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Rural and Urban Multidimensional Poverty and its Determinants in Tinsukia District of Assam, India

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Abstract:
Tinsukia district is one of the commercial district of Assam. Despite of being an industrial district having high opportunity, its position is 22nd out of 27th in human development index. This paper aims at measuring the level of multidimensional poverty and its dimensional breakdown in Tinsukia district, Assam. The paper also aims at comparing the outcome of income and multidimensional poverty among the rural and urban households in Tinsukia district, Assam. The paper estimates multidimensional poverty applying the methodology developed by Alkire and Foster using primary survey data. Following the same dimensions and indicators, weight and cut-offs, this study also considered three dimensions for both rural and urban areas: education, health and standard of living and 10 indicators for each dimensions, two for education, two for health and six for standard of living. The study found that multidimensional poverty is high in rural areas compared to urban. In the impact of change in different poverty cut-offs, the study found decline the value of MPI both in rural and urban areas with every increase in poverty cut-offs of the district. The contribution of nutrition indicator to MPI is high in rural areas followed by years of schooling while in urban child enrollment indicator contribute more to MPI followed by years of schooling and nutrition indicator. The comparative analysis of income and multidimensional poverty using cross tabulation shows that in rural areas for all three poverty cut-offs, the similarities between the two measures found less than the mismatch while in urban the similarities found in both income and multidimensional poverty measures higher than mismatch.

Keywords: Binary Logistic Regression, Determinants, Income poverty, Multidimensional, Rural and urban, comparative analysis, standard of living etc.

I. Introduction:

The existence of poverty in living standard between classes of people is widely believed to be an important development challenge across the world. Realizing the fact, efforts have been made at different levels to quantify the poor on the basis of the poverty line reckoned in money metrics terms for operational phase of interventions. UN, in its Millennium Development Goals targeted to halving the proportion of poor living in income less than $1.25 by 2015. According to the MDG Report, 2015, although the targets of eradication of extreme poverty and hunger have been met or almost met, the world is still having 825 million people living in extreme poverty. This signifies that measuring poverty in income dimension may yield some pertinent information on its chosen scale, but perhaps overlooks the multifaceted nature of human deprivation. Therefore, there has been a shift of conceptualizing poverty beyond its income dimension. The fundamental reconsideration of the concept of poverty particularly conceived broadly in economics, prompted in the capability approach developed by Amartya Sen. In capability approach Sen. viewed poverty as capability failure and thus rooted poverty as multidimensional. By portraying poverty in

multidimensional space in terms of capability failure, Sen., invites direct attention to a range of specific capabilities relating to health, education, shelter and basic amenities. Unlike Sen, many scholars hold the view that for poverty reduction, rise in individual income can of course be very important but simultaneously it needs some social and economic arrangement such as facilities for education and health care as well as political and civil right. The framework of Chamber & Conway's livelihood approach, Basic needs approach of Hicks and Streeten, Atkinson's & Marlier's social inclusion, UNRISD's social protection, the concept of human security etc throw light on the multidimensional aspect of poverty. Over the last decades, both the theory and the practical measurement of multidimensional poverty have made rapid advance. The evolution of the human development paradigm in 1990 led to the strong theoretical foundation to measure multidimensional poverty. Human Development Report, 2010, introduces the global multidimensional poverty index which directly measures the combination of deprivations that each household experience.

The case for distinct focus on multidimensional poverty rest in the proposition that there are many aspects of poverty which for a variety of reasons may not be adequately captured by in single dimension of income or consumption. The focus on multidimensional aspect of poverty in addition has the potential to draw attention to government failure especially in relation to provision of public goods and how market function. While these conceptual arguments for an independent focus on measuring multidimensional poverty apply to all countries, there is also a significant relevance for India and Assam too. In India about 47.9 percent of Indian households that have more than five children are severely deprived of shelter, water, sanitation, health and education. In Assam despite declining trend of poverty in recent years, 77 percent of rural people are without access to sanitation facilities, 14.2 percent are without having safe drinking water and 36.2 percent have no access to electricity facility (the Human Development Report, 2016). The literature of poverty studies exposed that poverty has regional dimension means where the poor lives is an important dimension. Therefore, the variation in multidimensional poverty as well as material deprivation is found in rural and urban areas across all the countries of the world.

Tinsukia district of Assam: Tinsukia district is one of the 27 administrative districts of Assam. It is situated in between 27.23^0N to 27.48^0 N latitudes and 93.38^0 E longitudes at the north covering an area of 3790 sq.km. Located in the Upper part of Assam, the district is surrounded by Arunachal Pradesh in the East, Dibrugarh district in the west and in the north river Brahmaputra, in the south Arunachal Pradesh. As per 2011 census, total population of the district is 1325263 with population density 350 persons. The population of this district has increase from 1150062 in 2001 to 1327924 in 2011. According to the rank of urban agglomeration in Assam, Tinsukia is in the position of 7th rank having population 1 lakhs or above. Tinsukia district has 3 sub-divisions that are Tinsukia, Margherita and Sadiya, 7 revenue circle, 7 development blocks and 86 gaon panchayat. The number of villages in this district is 1168 and 80.60 percent of population live in rural area. Total urban population in this district is 262992 lakes (19.94 percent) out of which 44051 (16.75) are slum dwellers (2011 census). According to the Statistical Hand Book of Government of Assam, 2011, there are 13 towns and 102 slum pockets in Tinsukia district. It is a district of mixer communities. The major indigenous communities of the district are the Ahoms, Sonowal Kachari, Chutiya Kachari, Moran Kachari, Moran and Motok, Kaibarta, Misings, Singpho, Tai Phake, Khamyang and Nokte. There are migrant communities like Bihari and Bengali, the Muslim demographic includes Iraqi Biradari and Indian Pathans, Tea tribes who were brought by the British in colonial times also form a large section of the population. The

Tinsukia district, once known as Bangmara was the capital of Muttak Kingdom. As a commercial and trade hub, Tinsukia district has the tea, coal, crude oil, petroleum product, plywood etc. supplied from the hinterlands. Rural people of this district generally engaged in agriculture, tea plantation, and cultivation of orange, ginger and other citrus fruits. Despite of being one of the commercial districts with high opportunity and potentiality, people in this district are unemployed, living in poor condition and deprived in having access to basic amenities of life.

II. Objectives:

The objectives of the paper are - (1) to measure the extent of multidimensional poverty in the study areas of Tinsukia district (2) to compare the outcome of income and multidimensional poverty measure for rural and urban areas of the district.

III. Methodology:

Data source: The present study is based on the primary data collected by field survey through a structured questionnaire prepared for the purpose. Moreover, some secondary data was also collected from OPHI, Global MPI Report, Statistical Hand Book of Assam, 2016, Assam Human Development Report, 2016

IV. Analytical Strategy:

For the purpose of the measurement of multidimensional poverty and to identify the households' experience of multidimensionally deprived, Alkire and Foster methodology (UNDP, Human Development Report, 2010) was used. And for identify the monetary poor, monthly per capita consumption expenditure for each household is calculated and then compared with the poverty threshold value of MPCE based on the state specific poverty line for rural(Rs. 1006.66) and urban(Rs.1420.12) recommended by Rangarajan committee of planning commission of India (2014). Considering the household as the unit of analysis, the study follows two steps – (a) Identification and (b) aggregation of the poor who are multidimensionally deprived. In the identification part the steps taken are –

1) Choosing the dimensions: in the present study same three dimensions were used unlike the UNDP follows in the construction of Global MPI i.e. education, health and living standard.

2) Defining the indicator for each dimension: In the present study, the 10 indicators sets for each dimension by UNDP were used to reflect the multidimensional deprivation.

3) Determining the relative weight and define the cutoff: In this step, uniform weight procedure was applied so that the sum of value of each weight will be equal to 1 (one). To identify the poor, **dual cutoff** method was used. One is set off **deprivation cutoff** which identify whether a person is deprived with respect to each dimension. If a person is identified as deprived in respective indicators based on the specified norms or cutoff, a value of 1 is assigned and if non-deprived according to the definite cutoff a value of 0 is assigned. Another cutoff or threshold is **poverty cutoff** denoted by k (k=1/3) which mean a person is identified as poor if the person's deprivation score is equal to 1/3. The base information in multidimensional poverty measurement is represented by an *n* x *d* dimensional achievement matrix X, where X_{ij} is the achievement of person I in dimension j, for each dimension j, a threshold zj is defined as the minimum achievement required in order being non-deprived. Deprivation cutoffs are collected in the *d* dimensional vector $z=(z_1 \ldots, z_d)$. Given each person's achievement in each dimension x_{ij} , if the ith person's achievement level in a given dimension j fall short of the respective cutoff z_j , the person is said to be deprived in that dimension(that is, if $x_{ij} < z_j$). From achievement matrix x and the vector of deprivation cutoff

z, we can obtain a deprivation matrix g_0 such that $g_{ij}^0 = 1$ whenever $x_{ij} < z_j$ and $g_{ij}^0 = o$ otherwise. The matrix g_{ij} summarizes the deprivation status of all people in all dimensions matrix x, the vector g_i^0 summarize the deprivation status of person I in all dimensions, and vector g_j^0 summarizes the deprivation status of all persons in dimension j.

The deprivation in each of the dimensions may not have the same relative importance. Thus, a vector $w=(w_1 \ldots\ldots w_d)$ of weights or deprivation value is used to indicates the relative importance of a deprivation in each dimension. The deprivation value attached to dimension j is denoted by $w_j > 0$. In the AF methodology, each dimension is equally weighted i.e. 1/3. In health dimension, child mortality and nutrition have been assigned the weight of 1/6 and in the education dimension; years of schooling and child school attendance have the same weight of 1/6. The standard of living has the six indicators and so weight is assigned 1/18 in each indicator. (Shown in Table 1)

4) In the aggregation part, after setting the poverty cutoff, a censored deprivation score vector is obtain by multiplying each entry by the identification function. Alternatively, it can be derived directly from the censored deprivation matrix and can be obtain on the basis of the formula given below

$$C_i(k)=\sum_{j=1}^{d} w_j g_{ij}^0 (k) \ldots\ldots..(1)$$

The censored deprivation score vector is denoted by C (k).

After censoring deprivation of the non-poor and computing the proportion of people who have been identified as multidimensionally poor in the population, the head count ratio of multidimensional poverty (H) is counted which represent the incidence of multidimensional poverty. After counting the incidence of poverty, the intensity of poverty (A) is derived by computing the average share of weighted indicators in which poor people are deprived. This is obtaining by adding up the deprivation scores of the poor and dividing them by the total number of poor people. On the basis of the two partial indices, incidence (H) and the intensity (A), multidimensional poverty index is constructed as the product of H x A. This can be express as

$$MPI= H \times A \ \ldots\ldots..(2)$$

V. Dimensions, Indicators, deprivation cut-offs and weights:

The multidimensional poverty index in this study is constructed following the international Multidimensional Poverty Index that was published in the Human Development Report 2010 (UNDP, 2010, Alkire and Santos, 2014). But made some adjustment of indicators on the basis of own judgment. For example, in housing floor indicator, sometimes it was observed that households may not have dirt/sand floor, but condition of the wall are not improved. In the sanitation indicator, if household access improved sanitation facilities but shared with number of households, the household is considered as deprived. In the drinking water indicator, households are considered deprived if they don't purify the water despite of having tube well and in assets indicator sometimes households are considered as deprived in assets despite of having mobile phone. Because, most of the poor have mobile phone though they don't access to improved housing floor, sanitation, pure drinking water, electricity and cooking fuel. The dimensions, indicators, deprivation cut-off and weight are given in Table.1.

Table No.1 Dimensions, indicators, deprivation cut-off, and weights of the global MPI

Dimension	Indicator	Deprivation Cutoff	weight
Education	Years of schooling	No household member has completed five years of schooling.	1/6
	Child enrolment	Any school age child in the household is not attending school up to class 8.	1/6
Health	Nutrition	If any adult or child in the househol is undernourished.	1/6
	Mortality	Any child has passed away in the household in last five years	1/6
Standard of living	Floor	The household has a dirt, sand, or dung floor/not improved wall of the house.	1/18
	Sanitation	The household's sanitation facility is not improved/ if improved shared with numbers of families	1/18
	Cooking fuel	The household cooks with dung, wood, or charcoal	1/18
	Water	The household doesnot have access to pure drinking water.	1/18
	Electricity	The household has no electricity	1/18
	Assets	The household owns at most one of the following: radio, mobile phone, TV, bike, refrigerator, and doesnot own a car or truck.	1/18

Source: *Alkire and Santos (2010, 2014), cf. Alkire, Roche, Santos, and Seth (2011) and Alkire, Conconi, and Roche(2013)*

VI. Estimation Results

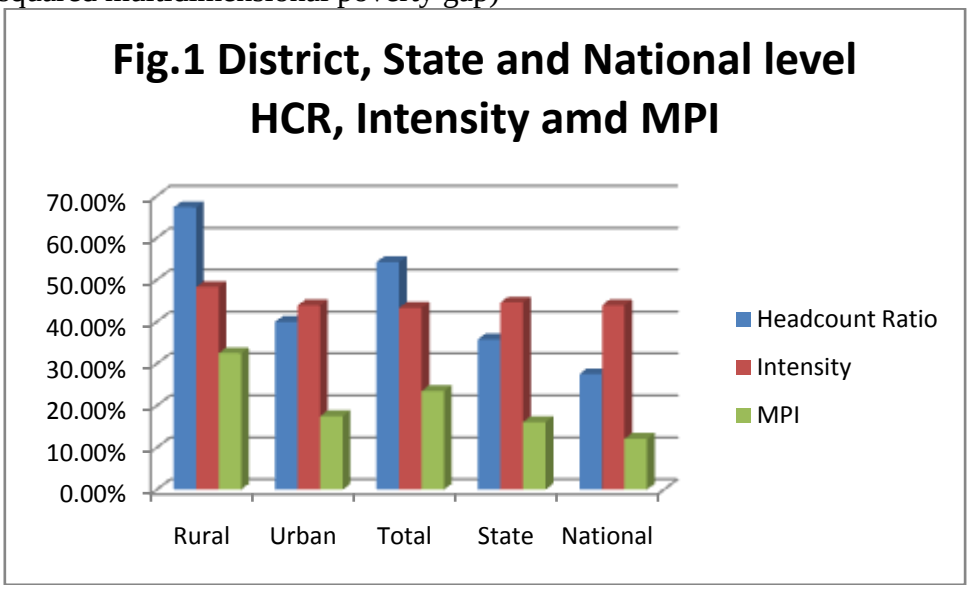
Multidimensional poverty Index of the sample households: Using the methodology of Alkire and Foster (UNDP, 2010, 2014), the multidimensional poverty was constructed on the basis of the FGT class of poverty measures for the households living in rural and urban areas of Tinsukia district. The study found higher uncensored headcount ratio or incidence of poverty in rural area (67 percent) compared to urban area (40 percent) of the district. If we see the intensity (A), less differences is found between the two locations of the district (48 percent in rural and 44 percent in urban) despite of having high differences in headcount ratio.

As a product of partial indices of H and A, the higher value of multidimensional poverty index found in rural area compared to urban area of the district. In rural the value (M_0) found is 0.325 and in urban 0.175 that means 33 percent households are multidimensionally deprived in rural area while in urban 18 percent are multidimensionally deprived.(Table.2, Fig.1)

Table.2 MPI of the Sample Households

Area	H(Incidence)	A(Intensity)	M_0 (MPI)	M_1	M_2
Rural	0.673	0.483	0.325	-0.253	0.198
Urban	0.400	0.439	0.175	-0.058	0.052
Total population	0.542	0.433	0.235	-0.073	0.066
Assam(State)	0.358	0.446	0.161	--	--
India(national)	0.275	0.439	0.121	--	--

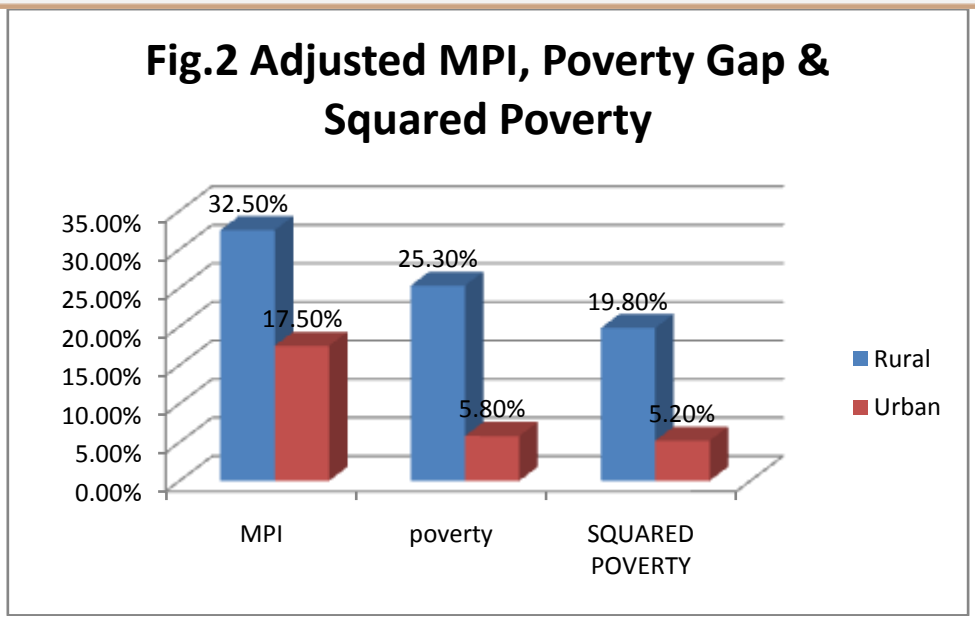
Source: Primary data, own calculation, For Assam and India (Global MPI Report, 2018)
(M_0= adjusted multidimensional poverty, M_1= adjusted multidimensional poverty gap, M_2= adjusted squared multidimensional poverty gap)



The adjusted poverty gap and adjusted squared poverty gap:

The adjusted poverty gap is the sum of the weighted normalized gap of poor divided by the total population. This provides us the information on the average depth of deprivation across all poor. In other words, it explain whether the differences in higher poverty gap across location is due to higher value of incidence (H) or intensity (A) or poverty gap(G). In the study, it was found higher adjusted multidimensional poverty gap value i.e 0.253 in rural while in urban the value found is 0.058 due to higher differences in the value of poverty incidence (H) then the intensity of poverty.(Table No.2, Fig 2)

The adjusted squared poverty gap is the sum of the weighted normalized squared gap of the poor divided by total population. This can also be expressed in terms of partial indices as the product of H (incidence) and A (intensity) and the average severity S. The analysis of squared poverty gap in Tinsukia district shows higher in rural area (value 0.198) compared to urban area (value 0.052) of the district.



VII. MPI at different poverty cut-offs:

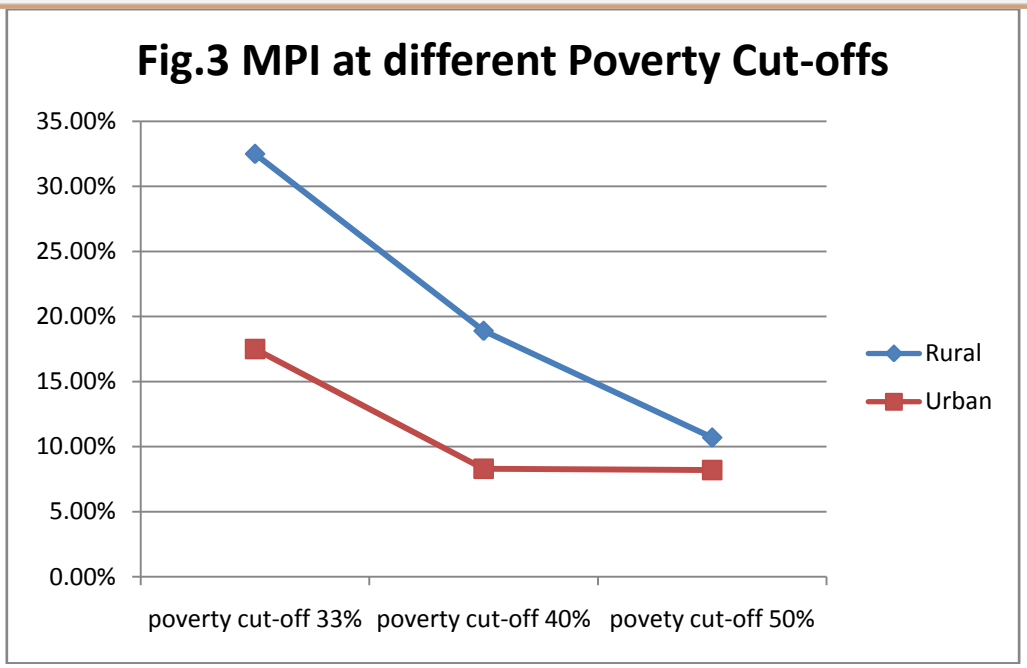
To know the impact on multidimensional poverty due to change in poverty cut-off, multidimensional poverty index was constructed for the sample households considering two additional poverty cut-off i.e. k=40% and k=50%. Table.3 shows that both in rural and urban areas with increase in poverty cut-off to 40 percent and 50 percent, the incidence of poverty (H) and the value of MPI decrease. In rural area, the incidence of multidimensional poverty (H) at k=33%, k=40%, k=50% is 67 percent, 34 percent and 17 percent respectively. The corresponding value of MPI, decrease from the value of 0.325 at k=33 percent to 0.189 and 0.107 at k-40 percent and k=50 percent. In urban area the value of the incidence (H) decrease from 0.400 to 0.155 and 0.155 at the same poverty cut-off and the corresponding value for MPI decrease from 0.175 to 0.083 and 0.082. (Fig.3)

Table. 3 MPI of the Sample Households for different poverty cut-off

Multidimensional poverty cutoff(k)	Rural			Urban		
	H	A	MPI	H	A	MPI
K=33%	0.673	0.483	0.325	0.400	0.439	0.175
K=40%	0.344	0.551	0.189	0.155	0.541	0.083
K=50%	0.170	0.628	0.107	0.097	0.841	0.082

Source: Primary data, own calculation

While the value of multidimensional poverty index decrease with increase poverty cut-off, but the intensity shows higher value with every increase of poverty cut-off.



VIII. Indicator-wise Uncensored and censored headcount ratio:

Table.4 shows the uncensored and censored headcount ratio in each indicator within the three dimensions. In the study, the higher uncensored headcount ratio is found in drinking water (0.791), nutrition(0.788) , housing floor(0.762) and cooking fuel(0.619) indicators and lower ratio is found in child mortality (0.015) indicator in rural area.

Table.4 Indicator wise Uncensored and Censored Head Count Ratio

Dimensions	Indicator	Rural		Urban	
		Uncensored head count ratio	Censored headcount ratio	Uncensored head count ratio	Censored headcount ratio
Education	Years of schooling	0.227	0.223	0.293	0.265
	Child enrolment	0.077	0.077	0.387	0.283
Health	Nutrition	0.788	0.621	0.195	0.134
	Child Mortality	0.015	0.015	0.040	0.040
Living Standard	Housing Floor	0.762	0.634	0.491	0.199
	Sanitation	0.595	0.553	0.134	0.076
	Cooking fuel	0.619	0.569	0.436	0.193
	Drinking Water	0.791	0.607	0.460	0.011
	Electricity	0.338	0.329	0.121	0.059
	Assets	0.332	0.294	0.557	0.277

Source: Primary data, own calculation

While in urban area, the higher value is found in assets (0.557) followed by housing floor (0.491), drinking water (0.460), cooking fuel (0.436) and lower value is found in child mortality (0.040). If we compare the uncensored headcount ratio found in each indicator, in

rural area the higher value for each indicator is found compared to urban counterpart except in child mortality indicator and in indicator of health dimension.

IX. Determinants of Multidimensional Poverty

Model Specification: The present study used a Binary Logistic Regression Model to identify the determinants of Multidimensional Poverty. Here the dependent variable is dichotomous in nature and the Multidimensional poverty incidence (1= Poor, 0=Non-poor) is taken as the dependent variable. On the basis of the deprivation score of the sample households, they are classified as poor or non-poor. The Binary Logistic Regression Model applied here can be expressed as-

$$Z_i = \text{In}\left(\frac{p_i}{1-p_i}\right) = \beta_0+\beta_1X_1+\beta_2X_2+ \ldots\ldots\ldots+\beta_kX_k+\varepsilon i \quad \ldots\ldots\ldots(3)$$

Where Z_i is the Multidimensional poverty status of the ith household represented with dummy: 1 if poor and 0 otherwise. P_i is the probability of the household being multidimensionally poor and $1-P_i$ is the probability that the household is being non-poor. β_0 is the constant term included in the model and β_1, β_2 and β_k is the regression coefficient of each independent variable included in the model (X_1, X_2,….. X_k) and ε_i represent the stochastic error term.

Selection of Variables: The literature on the determinant of poverty use a number of determinants of poverty, but the present study include location or area of the household, gender, education of the household head, household size and employment status of the household head as the determinants of the multidimensional poverty status of the sample households. The predictor variables are discussed below in the following (Table.No.5)

Table No. 5 Description of the explanatory variables

Variable	Definition	Type	Description
Area	It refers to whether household belong to rural or urban area	Categorical	1= Rural, 0 =Urban
Gender of the household head(GHH)	It refers to whether household head is male or female	Categorical	1= Male, 0 = Female
Education of the household head(EHH)	It refers to education status of the household head	Categorical	1= Primary and/or above, 0= No education
Household Size(HS)	It refers to total no. of member in the household	Continuous	Total numbers of members in the household
Employment status of the household head(ESHH)	It refers to whether household member is employed or unemployed	Categorical	1=Employed, 0= Unemployed

Source: ***Own Justification***

X. Regression Results

The estimated results of the regression model of the determinants of multidimensional poverty of the sample households have been given in the following Table No.6

Table No.6 Determinants of Multidimensional Poverty: Binary Logistic Regression Results

Dependent Variable: Multidimensional Poverty Status of the sample households (1= Multidimensionally poor, 0 = Multidimensionally not poor)

Predicted Variable	Coefficient(β)	S.E	Wald	Sig	Exp(β)
AREA	1.342*	.258	29.035	.000	4.023
GHH	.171	.529	.104	.747	1.186
EHH	-2.240*	.329	46.359	.000	.106
HS	-.060	.071	.709	.400	.942
ESHH	-.781**	.337	5.447	.020	.455
CONSTANT	-1.437	.676	4.518	.034	4.208

Source: Own calculation using SPSS

*implies 1 percent level of significance, **implies 5 percent level of significance

Cox & Snell R^2 =.252, Nagelkerke R^2 = .337

Hosmer and Lemeshow Goodness of Test Statistics = 19.353 (p = .007)

XI. Discussion

From the estimated result of the binary logistic regression model it can be observed that out of five independent variables included in the model three variables viz., area, education and employment status of the household head are found as the significant variable in determining multidimensional poverty status of the sample household. The area and the education of the household head are found at 1 percent level of significant and the employment status of the household is found significant at 5 percent level. The coefficient of the area is found to be 1.342 that means the probability of being poor is increased by the increase of household living in rural area. The exponential of the coefficient of the area indicates that keeping the other regressors as constant one percent increase of the household living in rural area increase the probability of being poor by 4.02 units. The result is found to be consistent with Deressa and Sharma (2015). They also found greater odd ratio which means positive correlation of probability of being poor.

The estimated coefficient of the education of the household head is significant at 1 percent level of significant. The value of the estimated coefficient of the education variable of the household head is -2.240. This negative value means that increase of education level of the household head reduce the probability of being multidimensionally poor by -2.240 units. . This result is consistent with Biyase and Zwane. They also found negative correlation of the variable education with probability of being multidimensional poor. The estimated coefficient found in the employment status is -.781. This negative value found in the employment status indicates that increase the employment status of the household head reduce the probability of being multidimensionally poor by -.781 units. This result is consistent with the findings of Majeed and Malik (2014) and Deressa and Sharma ((2015).

XII. Conclusion

This paper has estimates the multidimensional poverty in Tinsukia district of Assam, India using the Alkire and Foster methodology (2010). The selection of the dimensions and indicators both for rural and urban areas are same and followed the same indicators with some change in own justification, weight and cut-offs as in the Global MPI, The findings of the present study shows that 33 percent households in rural area and 17 percent in urban area in the district are multidimensional poor. Compared to rural area, in urban censored

headcount ratio, poverty gap and squared poverty ratio is found high. In the analysis of percentage contribution of each indicator to MPI, the difference occurs in nutrition indicator which is high in rural area compared to urban. And in urban, the indicator shows high contribution to MPI, is years of schooling. One important point that was observed in the study that households both in rural and urban are less asset poor but poor in nutrition, sanitation, water, housing floor. This means that both in rural and urban, expenditure on purchasing asset are high compared to other basic amenities of life. Regarding comparisons of income and multidimensional poverty, the result shows that in rural area only income poverty still play important role in determining multidimensional poverty status while in urban, less mismatch is found between the two measures of poverty. The result found in the present study shows that poverty reduction policy should focus on simultaneous use of both the income and multidimensional measurement of poverty to identify the poor for effective implementation of the programmes framed for poverty eradication. The analysis of the determinants of the multidimensional poverty of the household head also shows that education of the household head, employment status, living in rural area are correlated with probability of being poor.

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