121), Mahendragarh (0.129), Kurukshetra (0.144), Faridabad (0.146) and Ambala (0.152) were found in better condition.

5. RECOMMENDATIONS

5.1 Drinking Water

The water connections and water pipes should be laid to individual household in the villages under schemes invented by government. The timings for the water supply should be fixed so that the villagers don't face any problem as most of them work as labourers and they can't keep waiting for water supply the whole day.

5.2 Sanitation

To overcome the problem of sanitation, community participation is very important. Regarding sanitation problem, government should implement some schemes like construction of individual household latrines, sanitary complex for women, school sanitation. The various technological options and models should be provided to the rural people and they can select the affordable model for construction of individual household latrines. Selection of beneficiaries under these schemes should be fair without any biasness. This can be achieved by having periodic as well as surprise checks at the sites by the authorities, checking of the records

and meeting the beneficiaries to make sure that the deserving cases have been selected. Any deviations found should be rectified and the person responsible should be penalized. The material supplied for the construction of toilets should be sufficient of good quality and should also be complete.

5.3 Housing

To provide shelter to all BPL families, it should be ensured the proper quality of building material is supplied and in time. The programmes for rural housing needs increased fund allocation. There should be proper monitoring system for checking the quality of building material and a proper and effective source of building material should be fixed. Villagers should know this source so that a proper transparency is maintained.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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