

Spatial Assessment of Multidimensional Poverty in Rural Nigeria

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Abstract: Poverty is not only an economic development challenge in Nigeria but an unacceptable violation of people's fundamental rights. Several studies had proposed the desirability of multidimensional poverty measurement over the unidimensional approach in order to have a broader overview of the distribution of welfare. This study therefore assessed the spatial distribution of multidimensional poverty focusing on the Nigerian states. The data were the Core Welfare Indicator Questionnaire (CWIQ) that were collected in 2006 using well-structured questionnaires from 59567 rural households. Descriptive statistics and fuzzy set decomposition approaches were used for data analysis. Results show that many of the states in the northern part of the country had the highest percentage of those with no education. Average multidimensional fuzzy poverty index was 0.3796. Also, housing/sanitation and economic condition/security are the main factor that contributed to poverty across the states. It was concluded that in order to implement socio-economic policies to reduced poverty diffusion, economic reforms should be directed towards education, improving housing/sanitation and economic/security conditions.

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1. Introduction

The evolution of the meaning and measurement of poverty has been closely entwined with the evolution of development economics and its relationship with development studies (Sumner, 2004). No doubt, poverty means different things to different people. Some people will define poverty as the absence of a car or fridge, while for others it will be the lack of formal education, housing or employment. If one were to consult the Oxford English dictionary (1989), one would find six definitions of poverty. Poverty, and being poor, are described by expressions such as "deficiency in", "lacking of", "scantiness", "inferiority", "want of", "leanness or feebleness", and many more. Experiences of poverty differ from person to person, from one area to another, and across time.

The original meaning of poverty implies deprivation of something that is essential or desired. The concept of poverty varies depending on the recognized values. In one extreme, it is found that the most absolute forms of poverty are starvation or death from lack of shelter. On the other side, poverty extends continuously towards a fuzzy limit. It also varies with the wealth of societies as well as with the passage of time (Baran et al 1999). Poverty appears as a multidimensional phenomenon, closely associated with the concept of exclusion. The poverty state is then, rather a continuum than a classical set or point on a scale of absolute values. It is defined with respect to a variety of quantitative and qualitative

criteria that may change with societies and cultures. Poverty notion involves, above all, a comparative concept that refers to a relative quality. That is why there is no consensus on an absolute definition of poverty, even though attempts have been made by many including Valentine 1992.

When talking about poverty it is important to note that with material deprivation, there are other kinds of deprivation(s) in variable combinations, from one society to another. At present, it is admitted that poor people are underprivileged in several other important fields such as education, occupation and political ones, among others (Valentine 1992).

Amaghionyeodiwe and Osinubi (2004) submitted that poverty is not only a term that is commonly used by the generality of the people but also one that has no specialized content as a concept. Besides, it is a multi-dimensional socioeconomic and cultural situation that transcends economic description and analysis. In addition, poverty is both concrete and relative. For any particular society, poverty and the poor are very concrete phenomena and can be easily identified. Yet it is also relative: the population that may be classified as poor in a developed economy would be regarded as materially well off in least developed countries.

Perceptions of poverty have not only evolved historically, but also vary tremendously from culture to culture. The criteria for distinguishing the poor from the non-poor tend to reflect national normative concepts and priorities. As countries

become wealthier, their perceptions of acceptable deprivations change. Being multidimensional, poverty takes different forms or typologies of which three broad ones can be identified as follows: physiological deprivation, social deprivation and human freedom deprivation.

Poverty line is very important in understanding the living condition of the poor and has great impact on policy decisions. There is no consensus in the definition of poverty line. Sen (1983) points out an irreducible core in the idea of poverty that is absolute. However, some people may be much less deprived with a given amount of attributes while some others are much more deprived, this justifies relative poverty line. In multidimensional approach, poverty line is established for each attribute and these are determined independently of the distribution. It has been argued that absolute poverty line is more viable in multidimensional analysis, because relative poverty line becomes essentially ambiguous in some dimensions. However, a multidimensional approach opens the possibility to express attributes in a relative or absolute way depending on the nature of good under consideration.

The issue of poverty in many developing countries is a very crucial one going by its intensity, incidence and severity. In Nigeria, poverty analyses had been extensively done with the food energy intake (FEI) and cost of basic needs (CBN) approaches (Aigbokhan, 2000). However, it had been observed that poverty in Nigeria has both income and non-income dimensions. Specifically, the poor are those who are unable to obtain adequate income, find stable jobs, lack adequate level of education, unable to satisfy their basic health needs, have no or limited access to food, clothing, decent shelter, have few economic assets, and sometimes lack self-esteem (Aluko, 1975; World Bank, 1995; Olayemi, 1995; Sancho, 1996).

Ayoola *et al* (2000) used focused group discussions to determine households' perception of poverty and wealth in some Nigerian rural and urban areas. It was found that in urban areas, the rich were perceived to have money and live in beautiful, cemented houses with boreholes or tap water. They eat good food, wear good clothes, have access to medical services and are healthy. Similar views were held for rural areas. Also, the rich were described as people with opportunities, both for themselves and their children. The urban rich achieve a good quality of life by having successful businesses and owning land and property. They are able to educate their children in private institution, who then in turn become successful. In rural areas, being rich could be described in terms of ownership of land and

productive capital inputs such as fertilizer, and access to markets.

Most of the works done on poverty in Nigeria have looked at the various welfare indicators such as access to water, healthcare facilities, housing etc (Ayoola *et al*, 2000; NPC and ORC Macro, 2004). But not much has been done in computing multidimensional poverty index from these indicators. Also, there have not been many studies on poverty response along side with multidimensional indicators of welfare and some implemented development programs. This study therefore seeks to determine those welfare variables that significantly influence poverty status of the household. Also, it looks at the effects of households' welfare on poverty reduction interventions. This study adopts the methodology developed by Dagum and Costa (2004), supplemented with the decomposition methods of Mussard and Pi Alperin (2005) which is an alternative for measuring poverty in Guinea for the years 2002-2003.

In the past few decades, the measurement and assessment of poverty has been one of the top priorities in international discussions. This is necessary in order to generate relevant and accurate for a timely analysis of the nature and causes of persistent poverty for policy implementation (Barrett, 2004). This paper therefore applies the fuzzy set approach to provide a spatial multidimensional poverty profile for Nigeria. In the remaining part of the paper, the methodology, results and discussions and conclusions have been provided.

2. Materials and Methods

Nigeria is one of the Sub-Sahara African (SSA) nations located in the western part of Africa and borders Niger in the north, Chad in the northeast, Cameroon in the east, and Benin in the west. To the south, Nigeria is bordered by approximately 800 kilometres of the Atlantic Ocean, stretching from Badagry in the west to the Rio del Rey in the east. It lies between 4°16' and 13°53' north latitude and between 2°40' and 14°41' east longitude.

Nigeria is made up of 36 states and a Federal Capital Territory (FCT), which are grouped into six geopolitical zones (North-Central, North-East, North-West, South-East, South-South, and South-West) as shown in figure 4.1. There are also 774 constitutionally recognized Local government Areas (LGAs) in the country. Within the boundaries of Nigeria are many social groups with distinct cultural traits, which are reflected in the diverse behaviour of the people. There are about 374 identifiable ethnic groups, but the Ibo, Hausa, and Yoruba are the major groups.

The data and Sampling procedures

The study used data collected during the 2006 National Core Welfare Indicator Questionnaire (CWIQ) Survey by the National Bureau of Statistics (NBS) 2006. According to NBS (2006), atwo-stage cluster sample design was adopted in each LGA. The first stage involves the Enumeration Areas (EAs), while Housing Units (HUs) constitute the 2nd stage. The National Population Commission (NPopC) EAs as demarcated during the 1991 Population Census served as the sampling frame for the selection of 1st stage sample units. In each LGA, a systematic selection of 10 EAs was made. Prior to the second stage selection, complete listing of Housing Units (and of Households within Housing Units) was carried out in each of the selected 1st stage units. These lists provided the frames for the second stage selection. Ten (10) HUs were then systematically selected per EA and all households in the selected HUs were interviewed. The projected sample size was 100 HUs at the LGA level. The sample size using other defined reporting domains (FC, senatorial, state and geo-political zone) varied, depending on the number of the LGAs that made the reporting domain. Overall, 77,400 HUs were drawn at the national level out of which 59567 were from the rural areas. Also, sampling weights were constructed for each sample, thus making the data representative of the entire population in Nigeria.

*Analytical Techniques**Descriptive analysis*

The descriptive statistics that were used for this study include frequency distribution, histogram and measure of central tendency and dispersion. The measure of central tendency and dispersion used include mean, standard deviation and coefficient of variation.

Analyses of Variance (ANOVA)

The ANOVA method was used to test for significant differences in the group means of multidimensional poverty ratios computed across some socio-economic and regional variables (hypothesis 1). This was done by computing the F-ratio, which measures the ratio of systematic variations to unsystematic variations. The homogeneity test of variance test was done using the Levene's test. When this was broken, the computed F-ratios based on the Brown-Forsythe (1974) and the Welch (1951) approaches were used (Field, 2005).

Computation of Multidimensional Poverty Indices

Indices of multidimensional poverty were computed using the Fuzzy Set theory originally developed by Zadeh (1965). Zadeh (1965) characterized a fuzzy set as a class with a continuum of grades of membership. Therefore, in a population A of n households $[A = a_1, a_2, a_3, \dots, a_n]$, the subset

of poor households B includes any household $a_i \in B$. These households present some degree of poverty in some of the m poverty attributes (X).

The multidimensional poverty ratio of a household, $\mu_B(a_i)$, which shows the level of welfare deprivation and membership to set B is defined as the weighted average of x_{ij} ,

$$\mu_B(a_i) = \sum_{j=1}^m x_{ij} w_j / \sum_{j=1}^m w_j \quad 1$$

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

The intensity of deprivation with respect to X_j is measured by the weight w_j . It is an inverse function of the degree of deprivation and the smaller the number of households and the amount of their deprivation, the greater the weight. In practice, a weight that fulfils the above property had been proposed by Cerioli and Zani (1990). This can be expressed as:

$$w_j = \log \left[\frac{\sum_{i=1}^n g(a_i)}{\sum_{i=1}^n x_{ij} g(a_i)} \right] \geq 0 \quad 2$$

Ideally, $g(a_i) / \sum_{i=1}^n g(a_i) > 0$ and $g(a_i) / \sum_{i=1}^n g(a_i)$ is

the relative frequency represented by the sample observation a_i in the total population. Therefore when $x_{ij}=0$, the welfare attribute should be removed.

Sub-group decomposition

From (4.2), the dimension that tends to increase the level of poverty of each household can be determined by decomposing the household poverty index:

$$\mu_B(a_i) = \sum_{j=1}^m y_{ij} \quad 3$$

where y_{ij} is the contribution of the j-th attribute to the overall amount of the household poverty index $\mu_B(a_i)$:

$$y_{ij} = x_{ij} w_j / \sum_{j=1}^m w_j \quad 4$$

Following Mussard and Pi Alperin (2005) it is possible to decompose multidimensional poverty indices by sub-population. Suppose the total economic surface is divided into K groups, S_k , of size n_k ($k=1, \dots, K$). The intensity of poverty of the i-th household of S_k is given as:

$$\mu_B(a_i^k) = \frac{\sum_{j=1}^m x_{ij}^k w_j}{\sum_{j=1}^m w_j} \quad 5$$

Where χ_{ij}^k is the degree of membership related to the fuzzy sub-set B of the i-th household ($i=1, \dots, n$) of S_k with respect to the j-th attribute ($j=1, \dots, m$). Hence, the fuzzy poverty index associated with group S_k is:

$$\mu_B^k = \frac{\sum_{i=1}^{nk} \mu_B(a_i^k) g(a_i^k)}{\sum_{i=1}^{nk} g(a_i^k)} \tag{6}$$

Following equation (6), the overall poverty index can be computed as a weighted average of the poverty within each group:

$$\mu_B = \frac{\sum_{k=1}^k \sum_{i=1}^{nk} \mu_B(a_i^k) g(a_i^k)}{\sum_{i=1}^n g(a_i)} \tag{7}$$

Thus, the contribution of the k-th group to the global index of poverty is:

$$C_{\mu_B}^k = \frac{\sum_{i=1}^{nk} \mu_B(a_i^k) g(a_i^k)}{\sum_{i=1}^n g(a_i)} \tag{8}$$

In order to know the contribution of the welfare attribute, the multidimensional poverty indices was decomposed based on the contributions of each welfare attribute. The poverty ratio of the population μ_B is simply obtained as a weighted average of the poverty ratio of the i-th household $\mu_B(a_i)$

$$\mu_B = \sum_{i=1}^n \mu_B(a_i) g(a_i) / \sum_{i=1}^n g(a_i). \tag{9}$$

Similarly,

$$\mu_B(X_j) = \sum_{i=1}^n x_{ij} g(a_i) / \sum_{i=1}^n g(a_i) \tag{10}$$

In this way it is possible to decompose the multidimensional poverty ratio of the population μ_B as the weighted average of $\mu_B(X_j)$, with weight w_j .

$$\mu_B = \sum_{i=1}^n \mu_B(a_i) g(a_i) / \sum_{i=1}^n g(a_i) = \sum_{j=1}^m \mu_B(X_j) w_j / \sum_{j=1}^m w_j \tag{11}$$

3. Results and Discussions

Descriptive analysis of respondents' socio-economic characteristics

Table 1 presents the socio-economic characteristics of the respondents across the gender of household heads and marital status. It reveals that northern/middle belt states had highest proportions of their respondents being males. Specifically, Kebbi, Bauchi, Niger, Kano, Sokoto and Zamfara states had highest values of 99.54 percent, 98.91 percent, 98.71 percent, 98.69 percent, 98.58 percent and 98.54 percent respectively. This can be attributed to religious practices whereby in predominantly Islamic society of the northern Nigeria, women are sometimes forbidden from showing their faces in public places. Therefore, women are kept indoor and are only able to interact within the house.

The table also shows that based on marital status, respondents from northern states had highest proportions being married as monogamy and polygamy. Polygamous respondents from Katsina, Zamfara, Kebbi, Kano, Jigawa and Gombe states accounted for 38.62 percent, 38.23 percent, 36.42 percent, 35.32 percent, 34.20 percent and 29.78 percent, respectively. However, monogamous respondents from Plateau, Sokoto, Bauchi, Norno Niger and Taraba states constituted 73.88 percent, 73.47 percent, 67.14 percent, 67.13 percent, 66.89 percent and 65.74 percent respectively. Enugu and Abia states have highest proportions of their respondents.

Table 1: Percentage distributions of rural households' heads gender and marital status across the Nigerian States

States	Male (%)	Female (%)	Single	Mono-gamous	Poly-gamous	Informal	Widowed, divorce, separated	Total Freq
Abia	71.40	28.60	5.69	59.50	5.25	0.22	29.34	1353
Adamawa	93.60	6.40	6.15	64.41	20.87	0.00	8.57	1610
Akwa Ibom	77.38	22.62	9.49	61.31	5.07	0.79	23.34	2781
Anambra	74.10	25.90	4.94	65.50	4.86	0.00	24.70	1255
Bauchi	98.91	1.09	1.58	67.14	28.55	0.00	2.73	1832
Bayelsa	77.13	22.87	9.60	48.02	22.41	5.03	14.94	656
Benue	91.29	8.71	10.64	61.60	16.07	0.14	11.55	2078
Borno	95.47	4.53	3.24	67.13	21.54	0.00	8.09	2163
Cross River	76.71	23.29	13.04	56.89	7.07	3.39	19.60	1357
Delta	70.59	29.41	9.47	52.09	9.79	4.55	24.12	1870
Ebonyi	76.39	23.61	5.76	55.61	13.17	0.39	25.07	1025
Edo	76.60	23.40	9.66	53.28	12.91	1.74	22.42	1325
Ekiti	75.81	24.19	5.90	55.96	12.88	1.20	24.07	831
Enugu	71.11	28.89	3.91	58.84	6.49	0.27	30.49	1125
Gombe	98.53	1.47	5.66	61.27	29.78	0.00	3.28	883
Imo	76.29	23.71	6.88	64.02	3.48	0.09	25.54	2240
Jigawa	97.55	2.45	1.46	60.69	34.20	0.00	3.64	2526

Kaduna	97.42	2.58	4.22	64.50	28.16	0.00	3.11	1896
Kano	98.69	1.31	1.93	60.19	35.32	0.00	2.56	3828
Katsina	98.11	1.89	1.42	57.59	38.62	0.00	2.37	2957
Kebbi	99.54	0.46	0.40	62.14	36.42	0.00	1.04	1738
Kogi	77.64	22.36	11.11	55.76	12.88	0.68	19.56	1467
Kwara	80.26	19.74	6.67	53.47	22.30	0.00	17.55	1094
Lagos	87.23	12.77	6.38	62.31	16.41	0.00	14.89	329
Nasarawa	97.35	2.65	9.76	60.50	25.53	0.08	4.14	1281
Niger	98.74	1.26	3.21	66.89	26.48	0.00	3.42	1903
Ogun	75.40	24.60	7.34	48.46	15.60	0.42	28.19	1199
Ondo	78.38	21.62	8.66	49.17	14.69	2.15	25.33	1212
Osun	73.45	26.55	6.13	46.89	24.33	0.18	22.47	2203
Oyo	85.72	14.28	9.35	59.79	14.55	0.22	16.08	1828
Plateau	95.04	4.96	6.69	73.88	12.75	0.00	6.69	1271
River	77.41	22.59	12.94	57.94	5.87	4.13	19.11	1669
Sokoto	98.58	1.42	1.52	73.47	23.28	0.00	1.73	1907
Taraba	96.75	3.25	11.09	65.74	17.36	0.30	5.51	1325
Yobe	97.90	2.10	2.77	64.12	29.24	0.00	3.87	1190
Zamfara	98.54	1.46	1.30	58.52	38.23	0.08	1.87	1232
FCT	96.00	4.00	14.57	62.86	18.57	0.00	4.00	350
Total	87.72	12.28	5.92	60.31	20.43	0.61	12.73	58789

Source: Author's computation from the 2006 CWIQ data.

Table 2 shows the distribution of respondents based on occupation. As expected of typical rural Nigerian areas, agriculture and self employment dominate the occupational distributions. The table shows that the percentages of the respondents from Benue, Ebonyi, Zamfara, Niger,

Katsina, Kebbi and Edo states in agriculture were 76.13, 72.59, 69.32, 62.50, 61.62 and 60.30 respectively. However, Bayelsa, Bauchi, Yobe, Gombe and Zamfara states have their proportions of unemployed household heads being highest and higher than 3 percent.

Table 2: Percentage distribution of rural respondents across the employment groups in Nigerian States

States	None	Public	Private formal	Private informal	Self agriculture	Self others	Unemployed	Others	Total Freq
Abia	2.07	7.46	3.10	2.07	49.45	23.58	0.52	11.75	1353
Adamawa	6.77	9.32	0.93	1.68	45.71	10.06	2.30	23.23	1610
Akwa Ibom	3.60	10.82	3.16	4.31	32.11	38.48	1.58	5.93	2781
Anambra	3.51	4.62	3.11	3.43	43.59	28.53	1.27	11.95	1255
Bauchi	3.00	6.60	0.71	3.66	36.24	30.29	3.33	16.16	1832
Bayelsa	4.57	19.05	2.29	1.98	24.70	36.74	3.35	7.32	656
Benue	3.13	7.75	0.82	0.63	76.13	5.10	0.82	5.63	2078
Borno	4.67	5.83	0.83	3.47	57.70	13.41	0.18	13.92	2163
Cross River	2.36	14.52	2.58	1.47	59.91	14.15	0.44	4.57	1357
Delta	3.74	9.04	3.74	5.72	36.31	29.63	2.51	9.30	1870
Ebonyi	3.41	6.44	0.68	0.98	72.59	11.71	0.10	4.10	1025
Edo	4.91	5.74	1.51	0.83	60.30	17.36	1.13	8.23	1325
Ekiti	3.01	11.43	1.81	1.56	51.99	21.54	0.36	8.30	831
Enugu	1.87	9.51	0.89	3.20	56.09	18.31	0.18	9.96	1125
Gombe	2.83	4.64	0.23	4.08	52.10	17.67	3.06	15.40	883
Imo	4.87	6.03	3.08	2.14	38.39	31.29	0.85	13.35	2240
Jigawa	2.81	7.44	0.24	2.73	50.87	17.81	0.44	17.66	2526
Kaduna	5.91	12.97	1.21	1.58	48.52	21.36	0.26	8.18	1896
Kano	2.80	7.55	1.15	1.99	49.63	30.33	1.20	5.36	3828
Katsina	3.35	4.57	0.24	4.87	62.50	15.42	2.03	7.03	2957
Kebbi	3.05	6.96	0.23	7.77	61.62	15.65	1.38	3.34	1738
Kogi	2.39	12.07	2.52	1.02	48.33	21.75	0.68	11.25	1467
Kwara	4.20	11.43	1.83	1.19	44.33	27.51	1.10	8.41	1094
Lagos	2.13	17.63	6.38	1.22	13.37	46.81	1.22	11.25	329
Nasarawa	2.50	16.86	1.09	7.34	45.04	14.13	3.04	9.99	1281
Niger	3.15	10.67	0.95	4.78	64.06	11.25	0.26	4.89	1903
Ogun	3.75	5.09	1.17	1.00	56.55	25.02	0.33	7.09	1199
Ondo	2.48	8.09	1.98	2.39	51.90	25.83	0.74	6.60	1212
Osun	2.91	7.26	2.41	2.00	37.59	36.36	0.50	10.99	2203
Oyo	3.01	5.14	1.75	2.68	51.75	28.67	0.71	6.29	1828
Plateau	2.05	9.21	1.65	1.57	60.11	8.18	1.26	15.97	1271
River	5.15	14.80	6.47	8.75	28.28	27.80	2.16	6.59	1669
Sokoto	3.36	6.35	0.31	6.24	58.57	15.15	1.52	8.50	1907

Taraba	6.11	13.81	0.75	5.81	53.36	13.43	0.91	5.81	1325
Yobe	11.09	5.88	0.08	8.24	32.27	17.65	3.11	21.68	1190
Zamfara	4.46	4.38	0.24	2.84	69.32	9.17	0.16	9.42	1232
FCT	2.57	18.00	6.86	0.29	51.43	13.43	0.00	7.43	350
Total	3.71	8.60	1.64	3.35	50.24	21.59	1.21	9.65	58789

Source: Author's computation from the 2006 CWIQ data.

Table 3 shows the distribution of the respondents across educational levels. It reveals that states with high proportions of household heads with no education were Yobe (90.25 percent), Kebbi (90.16 percent), Sokoto (89.09 percent), Zamfara

(86.77 percent), Borno (83.59 percent) and Katsina (80.72 percent). These are all in northern Nigeria. Akwa Ibom, Lagos, Imo, Rivers and Cross River states have the lowest proportions of their household heads not having formal education.

Table 3: Frequency distribution of rural house heads' educational levels across the Nigerian States

States	None	Some primary	Completed primary	Some secondary	Completed secondary	Post secondary	Total Freq
Abia	30.52	9.61	31.86	5.25	14.63	8.13	1353
Adamawa	56.71	2.55	10.43	6.52	14.91	8.88	1610
Akwa Ibom	24.02	13.30	31.64	7.08	13.56	10.39	2781
Anambra	31.16	11.87	37.93	4.62	8.61	5.82	1255
Bauchi	72.93	1.53	10.75	2.78	7.21	4.80	1832
Bayelsa	30.64	4.12	16.31	7.93	27.29	13.72	656
Benue	37.54	4.28	19.35	7.84	21.03	9.96	2078
Borno	83.59	0.74	4.95	0.88	5.18	4.67	2163
Cross River	29.85	8.99	25.94	8.25	14.66	12.31	1357
Delta	33.37	4.76	20.80	9.47	19.84	11.76	1870
Ebonyi	55.51	7.90	20.29	2.54	7.12	6.63	1025
Edo	36.15	3.02	22.04	5.89	24.08	8.83	1325
Ekiti	44.77	3.37	17.21	4.33	13.84	16.49	831
Enugu	49.60	7.73	28.44	2.22	5.51	6.49	1125
Gombe	76.10	1.81	10.08	2.49	4.53	4.98	883
Imo	28.62	12.32	32.72	3.66	13.44	9.24	2240
Jigawa	82.15	1.23	9.11	0.79	2.89	3.84	2526
Kaduna	56.07	3.22	9.97	4.17	15.08	11.50	1896
Kano	73.88	1.02	14.05	1.41	4.83	4.81	3828
Katsina	80.72	1.52	10.08	1.35	3.42	2.91	2957
Kebbi	90.16	0.58	4.95	0.46	1.73	2.13	1738
Kogi	50.31	3.34	15.61	2.73	16.16	11.86	1467
Kwara	62.71	1.74	10.51	2.01	10.97	12.07	1094
Lagos	28.57	1.82	24.32	4.26	27.05	13.98	329
Nasarawa	42.08	3.83	16.32	8.35	15.22	14.21	1281
Niger	78.82	0.21	4.52	0.68	7.99	7.78	1903
Ogun	55.21	3.75	18.85	4.50	9.84	7.84	1199
Ondo	36.96	3.22	23.02	6.19	16.83	13.78	1212
Osun	43.89	3.40	18.11	4.63	17.52	12.44	2203
Oyo	55.91	2.52	18.22	3.72	12.04	7.60	1828
Plateau	54.21	3.93	15.03	6.53	12.98	7.32	1271
River	28.88	3.18	19.53	4.07	30.74	13.60	1669
Sokoto	89.09	0.84	4.61	0.73	1.99	2.73	1907
Taraba	50.57	3.70	8.30	7.02	17.66	12.75	1325
Yobe	90.25	1.01	4.20	1.09	1.26	2.18	1190
Zamfara	86.77	1.22	4.55	1.62	3.17	2.68	1232
FCT	48.00	0.86	11.71	5.14	18.86	15.43	350
Total	56.57	3.92	16.08	3.88	11.45	8.11	58789

Source: Author's computation from the 2006 CWIQ data.

Construction of composite multidimensional poverty indices

Table 4 shows the variables that were selected for multidimensional poverty measure and their weights. The highest weight was attached to ownership of dwelling place. It implies that most rural dwellers own their houses. Also, majority of rural households owns a mat; therefore not having it attracts greater weight. Ownership of fixed telephone

line was given low weight. This implies that very few rural dwellers possess fixed telephone line, therefore the household head that does not have should not be penalized for not having it. It is not the life style of rural dwellers. Other attributes with low weight include ownership of a personal computer, use of insecticide treated net, ownership of a camel and ownership of a gas cooker.

Table 4: Weight attached to each attribute

Attributes	Weight	Attributes	Weight
Material of the roof of the house	0.1866	Own a bicycle?	0.1917
Material of the walls of the house	0.3253	Own a motorcycle	0.0868
Material of the floor of the house	0.2879	Own a vehicle	0.0179
Housing unit type	0.0543	Own a canoe	0.0147
Number of rooms per person	0.7501	Own a donkey	0.0281
Main source of drinking water	0.2385	Own a camel	0.0042
Problems with supply of drinking water	0.4462	Education level of head of household	0.1355
Water treated before drinking	0.0529	Own a generator	0.0233
Type of toilet facility	0.2380	Source of electricity	0.1736
Type of refuse collection	0.1358	Main fuel used for lighting	0.1439
Maintain good drainage	0.0101	Main fuel used for cooking	0.2425
Maintain good sanitation	0.0365	Own a television	0.0832
Dwelling has window/door net	0.0198	Own a fixed line telephone	0.0019
Own the dwelling	0.9392	Own a mobile phone	0.0556
Problem satisfying food needs	0.4760	Own a radio	0.6304
Problems paying school fees	0.5420	Member provides materials	0.0191
Problems paying house rent	0.8801	Member provides labour	0.0737
Problems paying utility bills	0.6868	Member provides management	0.0182
Problems paying for health care	0.4328	Member provides funds	0.0457
Improved household economic state	0.3122	Uses bed net to prevent malaria	0.0674
Improved community economic state	0.3010	Uses insecticide against malaria	0.1836
Members perceived household to be poor	0.1759	Uses anti-malaria drug	0.0778
Security situation of the community	0.2815	Uses fumigation against malaria	0.0106
Own an electric iron	0.0713	Uses insecticide treated net	0.0030
Own a charcoal iron	0.1455	Area of land owned (hectares)	0.2079
Own a refrigerator	0.0326	Number of cattle and other large animals	0.0408
Own a personal computer	0.0020	Number of sheep, goats, etc. owned	0.0914
Own a mattress or bed	0.8602	Time to supply of drinking water	0.7088
Own a watch or clock	0.5994	Time to food market	0.3357
Own a modern stove	0.1266	Time to nearest public transportation	0.4244
Own a gas cooker	0.0045	Time to nearest primary school	0.5302
Own a fan	0.1020	Time to nearest secondary school	0.2412
Own a mat	0.9311	Time to nearest health clinic or hospital	0.3033
Own a VCR	0.0352	Time to nearest all seasons road	0.3656
Own furniture	0.2077		

Source: Computed from the 2006 CWIQ data.

Multidimensional poverty index in rural Nigeria

Table 5 shows the multidimensional poverty decomposition across the states. It shows that the highest average multidimensional poverty index of 0.4508 was observed in Yobe while the lowest average multidimensional poverty index of 0.3235 was observed in FCT. The corresponding variability index was 21.84 and 28.14 percent respectively. Adamawa, Akwa Ibom, Anambra, Bayelsa, Benue, Cross River, Delta, Ebonyi, Edo, Enugu, Imo, Kebbi, Ogun, Oyo, Plateau, Rivers, Taraba, Yobe, and Zamfara had average multidimensional poverty index that is higher than the overall average multidimensional poverty index. The highest variability index was observed in Osun while the

lowest was observed in Yobe. Kano had the highest absolute contribution to multidimensional poverty of 0.0221. Akwa Ibom also had high absolute contribution to multidimensional poverty of 0.0192. The lowest absolute contribution to multidimensional poverty of 0.0019 was observed in FCT. Lagos also had low absolute contribution to multidimensional poverty of 0.002. The Levene's test shows that the variances of multidimensional poverty indices across the states are significantly different ($P < 0.01$). Using the Welch and Brown-Forsythe F statistics, it was concluded that multidimensional poverty indices were significantly different ($p < 0.01$) across the states. Therefore null hypothesis 1 for the states was hereby rejected.

Table 5: Multidimensional poverty decomposition across Nigerian states

State	Freq	Av. MPI	Std. Deviation	CV	Absolute Contributions
Abia	1353	0.3645	0.1007	27.6334	0.0084
Adamawa	1610	0.3940	0.0969	24.5943	0.0108
Akwa Ibom	2781	0.4060	0.1027	25.2908	0.0192
Anambra	1255	0.4092	0.1154	28.2019	0.0087
Bauchi	1832	0.3775	0.1041	27.5755	0.0118
Bayelsa	656	0.4010	0.1021	25.4716	0.0045
Benue	2078	0.3868	0.1071	27.6841	0.0137
Borno	2163	0.3795	0.1019	26.8502	0.0140
Cross River	1357	0.4225	0.1086	25.6973	0.0098
Delta	1870	0.3957	0.1109	28.0182	0.0126
Ebonyi	1025	0.4251	0.1123	26.4125	0.0074
Edo	1325	0.3900	0.1095	28.0809	0.0088
Ekiti	831	0.3614	0.1008	27.9057	0.0051
Enugu	1125	0.4109	0.0972	23.6414	0.0079
Gombe	883	0.3755	0.0999	26.6101	0.0056
Imo	2240	0.4148	0.1071	25.8156	0.0158
Jigawa	2526	0.3523	0.0999	28.3571	0.0151
Kaduna	1896	0.3413	0.1041	30.5049	0.0110
Kano	3828	0.3392	0.0873	25.7354	0.0221
Katsina	2957	0.3680	0.0953	25.8857	0.0185
Kebbi	1738	0.3801	0.0967	25.4398	0.0112
Kogi	1467	0.3572	0.0953	26.6869	0.0089
Kwara	1094	0.3610	0.1030	28.5265	0.0067
Lagos	329	0.3577	0.1041	29.1136	0.0020
Nasarawa	1281	0.3733	0.0995	26.6666	0.0081
Niger	1903	0.3305	0.0978	29.5833	0.0107
Ogun	1199	0.3931	0.1041	26.4821	0.0080
Ondo	1212	0.3607	0.1014	28.1268	0.0074
Osun	2203	0.3517	0.1111	31.5915	0.0132
Oyo	1828	0.3926	0.1184	30.1615	0.0122
Plateau	1271	0.4230	0.1024	24.1993	0.0091
River	1669	0.3802	0.1132	29.7842	0.0108
Sokoto	1907	0.3502	0.0887	25.3363	0.0114
Taraba	1325	0.4443	0.1068	24.0344	0.0100
Yobe	1190	0.4508	0.0985	21.8423	0.0091
Zamfara	1232	0.3811	0.1017	26.6901	0.0080
FCT	350	0.3235	0.0910	28.1426	0.0019
Total	58789	0.3796	0.1065	28.0541	0.3796

Table 6 shows the relative contributions of multidimensional poverty decomposition of the grouped attributes across the States in Nigeria. The attribute education has the lowest relative contribution to multidimensional poverty in all the states. Housing/sanitation has the high relative contribution multidimensional poverty in the following states Kano (1.40 percent), Kastina (1.12 percent), Jigawa (0.99 percent), Akwa Ibom (0.90), Osun (0.88 percent), Borno (0.78 percent), Benue (0.77 percent), Oyo (0.73 percent), Delta (0.71) and Sokoto (0.70 percent), Economic condition/security has the high relative contribution to multidimensional

poverty in the following states Akwa Ibom (1.21 percent), Imo (1.19 percent), Kano (1.04 percent), Katsina (0.96 percent), Delta (0.90 percent), Anambra (0.78 percent), and Osun (0.75).

Lagos state has the lowest relative contribution to multidimensional poverty in the following attributes housing/sanitation (0.13 percent), goods equipment and assets (0.07 percent), education (0.01 percent), energy (0.02 percent), community project involvement (0.01 percent), health (0.02 percent) and access to basic infrastructure (0.05 percent). FCT has the lowest relative contribution to multidimensional poverty in the following attributes

economic condition/security (0.08 percent), means of transportation (0.03 percent), communication (0.02 percent) and ownership of land and livestock (0.02 percent). It is observed that Kano has the highest relative contribution to multidimensional poverty in the following attributes housing/sanitation (1.40 percent), goods equipment and assets (0.92 percent), means of transportation (0.23 percent), education (0.12 percent), energy (0.40 percent), communication (0.22 percent), community project involvement (0.15

percent) and Health (0.24 percent). Akwa Ibom has the highest relative contribution to multidimensional poverty in the attributes economic condition/security (1.21 percent), ownership of land and livestock (0.23 percent) and access to basic infrastructure (1.08 percent). Across the attributes the highest and lowest relative contribution to multidimensional poverty is observed in Kano (5.82 percent) and FCT (0.0019 and 0.51 percent).

Table 6 Relative contributions of multidimensional grouped attributes to rural deprivation across the States in Nigeria

State	Housing/sanitation	Economic condition/security	Goods equipment and assets	Means of transportation	Education	Energy	Communication	Comm. project involvement	Health	Ownership of land and livestock	Access to basic infrastructure	Total
Abia	0.3965	0.5905	0.2897	0.0931	0.0310	0.1134	0.0922	0.0531	0.1041	0.1153	0.3311	2.2099
Adamawa	0.6267	0.5125	0.4778	0.1069	0.0418	0.1883	0.1199	0.0626	0.1056	0.0875	0.5130	2.8425
Akwa Ibom	0.9043	1.2128	0.5880	0.1747	0.0606	0.2819	0.2158	0.1029	0.2102	0.2321	1.0758	5.0593
Anambra	0.3498	0.7796	0.1941	0.0966	0.0309	0.1040	0.0614	0.0490	0.0917	0.1034	0.4406	2.3012
Bauchi	0.6889	0.5402	0.4246	0.1160	0.0560	0.2106	0.1443	0.0718	0.1330	0.1084	0.6049	3.0989
Bayelsa	0.2635	0.2438	0.1720	0.0578	0.0126	0.0615	0.0509	0.0270	0.0505	0.0535	0.1855	1.1788
Benue	0.7717	0.6120	0.5706	0.1423	0.0458	0.2467	0.1742	0.0786	0.1431	0.1000	0.7165	3.6014
Borno	0.7816	0.5897	0.5743	0.1522	0.0704	0.2507	0.2022	0.0874	0.1341	0.1070	0.7288	3.6784
Cross River	0.6001	0.5733	0.3157	0.1098	0.0294	0.1365	0.1186	0.0495	0.1019	0.1175	0.4167	2.5689
Delta	0.7179	0.9039	0.4321	0.1330	0.0395	0.1568	0.1602	0.0774	0.1380	0.1482	0.4087	3.3156
Ebonyi	0.3505	0.3544	0.3357	0.0661	0.0288	0.1141	0.0765	0.0343	0.0809	0.0841	0.4271	1.9524
Edo	0.4613	0.5291	0.3307	0.0977	0.0287	0.1098	0.1039	0.0511	0.1088	0.0948	0.3997	2.3156
Ekiti	0.3284	0.2710	0.2169	0.0702	0.0190	0.0782	0.0595	0.0342	0.0649	0.0626	0.1407	1.3457
Enugu	0.3485	0.4443	0.3218	0.0768	0.0310	0.1198	0.0714	0.0415	0.0925	0.0943	0.4296	2.0716
Gombe	0.3356	0.2705	0.2103	0.0618	0.0278	0.1009	0.0756	0.0366	0.0486	0.0461	0.2721	1.4858
Imo	0.6230	1.1937	0.4644	0.1450	0.0513	0.2052	0.1402	0.0826	0.1631	0.1601	0.9346	4.1631
Jigawa	0.9899	0.5775	0.6238	0.1851	0.0832	0.2985	0.2234	0.0846	0.1683	0.1206	0.6333	3.9881
Kaduna	0.6699	0.5885	0.4463	0.1136	0.0483	0.1886	0.0965	0.0735	0.1245	0.1179	0.4319	2.8995
Kano	1.4032	1.0410	0.9183	0.2257	0.1192	0.4008	0.2243	0.1472	0.2384	0.2021	0.8990	5.8191
Katsina	1.1201	0.9576	0.6887	0.1730	0.0970	0.3359	0.2010	0.1068	0.2022	0.1393	0.8547	4.8763
Kebbi	0.6559	0.5779	0.5144	0.1097	0.0602	0.1922	0.1186	0.0601	0.0876	0.0855	0.4977	2.9600
Kogi	0.5416	0.4846	0.3280	0.1067	0.0360	0.1351	0.1059	0.0512	0.1177	0.1177	0.3240	2.3484
Kwara	0.4195	0.3940	0.2517	0.0823	0.0295	0.0988	0.0795	0.0396	0.0836	0.0850	0.2063	1.7698
Lagos	0.1259	0.1439	0.0679	0.0295	0.0063	0.0179	0.0215	0.0127	0.0229	0.0273	0.0517	0.5274
Nasarawa	0.4959	0.5253	0.2813	0.0765	0.0289	0.1362	0.0717	0.0438	0.0795	0.0875	0.3162	2.1427
Niger	0.6500	0.5472	0.4772	0.0986	0.0585	0.2004	0.1023	0.0673	0.1048	0.1028	0.4093	2.8184
Ogun	0.4654	0.4232	0.3640	0.0993	0.0323	0.1108	0.0907	0.0413	0.0849	0.0921	0.3080	2.1122
Ondo	0.4792	0.4168	0.2980	0.1052	0.0264	0.1060	0.0738	0.0498	0.0817	0.0834	0.2384	1.9589
Osun	0.8816	0.7489	0.5194	0.1906	0.0509	0.1743	0.1438	0.0823	0.1585	0.1578	0.3641	3.4722
Oyo	0.7831	0.6036	0.5142	0.1562	0.0489	0.1785	0.1410	0.0713	0.1322	0.1209	0.4661	3.2161
Plateau	0.4799	0.4437	0.4148	0.0907	0.0335	0.1526	0.1082	0.0496	0.1019	0.0690	0.4652	2.4092
River	0.5805	0.6634	0.3721	0.1142	0.0313	0.1611	0.1236	0.0666	0.1243	0.1363	0.4699	2.8433
Sokoto	0.7040	0.4007	0.5209	0.1449	0.0654	0.2233	0.1246	0.0743	0.1185	0.1386	0.4778	2.9929
Taraba	0.5294	0.6484	0.4140	0.0992	0.0316	0.1618	0.1266	0.0483	0.1055	0.0785	0.3949	2.6382
Yobe	0.5190	0.4473	0.3378	0.0856	0.0413	0.1440	0.1263	0.0483	0.0781	0.0631	0.5131	2.4037
Zamfara	0.4711	0.3896	0.2785	0.0762	0.0416	0.1445	0.0756	0.0468	0.0794	0.0668	0.4335	2.1038
FCT	0.1304	0.0824	0.0716	0.0264	0.0079	0.0320	0.0162	0.0140	0.0257	0.0224	0.0784	0.5074

Source: Computation from the 2006 CWIQ data.

4. Conclusion

Multidimensional approach (Fuzzy set) is very robust method of poverty analysis in that it revealed that degree of poverty varies. This study examines the multidimensional aspects of the phenomenon of poverty and living conditions of rural household head across the States in Nigeria. It further looked at a synthetic analysis of decomposition that point out the dominant attributes/dimensions (housing/sanitation, economic condition/security, education, energy, etc.). The result shows that the multidimensional poverty for the rural Nigeria is

0.3796. It has been shown that housing/sanitation and economic condition/security are the main factor of poverty across the states. Also, most states in the northern part of the country have the highest percentage of those with no education. In order to implement socio-economic policies to reduced poverty diffusion, based on the findings, reform actions should be directed towards education, improving housing/sanitation and economic/security conditions.

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