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Poverty Status of Households and Child Malnutrition in Rural Population of Nigeria

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Abstract: Child malnutrition has been a cause for concern in Sub-Saharan Africa, so does poverty. Establishing the link between the two phenomena is however pertinent in achieving the key Sustainable Development Goals. The study examined the effects of household poverty on child nutrition in Rural Nigeria. National Demographic Health Survey (NDHS 2013) data sampled by National Bureau of Statistics (NBS) were used. Analytical tools adopted were: descriptive statistics, fuzzy set, body mass index (BMI) and multinomial logistic regression models. The multidimensional poverty index threshold was set at 30% with 81.85% of the entire rural households being poor. Also, 91% of the population of children, 5years and below was underweight. The regression analysis revealed that households' poverty had adverse effect on child nutrition. Poverty alleviation programs targeting the rural households need to be intensified in order to reduce household poverty, which would lead to the improvement of the nutrition of children.

Keywords: Multidimensional poverty, Malnutrition, Body mass Index, Fuzzy set, Multinomial logit, Rural Nigeria.

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1. Introduction

Despite significant variations, at spatiotemporal scales, to define poverty, in all forms it encompasses various dimensions of deficiencies in education, health and nutrition for humans (Loewe and Rippin, 2015). The Sustainable Development Goals 1 and 2 which are parts of blueprints in achieving a better and more sustainable future for all was designed to: end to poverty in all its manifestations; and end hunger, achieve food security and improved nutrition; and promote sustainable agriculture by 2030 (Agarwal, 2018; Ahmad et al., 2017; FAO, 2018; Minali et al., 2018; Nhemachena et al., 2018). Achieving this feat has been one of the greatest challenges facing humanity. Globally, 52% of the total population lives on less than $1.25 in a day in 1981, with the figure reduced to 17% in 2011 (Sharma et al, 2016). In Nigeria, 61.8% of the total populace is poor with 52% living under chronic poverty (NBS, 2010). Poverty is a multidimensional phenomenon. As reported by (World Bank, 2001), dearth of opportunity, empowerment and security are the several dimensions of poverty. Economic Prospect has been a mirage to the deprived, which resulted in their inability to provide for their basic nutritional requirement and basic needs. Absence of economic liberation and safety restricts the poor's options and increases their susceptibility to diseases. Poverty has been identified to be a rural menace, with majority of rural dwellers living below the poverty threshold (The World Bank, 1990). To achieve the Sustainable Development Goal (SDG) 1 of ending poverty in all its forms and everywhere by 2030 (Sach, 2012), poverty reduction strategies and programs must top the agenda of the government in the country.

Malnutrition on the other hand is inadequate, extreme or imbalance intake of food that are rich in energy and nutrients. (Smith and Haddad, 2000) observed the manifestation of malnutrition to be either under nutrition, over nutrition or micronutrients

malnutrition. In Sub-Saharan Africa, about 0.805 billion are affected by protracted hunger, with almost 2 billion suffering from micronutrient deficiencies (Sharma et al, 2016). Child malnutrition was regarded as major cause of sickness and death, which has resulted in more than 50 % of the children deaths worldwide (Cheah, et al. 2010). Without significant improvement in prevailing child malnutrition, it will not possible to achieve SDGs (Baye, 2017; Britto et al., 2017; Richter et al., 2017).

Malnutrition is a common denominator in Nigeria, with the rural population being the worst hit. This is however attributed to insufficient intake of food rich in nutrients (Babatunde et. al. 2007). This is however a big threat to achieving the Sustainable Development Goal (SDG) 2, of ending hunger; achieving food security and improved nutrition. (Ajieroh, 2010) reported that the proportion of children, 5 years and below that are stunted, underweight and wasted are 38%, 29% and 9.2% respectively. Related trend was also stated by The 2004 Food Consumption and Nutrition Survey, where 42%, 25% and 9% are stunted, underweight and wasted respectively. However, the children living in the rural areas are worst hit by the scourge of malnutrition relative to their urban counterpart.

It has long been recognized that poverty of households and infant malnutrition have debilitating influence on the wellbeing of children, which could reoccur to old age. Okunmadewa et al, (2010). Wight *et al*, 2014 established the link between poverty and food insecurity among children; (Arif, 2004) in his study established a correlation between poverty and malnutrition. Poverty was also identified as a likely determinant of malnutrition in infants through its outcome on the wellbeing of adults and their income (Chirwa and Ngalawa, 2008). Therefore, an empirical understanding of the effect of multidimensional household poverty on child nutrition is paramount if the menace of malnutrition in children is to be curtailed in Nigeria. The study aimed at determining the influence of household poverty on malnutrition in children among rural population in Nigeria.

Past studies have shown that the population of poor people is much more in agrarian areas compared to the metropolis (NBS, 2005). Also, majority of the past studies analyzed poverty using the income and expenditure (Borooah, et al., 2014), rather than the multidimensional approach. Establishing household poverty as a key determinant of child nutrition (Aheto et al., 2015; Akseer et al., 2018; Harris-Fry et al., 2017) is however imperative in this study. The study profiles household poverty across zones in the study area, so as to bring to fore zones that are prone to poverty (poorest of the poor) within the sector. Also, the use of multi-dimensional measure (which is more encompassing than the income/expenditure measure) of poverty would shed more light on the extent of well-being among respondents in Rural Nigeria.

Establishing the incidence of child nutritional status across zones in Rural Nigeria would reveal zone(s) that are more prone to the incidence of child malnutrition with the attendant formulation of zone specific policy measures to tackle the problem.

The explicit aims were to analyze the poverty status of rural populace in Nigeria, determine the nutritional categories of children in rural areas of Nigeria and examine the effects of household poverty on child nutrition in rural Nigeria. Examining the effect of household poverty on child nutrition would assist in revealing whether household poverty is a major constraint to child nutrition. This would inform policy makers in intensifying their poverty reduction strategies which would serve as a necessary condition in curbing child malnutrition in the country.

2. Materials and Methods

The area of focus is rural Nigeria. Secondary data accessed from the Nigeria Demographic Health Survey (NDHS, 2013), covering the entire six geopolitical zones of the country was used. **A** stratified three-stage cluster design was adopted to select 532 clusters in rural areas, of which 23,402 households were selected. However, 17,687 households' data were found useful for the analysis.

The first objective was evaluated using tables, frequencies distribution, central tendency measures and percentages. Multidimensional Poverty Index (MPI) was used to analyze the second objective, which is more robust and all-encompassing than the uni-dimensional (monetary) approach.

2.1. Multidimensional Poverty Index (MPI)

The MPI estimates acute global poverty (Alkire and Santos 2010; UNDP, 2010; Alkire et al., 2014). The constructed MPI was based on three dimensions: health, education, and standard of living, from within which eleven initial welfare indicators were carefully selected as guided by literatures (Oyekale and Okunmadewa, 2008; Alkire and Foster, 2010):

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Education:

- When five years of schooling is not accomplished.
- If a child of school age is out of school (child enrolment in school).

Health:

- Mortality: If at least one of children in the household is deceased

Living Standard:

- Households without electricity.
- Households without access to clean water within 30 minutes of walk from home.
- Households with no toilet or a shared toilet.
- Households living in dirty house, with sand or manure, materials on the floor of the house.
- Households that cook using wood, coal or manure.
- Households with no car or tractor and do not have at least two of the following items: radio, television, telephone, bicycle, or motorcycle.
- Material of the wall of the house

Households are regarded to be multidimensional poor if their poverty score surpasses a poverty threshold of 30% (UNDP, 2010).Fuzzy set was used to analyze the multidimensional poverty. It involved constructing an index from array of items that could be linked to poverty (attributes of poverty). Costa (2002), citing Dagum and Costa (2002), gives an exposition of the methodological framework of fuzzy set theory. Given population A of households, A = {a_1, a_2, ..., a_n}, the subgroup of poor households B comprises any household $a_1 \in B$ which exhibits some degree of poverty in at least one of the m attributes of X. The degree of involvement to the fuzzy set B of the i-th household (i=1,…, n) with respect to the j-th attribute (j=1,…, m) is defined as

$$\mu_B\left(X_1(a_1)\right) = x_{ij}, \qquad 0 \le x_{ij} \le 1 \quad [1]$$

x_{ij}= 1, when i-th household does not own the j-th attribute and x_{ij}= 0, when i-th household own the j-th attribute.

The multidimensional poverty ratio of the i-th household $\mu_B(a_i)$, i.e the extent of poverty of the i-th household as a weighing function of the m attributes, is expressed as the weighted average of x_{ij},

$$\mu_B(a_i) = \sum_{j=1}^{m} x_{ij}\, w_j \Big/ \sum_{j=1}^{m} w_j \quad [2]$$

Where w_j is the weight attached to the j-th attribute.

The weight w_j attached to the j-th attribute represents the extent of deprivation of X_j. As reported by Cerioli and Zani (1990), represented with the following expression:

$$w_j = log\left[n \Big/ \sum_{i=1}^{n} x_{ij}\, n_j\right] \geq 0 \quad [3]$$

The multidimensional poverty share of the population μ_B is obtained as a weighted mean of the poverty ratio of the i-th household $\mu_B(a_1)$.

$$\mu_B = \sum_{i=1}^{n} \mu_B(a_i)\, n_i \Big/ \sum_{i=1}^{n} n_i \quad [4]$$

Fuzzy set framework also allows obtaining one-dimensional poverty ratio for each of the j attributes. This is the weighted average of x_{ij} with weight n_i.

$$\mu_B(X_j) = \sum_{i=1}^{n} x_{ij}\, n_i \Big/ \sum_{i=1}^{n} n_i \quad [5]$$

It is also possible to obtain the multidimensional poverty proportion of the population μ_B as the weighted average of $\mu_B(X_j)$ (unidimensional poverty ratio of the atttibutes), with weight w_j.

$$\mu_B = \sum_{i=1}^{n} \mu_B(a_i)\, n_i \Big/ \sum_{i=1}^{n} n_i = \sum_{j=1}^{m} \mu_B(X_j)\, w_j \Big/ \sum_{j=1}^{m} w_j \quad [6]$$

2.2. Analysis of Child Anthropometric Indicators

In analyzing child nutritional status (objective 3), Body Mass Index (BMI) was used to quantify the variation in health and nutrition status. Body Mass Index is a good analytical measure of nutrition at population level; and also an alternate measure of adiposity, which has no relationship with age, gender and ethnicity (Scrimshaw, 2003; World Health Organization, 2010). Body mass index (BMI) was calculated as weight (kg) divided by height (m^2). The classification is into three groups as highlighted by the World Health Organization. Individuals are regarded to be chronically energy deficient if they have BMI below 18.5, overweight if the BMI is greater than 25 and obese if it is greater than 30.

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3.3. Multinomial Logistic Regression Model Techniques

In analyzing objective four however, Multinomial Logistic Regression Model was adopted. The model as specified by (Greene, 2000) is as follows:

$$Y_1 = \alpha_0 + \beta_1 X_1 + \beta 2 X_2 + \ldots\ldots \beta nXn + e_i$$
$$Y_2 = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots \beta nXn + e_i$$
$$Y_3 = \alpha_2 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots \beta nXn + e_i$$
$$Y_4 = \alpha_3 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots \beta nXn + e_i$$

Where, Y_i represents various nutritional statuses

Source:

Y_1= scores for underweight children; Y_2= scores for normal children; Y_3= scores for overweight children; Y_4 = scores for Obese children; β_1- β_n are the vectors of parameters to be estimated.

X_1- X_n are the explanatory variables

*e*i is the independently distributed error term.

Explanatory variables (X_i) are:

X_1= respondents' age (years)

X_2 household head's gender (male =1; female = 0)

X_3= Sex of child (male =1; female =0)

X_4= No of under 5 children

X_5= Mothers education (years)

X_6=household head's Educational attainment (yrs)

X_7= North central

X_8= Northeast

X_9= South east

X_{10} = South-south

X_{11} = South west

X_{12} = Poverty index

3. Results and Discussion

As revealed in Table 1, the mean age of households head in rural Nigeria is 41.22 years, indicating that majority of the respondents are in the energetic and industrious age group**.** About 91% of the households are headed by male; while a significant portion of the rural population (58.40%) are illiterates. The literacy level might go a long way in influencing the household poverty status as well as the level of child malnutrition in rural Nigeria. Moreover, about 63% of the entire rural households have 0-2 number of children that are 5 years and below as members of the households, while the ratio of male to female children that are less than 5 years is almost at par.

Table 1. Socio-economic Characteristics of the Respondents.

Variables	Frequency	Percentage
Age		
<40	10201	57.67
41-60	6262	35.41
>60	1224	6.92
Mean	41.22	
Gender of household head		
Male	16134	91.22
Female	1553	8.78
Children 5 years and below		
0-2	11,096	62.73
3-5	6,233	35.24
>5	358	2.03
Sex of Children		
Male	8,920	50.43
Female	8,767	49.57
Educational Level of Household head		
No formal Education	10,329	58.4
Primary	3,583	20.26
Secondary	3,385	19.14
Tertiary	390	2.2

It is expected that higher amount of children, residing in a particular household would also increase the likelihood of such family having malnourished children. Based on the poverty status of rural households, that is, their level of welfare deprivation, about 82% of rural households are poor, with north-eastern households recording the highest welfare deprivation (95.87%) as shown in Table 2. This might not be unconnected with the restiveness and insecurity being witnessed in this zone.

Table 2. Multidimensional poverty distribution of Households across zones

Region	Poor HH/%	Non-poor HH/%	Total
North Central	2215 (79.0%)	596 (21%)	2811
North East	3988 (94.7%)	225 (5.34%)	4213
North West	6287(95.9%)	271(4.13%)	6558
South East	250 (30.5%)	570 (69.51%)	820
South-south	1114 (50.0%)	1116 (50%)	2230
South West	623 (59.0%)	432 (41.0%)	1055
Total	14477 (81.8%)	3210 (18.1%)	**17687**

Table 3. BMI distribution of children

BMI categories	Frequency	Percentage
Underweight	15,937	90.11
Normal	1,436	8.12
Overweight	148	0.84
Obese	166	0.94
Total	17,687	100

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Table 4. Factors Affecting Child Malnutrition in Rural Nigeria (Underweight category)

Variables	Rrr	Z
Household head age(years)	1.012718	1.83*
Sex of household head	1.802512	1.75*
Sex of child	0.9138201	-0.58
No of under 5 children	1.231671	2.73***
Mothers education	1.009498	0.2
Educational attainment	0.7877837	-1.46
North central	1.772036	2.25**
North east	1.70911	4.33***
South east	1.080173	0.71
South-south	1.043706	0.73
South west	1.209122	2.37**
Poverty index	3.982493	2.04**
Constant	39.00495	5.80***

Table 5. Factors Affecting Child Malnutrition (Normal Category)

Variables	Rrr	Z
Household head age (years)	1.007489	1.03
Sex of household head	1.544572	1.23
Sex of child	0.7944161	-1.4
No of under 5 children	1.11568	1.38
Mothers education	0.9916004	-0.16
Educational attainment	0.8414086	-0.96
North central	0.7788381	-0.93
North east	1.322369	2.18**
South east	0.8147162	-1.72*
South-south	0.9252383	-1.25
South west	1.056799	0.66
Poverty index	0.4737051	-1.83*
Constant	9.293432	3.36***

These findings are in consonance with results reported by Garcia et al. (2006), which identified poverty as the main challenge of households in Nigeria. Ashagidigbi et al., (2013) also reported that per capita expenditure of households on food and non-food items in rural Nigeria was much lower.

The distribution of children (Table 3), across zones based on their Body Mass Index (BMI) revealed that more than 90% of the total populations of children (≤ 5 years) in rural Nigeria are underweight, while 8% are normal. This shows the level of health deprivation and nutritional deficiency of children in rural Nigeria, with the probable cause being high poverty level in the divide. These findings support results of earlier report (Das, 2017) who found out that more than half of the children are living in relatively less developed districts in India are chronically malnourished. Determinants of child malnutrition in rural Nigeria are categorized in underweight, normal and overweight categories (Table 4). Obese category was used as the base outcome. The chi^2 (317.55) and log (-6590.3) values signify that the model is significant (1% probability).

The Relative Risk ratio (RRR) used in explaining the Mutinomial logit regression model is also called the odd ratio. It shows by what magnitude would the number of children that are 5 years and below in each category change, if the independent variables changed by a unit. RRR coefficient higher than unity signifies positive relationship between the dependent and the explanatory variables, while coefficient less than 1 connotes negative relationship. The significant variables influencing the underweight children include household head's age and sex at 10 %. North-central and poverty index are significant at 5 %.

The significant variables at 1 % include; number of children under 5 years, north-east and north-west zones. A year increase in the age of head the household increases the likelihood of a child being in underweight category by 1.0127. This implies those households headed by the aged usually have children that are underweight. Likewise, male headed household increases the probability of a child falling into underweight category by 1.8002. By implication, underweight children are usually more in male headed households relative to the base category. The findings is in conformity with that of Cheriyen and Chirayath, (1999) that confirms age, gender and educational level of households head as factors determining child malnutrition.

A unit increase in number of children (5 years or below) in a particular household increases the likelihood of a child in such household being in underweight group; Implying that higher percentage of children tend to be underweight if the population of children that are 5 years and below is high. This is in consonance with the findings of (Rashad and Sharaf, 2018) which stated that birth interval of children under 5 years heightens child malnutrition.

The probability of a child to fall into underweight category is increased by 1.7720, 1.7091 and 1.2091 for households residing in North-central, north-eastern and south-western zones respectively, compared to the north-west zone. This implies that underweight children are more in these zones compared to north-western zone. A unit increase in poverty index increases the probability that a child will be underweight by 3.9824.

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Table 6. Factors Affecting Child Malnutrition (Overweight Category)

Variables	RRR	Z
Household head age (years)	1.008691	0.89
Sex of household head	1.248705	0.45
Sex of child	0.8352859	-0.79
No of under 5 children	0.9298764	-0.66
Mothers education	0.9316648	-0.4
Educational attainment	1.035669	0.06
North central	0.7413736	-0.78
North east	1.138624	0.77
South east	0.9095123	-1.76*
South-south	0.9792029	-0.25
South west	0.7693047	-1.4
Poverty index	0.4512474	-1.42
Constant	1.744127	0.61

Deprived families have higher likelihood to have more children that are malnourished than the base category. This supports the findings of earlier reports (Sununtar, 2005; Kazeem and Musalia, 2018), which revealed that malnutrition is caused by indicators of poverty such as food insecurity, lack of potable water, poor hygiene and health services; gender inequality and lack of alternative source of income.

As shown in Table 5, North-east is significant at 5% level of probability, while south-east and poverty index are significant at 10 % respectively, under the normal category. The probability that a child will fall into normal category is increased by 1, 3223 for north-eastern households and reduced by 0.8147 for south-eastern households, relative to the base category (north-western residents). However, a unit increase in poverty index reduces the likelihood that a child will be in normal category by 0.4737. This is an indication that poor families have fewer children in the normal category relative to the rich households, thus emphasizing the role of household poverty in adversely influencing child nutrition in rural Nigeria. This is in consonance with the findings of NBS (2010), where food insecurity tends to rise with households' poverty. Also, underweight population of children in Nigeria has been on the increase from 18 % (2007) to 29 % (2013). South-east zone is only significant variable at 10 % level (Table 6). The probability that a child will be in the obese category is reduced by 0.9095, for respondents residing in the South-east. Thus, revealing that children that are obese are fewer in number in this zone relative to the base category (North-west).

4. Conclusion

The study revealed high prevalence of poor households in rural divide of Nigeria, most especially in the North-west zone. Also, child malnutrition is highly prevalent in the agrarian areas of the country. However, household poverty has been identified as the significant determinant of child malnutrition. Therefore, to drastically reduce the level of child malnutrition in Nigeria (sustainable development goal 2), policy options geared towards households' poverty reduction should be of primary focus. Based on results it is recommended that there should be a poverty reduction policy option that will improve and enhance the access of rural households to basic infrastructural amenities (welfare indicators) in order to improve their poverty status, most especially in the northern divide of rural Nigeria. In ensuring a drastic reduction in child malnutrition, it is pertinent that welfare status of households needed to be improved upon to ensure that children in rural Nigeria maintain a healthy nutritional status as it has been observed that households' welfare deprivation is the main cause of child malnutrition.

List of Abbreviations: BMI, body mass index; MPI, multidimensional poverty index; NBS, National Bureau of Statistics; NDHS, National Demographic Health Survey.

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