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A Functioning Approach to Well Being Analysis in Rural Nigeria

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Abstract

The Nigerian rural population is described by low productivity, little formal education and poverty. The need for more studies on the issue of wellbeing of rural population is hinged on the continued development of approaches that give better understanding of the phenomenon. This paper attempted to use Amartya Sen's capability approach to assess multidimensional well being in rural Nigeria in six functioning dimensions obtained from the Nigerian Core Welfare Indices Survey using the fuzzy set theory. A binary logistic regression was also carried out to isolate the factors that determine the attainment of a pre determined level of well being after computation with the fuzzy set analysis. The results showed that rural Nigeria is an agrarian society; the functioning with the highest level of achievement out of the six dimensions studied was Housing, while asset ownership/income was the least achieved dimension in rural Nigeria. Results further revealed that belonging to female headed households, increasing age and being employed in the private (formal) sector as well as having some form of post secondary education enhances well being while being employed within the agricultural sector significantly reduced the well being of rural households in Nigeria.

Keywords: rural households, functioning, well being, Nigeria

1. Introduction

Well-being has been described by various sources to mean the quality of life of an individual. The Stanford dictionary of psychology, (2008) defines it as what is non-instrumentally or ultimately good for a person. However, in Nigeria, the Human Development Index reveals that the well-being level is still on the low side: 0.43, (Human Development Report, 2010). Considering that about 54% of Nigerians are living in the rural areas, (Trading Economics, 2011), it may be pertinent to say that rural households in Nigeria have low levels of well-being. Adebo, (2010) implied that the well- being level of rural households is usually lower than those of the urban households considering the low population density, low area of habitation, homogeneity, few social classes, low standard of living, few social amenities, low social mobility and prevalence of agriculture as main occupation, which has been synonymous with low living standards. This study is thus predicated on the need for a more thorough understanding of well being and the issues that surround it, with the aim of contributing to relevant policies.

Unidimensional well- being has been studied using the income and utility approaches (Clark, 2005a); happiness approach has been used by psychologists, (Kingdon & Knight, 2004; Easterlin, 2003); the recent functioning and capability well being have been used to analyse multidimensional well being, (Chiappero, 2000; Majumder, 2006, 2009). However, Chiappero, (2000) posited that the approach used is a function of availability of data, ability to adequately capture the relevant information as well as an understanding of the methodology of analysis to be used.

This study sought to explore the usability of the capability theory of Amartya Sen in analysing the multidimensional well being of rural Nigeria using some sets of functioning dimensions that are associated with well being. The capability approach as a means of finding an encompassing definition for well being recognises well being as the 'ability to be'. In the theory, functioning is defined as the 'being' or the 'achievement' of the individual/household being considered, (Chiappero, 2000; Clark, 2005a, 2005b). While it may be difficult to access dimensions and indicators of capabilities from the national data, it is useful to use the sets of functionings achieved by the rural households in the study, (Chiappero, 2000; Majumder, 2006, 2009). The Nigerian core welfare indices survey has a list of functionings that could be used to achieve the purpose of a multidimensional

assessment of well being for this study.

The use of the fuzzy set theory in indexing is not new; however, its use in well being studies is credited to Enrica Chiappero (Majumder, 2006). The value addition of this study is that it made use of the fuzzy set approach to index the well being levels of rural Nigerians. The study also isolated the factors that promote or reduce rural households' well being in Nigeria.

2. Source of Data and Methodology

The data for this study was from the Core Welfare Indicators Questionnaires (CWIQ) survey of Nigeria, 2006. The CWIQ survey made use of the National Population Commission's 1991 census as the sample frame for the 1st stage of choosing Enumeration Areas in each Local Government area in the two-stage sampling procedure for the survey. The 2nd stage involved the Housing Units. In each local government, 10 Enumerations areas were systematically selected, and a listing of the Housing Units and Households within them were made. The listing within the first sample provided the sample frame for the second selection. From the list of the Housing Units, 10 Housing Units were again systematically selected and all Households within the selected housing Units interviewed. Thus at each local government level, the sample size was 100 housing units. In all, 77, 400 households were interviewed and 59, 567 were rural households. After sorting for missing data, the sample size used for the study was 29, 391 rural households, which covers a good representation of the rural households in Nigeria.

3. Analytical Framework

3.1 The Fuzzy Set Analysis

In well being analysis using the capability approach, well being and deprivation are not seen as contexts within clear and defined boundaries, rather they are conceptualized as fuzzy concepts. One useful tool for the analysis of such vague concepts is the Fuzzy set theory, developed by Zadeh, (1965) and has been used in many welfare and poverty studies over the years.

The fuzzy set substitutes the characteristic function of a crisp set that assigns a value of 1 or 0. Larger values denote higher degree of membership (Chiappero, 2000; Majumder, 2009). The degree of well being is shown by the placement of the individual on the 0 or 1 value or other values in between. The model is considered as follows: Assume X is a set and x an element of X . A fuzzy subset P of X can therefore be defined as follows:

$$P = \{x, \mu_p(x)\} \text{ for all } x \in X.$$

$\mu_p(x) = X \rightarrow 0, 1$. The $\mu_p(x)$ is a particular membership function with values between 0 and 1. In these analyses, given X is a set of households ($j=1 \dots n$) and P is a fuzzy subset of X (the set that denotes well being membership); the membership function of well being for the i^{th} individual (the set of people with well being values equal to or above a set point) will be:

$$x_{ij} = 1; \quad \text{condition of full achievement of functionings with respect to well being}$$

$$x_{ij} = 0; \quad \text{condition of total failure to achieve the set of functionings}$$

$$0 \leq x_{ij} \leq 1; \quad \text{conditions within the range of full achievement and zero achievement.}$$

3.1.1 Estimating Membership Functions

The variables that define indicators of well being are either dichotomous or categorical in nature.

Dichotomous Variables

Dichotomous variables are answered by either 'Yes' or 'No'; with the 'yes' being a state of well being and the no, a state of deprivation. According to Njong and Ningaye, (2008), from a universal set of X households, we define the membership function of fuzzy subset of P for the ai^{th} household ($i=1 \dots n$) that possess the j^{th} well being attribute ($j=1 \dots m$) as:

$$\mu_p(ai) = X_j(ai) = x_{ij},$$

$X_{j(ai)}$ is the m order of well being attributes that will result in a state of well being if totally or partially owned

by the ai^{th} household.

$x_{ij} = 1$, if the ai^{th} household possess the j^{th} attribute (that is it completely has the well being attribute)

$x_{ij} = 0$ if the ai^{th} household does not possess the well being attribute.

Categorical Variables

Categorical variables present themselves in a range of values, rather than just two values. Expressing the membership function for these variables take the form:

$$\begin{aligned} \mu_p(ai) &= X_j(ai) = x_{ij}, \text{ and thus;} \\ x_{ij} &= 1, \text{ if } 0 < C_{ij} \leq C_{\max} \\ x_{ij} &= C_{\max} - C_{ij} / C_{\max} - C_{\min}, \text{ if } C_{\min} \leq C_{ij} \leq C_{\max} \\ x_{ij} &= 0 \text{ if } C_{ij} \geq C_{\min} \end{aligned} \quad (1)$$

Where C_{\max} is the value that depicts high level of deprivation in the j^{th} attributes, which translates to lowest level well being; while C_{\min} is the lowest level of deprivation in the j^{th} attribute which indicates highest level of well being in the ai^{th} household. Thus, the modalities are arranged in decreasing order of well being attainment. C_{ij} values are the intermediate values within the two thresholds, which depicts the position of the ai^{th} household within the modalities set forth. This assumes that the modalities in the data set are equally spaced. Oyekale, *et al*, 2009 specifies this membership function as:

$$x_{ij} = C - C_i / C - 1 \quad (2)$$

Where $1 \leq C_i \leq C$,

so that $0 \leq x_{ij} \leq 1$

In specifying the Fuzzy Well being Index for the population, as a ratio of the well being index of the ai^{th} household, the formula presented by Njong and Nigaye, 2008, and Oyekale et al. 2009 is adopted as follows:

$$\mu_p = \frac{\sum_{i=1}^n \mu_p(a_i) n_i}{\sum_{i=1}^n n_i} \quad (3)$$

μ_p is the fuzzy well being index for the population of households studied.

$$= \frac{1}{n} \sum_{i=1}^n \mu_p(a_i) n_i \quad (4)$$

Equation 3 and 4 express the degree of attainment of the selected well being attribute

This could also be conceptualized as:

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

Where w_j is the weight given to the j^{th} attribute

$$w_j = \log \frac{n}{\sum_{i=1}^n x_{ij} n_i} \quad (6)$$

3.1.2 Choice of Functionings

The choice of functionings is based to a great extent on data availability, (Chiappero, 2000). It could also be done in an ad hoc way, (Kuklys, 2005). However, such functionings as health, housing and education are basic functionings in use in many literatures. Alkire (2007) presents five methods of choosing dimensions as follows:

- Data availability
- Assumption
- Public Consensus
- Ongoing Participatory processes, and

e. Empirical Evidence regarding people's status

The choice of functioning in this study was based on data availability as well as adaptation of functionings from literature that are available within the context of the study.

The present study analysed the Nigerian Rural household well being in the following dimensions: Housing and housing utilities, Infrastructure, Health, Education, Asset ownership/ income, and Information flow. Appendix 2 shows the indicators of the dimensions to be used in the study.

3.2 The Logistic Regression

Logistic regression describes the relationship between categorical response variable and a set of predictor variables. The categorical variable can be binary, ordinal or nominal. This study uses a binary logistic regression as the response variable is dichotomous.

The general model is given thus:

$$P(Y_i = m) = 1 / (1 + e^{-Z}) \quad (7)$$

$$P / (1 - P) = e^Z \quad (8)$$

P is the probability of occurrence of the dependent variable Y_i equal to a certain value.

Z is the predictor variable and can be said to be a linear combination of the conversion factors;

e is the base of natural logarithm and

P is the estimated probability of occurrence of one point of the dependent variable.

From equation 7,

$$1 - P = 1 / (1 + e^{-Z}) \quad (9)$$

1-P is the probability of failure.

$$\text{Given that } \Omega = P / (1 - P) \quad (10)$$

$$\text{Then, } \Omega = e^Z = \exp(Z) \quad (11)$$

$\Omega = P / (1 - P)$, represents the Odd of the evaluative factors (the functionings) occurring for each conversion factor,

Assuming Z is a linear function of a set of predictor variable, then,

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k \quad (12)$$

If (12), then;

$$\Omega = e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k} \quad (13)$$

In this study $P(Y_i \geq m)$ is the probability of occurrence of the i^{th} , individual that attain well being values greater than or equal to the mean values ; these are ascribed 1; and 0 otherwise. The logistic regression model is thus given as :

$$\Omega = \exp(\beta_0 + \beta_1 \sum X_1 + \beta_2 \sum X_2 + \dots + \beta_k \sum X_k) \quad (14)$$

The conversion/explicative factors are:

X_{1i} : Individual Household factors (Gender of household head, Age of household head, household size)

X_{2i} : Social factors (Occupational group of household head, Marital Status of household head, Educational Status of household head)

X_{3i} : Environmental Factors (Geopolitical zone of rural household)

The explicative factors of interest in this study are operationalised below. The base categories are designated '0':

Gender of household head: Dichotomous; Male= 0, Female =1

Age of household head: categorical: >20years=0, 21-40 years=1, 41-60 years=2, >61years=3

Marital Status of Household head: categorical; Single=0, Married(Monogamy)=1, Married(Polygamy)=2, Divorced/Widowed/Separated=3,, Informal union=4.

Educational Status of Household head: categorical; None=0, some primary=1, Completed Primary =2, some secondary =3, Completed Secondary =4, Post secondary =5.

Household size: categorical; 1-5 =0, 6-9 =1, ≥ 10 =2

Occupational Group of Household Head: categorical; Public Service= 0, Private(Formal) =1, Private (informal) =2, Self Employed(Agriculture) =3, Self Employed (Others) =4, Unemployed =5, Others=6.

Geopolitical Zone of Household: categorical Northwest =0, North East =1, North Central =2, South East =3, South West =4, South South =5

This study employed the mean values for the membership functions as the base value in determining the dependent variables for the models to be used. Thus, the dependent variable will be binary such that it is 1 if the well being value is greater than or equal to the mean well being value, 0 otherwise.

The best fit for the regression was obtained using the Pearson test.

4. Results and Discussions

4.1 Summary Statistics of Socioeconomic Characteristics of Rural Households in Nigeria

Tables 1-6 present the socioeconomic characteristics of the respondent households to represent rural households in Nigeria. Table 1 shows that the majority of households in rural Nigeria were male headed as seen by 89.4 male headed household studied in the survey. Table 2 reveals that most of the respondents were within the age group of 41-60 years, followed by those in the 21-40 years range. The mean age of the household heads 46.82 years. This implies that most of the household heads were in their active age.

Table 1. Distribution of households by gender of household head

Gender	Frequency	Percentage	Cumulative Frequency
Male	26263	89.36	89.86
Female	3128	10.64	100
Total	29391	100	

Source: CWIQ, 2006.

Table 2. Distribution of households by age of household heads

Age (years)	Frequency	Percentage	Cumulative Frequency
<20	353	1.20	1.20
21-40	11925	40.57	41.77
41-60	11971	40.73	82.50
>60	5142	17.50	100
TOTAL	29391	100	

Source: CWIQ, 2006.

Table 3. Distribution of households by marital status of respondent

Marital Status	Frequency	Percentage	Cumulative Frequency
Single/Never married	1660	5.65	5.65
Married(Monogamy)	18011	61.28	66.93
Married(Polygamy)	6189	21.06	87.99
Divorced/Separated	3366	11.45	99.44
Informal Union	165	0.56	100
Total	29391	100	

Source: CWIQ, 2006.

Table 4. Distribution of households by educational level of household head

Educational Status	Frequency	Percentage	Cumulative Frequency
None	15780	53.69	53.69
Some Primary	1141	3.88	57.57
Completed Primary	1944	16.82	74.39
Some Secondary	1127	3.83	78.23
Completed Secondary	3582	12.19	90.42
Post Secondary	2817	9.58	100
Total	29391	100	

Source: CWIQ, 2006.

Table 5. Distribution of households by occupational group of household head

Occupational Group	Frequency	Percentage	Cumulative Frequency
Public Service	3007	10.23	10.23
Private(Formal)	534	1.82	12.05
Private(Informal)	984	3.35	12.05
Self Employed(Agric)	14861	50.56	65.96
Self Employed(Other)	7010	23.85	89.81
Unemployed	295	1.00	90.81
Others	2700	9.19	100.00
Total	29391	100.00	

Source: CWIQ, 2006.

Table 6. Distribution of respondents by geopolitical zone

Geopolitical Zone	Frequency	Percentage	Cumulative Frequency
Northwest	4380	14.9	14.9
Northeast	8604	29.27	44.18
North central	4781	16.27	60.44
Southeast	3212	10.93	71.37
Southwest	4108	13.98	85.35
South south	4306	14.65	100.00
Total	29391	100.00	

Source: CWIQ, 2006.

With respect to marital status of household heads, the distribution in Table 3 shows that about three quarters of the respondents were married with 61.3% of the responded in monogamous relationships, while 12% are divorced or engaged in informal union. Only about 6% of the respondents were never married or single.

In Table 4, it is seen that about 54% of household heads in rural areas had no formal education and less than 10% had some form of post secondary education. Table 5 reveals that the majority of rural Nigerians were involved in agriculture as the source of livelihood, while Table 6 shows the distribution of rural population by geopolitical zones in Nigeria.

4.2 Multidimensional Assessment of Wellbeing Using the Fuzzy Set Theory

The functioning well being will be assessed in three groups:

- i. Functioning well being by socioeconomic characteristics of rural households
- ii. Functioning well being indicators from which the composite index will be adopted
- iii. Functioning well being by the 36 states and the Federal Capital Territory of Nigeria

4.2.1 Membership Degrees by Socioeconomic Characteristics

Table 7 shows the well being indices by socioeconomic characteristics. With respect to gender of household head, female headed households have a higher level of well being in terms of achieved functioning at 0.1246 to that of males at 0.1234. This may be due to the fact that females have the tendency to invest in assets that are permanent and able to give them livelihood for longer periods. On the other hands, males usually will move to where they believe they can achieve more in terms of livelihood and thus are less likely to invest in such assets that constitute achieved functions than the female folks.

Table 7. Achieved functioning well being by socioeconomic characteristics

S/N	Characteristic	Subset	Wellbeing Index
1	Gender Of Household Head		
		Male	0.1234
		Female	0.1246
2	Age Of Household Head		
		<20 years	0.1118
		21-40 years	0.1221
		41-60 years	0.1288
		>60 years	0.1314
3	Household Size		
		1_5	0.1222
		6_9	0.1255
		>=10	0.1298
4	Educational Status of Household Head		
		None	0.1082
		Some Primary	0.1127
		Completed Primary	0.1252
		some secondary	0.1247
		completed secondary	0.134
		Post secondary	0.1562
5	Marital Status Of Household Head		
		Single	0.1277
		Married(Monogamy)	0.1262
		Married(Polygamy)	0.1271
		Divorced/Widowed	0.1231
		Informal Union	0.1191
6	Geopolitical Zone		
		Northwest	0.0836
		North East	0.113

	North Central	0.1198
	South West	0.1244
	South East	0.097
	South South	0.1194
7	Occupational Group Of Household Head	
	Public service	0.154
	Private(Formal)	0.1434
	Private(Informal)	0.1187
	Selfemployed(Agric)	0.1126
	SelfEmployed(other)	0.1334
	Unemployed	0.1239
	Others	0.1249

Source: Researcher's Computation, 2011.

For age of household heads, the result shows that people in the oldest age range, > 60 years, have higher achieved functionings than other age groups at 0.1287. This may be because this age group have acquired assets over time and appreciate the importance of educational and health facilities as well as both financial and physical security. The lowest well being level is the age range, <20 years at 0.1118, probably because this age group has not attained much in the way of their desired level of achieved functionings, thus bringing in the issue of subjectivity in well being report.

With respect to household size, the highest achieved functioning well being level is for households with size greater than or equal to 10, while the lowest level is with the smallest household size, 1-2 at 0.1298 and 0.1222 respectively. The implication of this may be that there is a greater dependence on family labour in the predominantly agrarian rural Nigerian economy, thus larger household sizes lead to increased production, income and the attendant well being levels.

Educational status of household head confers a higher level of achieved functioning on the household. The result in Table 7 shows that households whose heads have post secondary education have the highest achieved functioning well being at 0.1562, while the lowest remains at those with no education at 0.1082. Higher educational levels confer on the household an appreciation of the valuable resources and the best uses to put such in order to achieve desired levels of functionings.

Being in the South west geopolitical zone confers a higher level of well being in achieved functioning on households. Table 7 indicates that at well being levels of 0.1244, households in the Southwest Geopolitical zones have the highest functioning well being level, followed by the North central geopolitical zone at 0.1198. The zone with the lowest well being level is the Northwest with 0.0836. The high score for the southwest may imply that households have achieved better well being levels especially in terms of education, health facilities as well as information flow than other rural areas in the other geopolitical zones of the country. This is especially true because the Federal Capital Territory of the country was in Lagos State, a south western zone before being moved to Abuja, in the North Central. This had provided the zone with higher leverage in terms of infrastructure and human capital development as well as information flow than the other geopolitical zones.

For marital status of household heads, the highest achieved functioning well being level is for those with Single/never married household heads at 0.1277, followed by those married and in a polygamous setting at 0.1281. The lowest wellbeing level in this category is for those in informal unions, at 0.119. Being single/never married confers a high level of well being in terms of functioning achieved. This may be due to the fact that households headed by single heads do not have so much responsibility as other who are married and with children and other relatives from both sides. Thus the single individual is able to put stock in more assets that could increase his well being.

With respect to the occupational group of the household head, it is found that households whose head work with the public service have the highest level of achieved functioning well being at 0.154. This is followed by those in formal private services and those self employed in non farming activities at 0.1434 and 0.1334 respectively. It is seen that farmers have the lowest level of achieved functioning well being at 0.1126. This confirms the findings

that rural dwellers who are mostly farmers are poor and worse off in terms of well being. Unemployed rural dwellers have achieved functioning well being of 0.129.

4.2.2 Membership Degree to the Elementary Subset of Achieved Functioning

Table 8 reveals that in terms of achieved functionings, rural Nigeria has the highest well being achievement in Housing and its utilities at 0.0477. This implies that the most important achievement for the rural People is their housing needs and the utilities needed to make the living good. The three lowest achieved functionings are Information flow, Education and Asset ownership/Income in descending order at 0.105, 0.0102 and 0.0028 respectively. The import of this is that these functionings are poorly achieved. This could be a result of the fact that housing needs are more highly valued and thus are more sought out by rural Nigeria than education, information and communication.

Table 8. Functioning wellbeing to the elementary indicators

Achieved Functioning Dimension	Indicators	Index Per Indicator	Index Per Dimension
Housing And Utilities(λ_1)	λ_{11}	0.0015	0.0477
	λ_{12}	0.0047	
	λ_{13}	0.0041	
	λ_{14}	0.0049	
	λ_{15}	0.0052	
	λ_{16}	0.0048	
	λ_{17}	0.0051	
	λ_{18}	0.0038	
	λ_{19}	0.0037	
	λ_{110}	0.0049	
	λ_{111}	0.005	
Infrastructure(λ_2)	λ_{21}	0.005	0.0157
	λ_{22}	0.0019	
	λ_{23}	0.0016	
	λ_{24}	0.0042	
	λ_{25}	0.003	
Health(λ_3)	λ_{31}	0.0328	0.041
	λ_{32}	0.004	
	λ_{33}	0.0042	
Education(λ_4)	λ_{41}	0.005	0.0102
	λ_{42}	0.0052	
Asset/Socioeconomy(λ_5)	λ_{51}	0.0013	0.0028
	λ_{52}	0.0015	
Information Flow(λ_6)	λ_{61}	0.003	0.0105
	λ_{62}	0.0039	
	λ_{63}	0.0036	
Composite Index			0.1279

Source: Researcher's computation, 2011.

The composite functioning well being for the rural population in Nigeria is quite low at a value of 0.1279,

indicating that rural Nigeria is actually not leading the kind of life that reveals a state of quality of living in the dimensions examined.

4.2.3 Membership Degree by State and the Federal Capital Territory

Table 9 shows the fuzzy well being index per state for the achieved functioning dimensions. The highest well being level is in Federal Capital Territory at 0.147. This is followed by Bayelsa and Ondo states at 0.143 and 0.135 respectively. Achieved functioning well being is lowest in Yobe, Adamawa and Borno states with functioning indices of 0.061, 0.069 and 0.074 respectively.

Table 9. Achieved functioning well being by states and the federal capital territory

S/N	STATE	N(Sample Size)	WELLBEING INDEX
1	ABIA	596	0.097
2	ADAMAWA	728	0.0699
3	AKWA IBOM	1697	0.096
4	ANAMBRA	475	0.1084
5	BAUCHI	903	0.0798
6	BAYELSA	227	0.1426
7	BENUE	1223	0.0991
8	BORNO	1269	0.0737
9	CROSS RIVER	585	0.1121
10	DELTA	732	0.1271
11	EBONYI	521	0.0969
12	EDO	412	0.1006
13	EKITI	461	0.1298
14	ENUGU	497	0.0891
15	GOMBE	628	0.0786
16	IMO	1123	0.0855
17	JIGAWA	1633	0.0819
18	KADUNA	846	0.1149
19	KANO	2157	0.0987
20	KATSINA	1236	0.122
21	KEBBI	1036	0.0927
22	KOGI	580	0.1273
23	KWARA	479	0.1168
24	LAGOS	191	0.118
25	NASSARAWA	740	0.1018
26	NIGER	1224	0.1185
27	OGUN	728	0.1061
28	ONDO	717	0.1352
29	OSUN	878	0.1318
30	OYO	1133	0.1026
31	PLATEAU	360	0.0742
32	RIVERS	653	0.1029
33	SOKOTO	1208	0.0906
34	TARABA	344	0.0937
35	YOBE	508	0.0613
36	ZAMFARA	488	0.1082
37	FCT	175	0.1469

Source: Researcher's Computation, 2011.

4.3 Result of the Binary Logistic Regression

The result of the logistic for the achieved functioning well being, presents the likelihood ratio value of 3628.55 as significant at 1%, indicating that the predictor variables indeed explain the response variable. A further test, the Pearson χ^2 test is also significant at 1% and suggests the significance of the model used. Table 10 presents the coefficients of the logistic regression and the marginal effects as follows:

The log odd for female as household head implies that being in female headed households tends to increase achieved well being significantly over being in male headed households.

Also, the log odds of achieving the desired well being status increases for being in older age group, Household heads that are above 60 years tend to have better well being than the other age groups. Increased educational achievements significantly improve functioning well being of rural household. Large household sizes also have significant increases in functioning well being than small household sizes.

Table 10. Isolating factors that determine achieved functioning well being

Predictor Variables	Coefficients	Marginal Effects
Gender of Household Head(b: male)	0.30202*** (0.06022)	0.07414*** (0.01495)
Age of Household head(b: <20 years)		
21-40 years	0.05824 (0.12467)	0.01407 (0.03015)
41-60 years	0.27776** (0.12713)	0.06726** (0.03083)
>60 years	0.59279*** (0.12938)	0.14593*** (0.03194)
Marital Status of Household head(b: Single)		
Married(Monogamy)	0.08611 (0.06014)	0.02075 (0.01446)
Married(Polygamy)	0.06144 (0.06991)	0.01488 (0.01698)
Divorced/Widowed/Separated	0.06848 (0.07820)	0.01661 (0.01905)
Informal Union	-0.66094*** (0.18250)	-0.14557*** (0.03539)
Educational Level of Household Head(b: None)		
Some Primary	0.37985*** (0.06571)	0.09374*** (0.0164)
Completed Primary	0.50364*** (0.03765)	0.12392*** (0.00932)
Some Secondary	0.61709*** (0.06814)	0.15276*** (0.01681)
Completed Secondary	0.83656*** (0.04478)	0.20597*** (0.01081)
Post Secondary	1.28867*** (0.05479)	0.30998*** (0.01187)
Occupational group of household head(b: public sector)		

Private(Formal)	0.19071*	0.04670*
	(0.10471)	(0.2594)
Private(Informal)	-0.56028***	-0.12620***
	(0.08254)	(0.01696)
Self Employed(agriculture)	-0.84222***	-0.20083***
	(0.05078)	(0.01181)
Self Employed(others)	-0.26161***	-0.06221***
	(0.05269)	(0.01232)
Unemployed	-0.57831***	-0.12934***
	(0.13256)	(0.2675)
Others	-0.59391***	-0.13445***
	(0.06336)	(0.01318)
Household size(b:1-5)		
6-9	0.11825***	0.02865***
	(0.03059)	(0.00744)
≥ 10	0.23341***	0.05717***
	(0.05252)	(0.01301)
Geopolitical Zone(b:NorthWest)		
North East	1.01772***	0.24751***
	(0.04544)	(0.01075)
North Central	0.92498***	0.22700***
	(0.05029)	(0.01202)
South East	1.06345***	0.25967***
	(0.05724)	(0.01324)
South West	1.13927***	0.27728***
	(0.05318)	(0.01219)
South South	0.8619***	0.21195***
	(0.05364)	(0.01292)
Constant	-1.41027***	
	(0.13988)	

In terms of marital status of household heads, the log odds of attaining at least the mean well being index level significantly reduces for being in an informal union than for being single. The coefficients of the other marital status are not significant.

Being in private (formal) occupational group increases well being significantly rather than being in the public sector. However, achieved well being decreases significantly for households whose heads are in the other occupational groups, rather than in the public sector. The results shows that households whose heads are in the agricultural sector are less likely to have good well being in terms of achieved functioning.

With respect to geopolitical zones, the log odds of attaining the achieved functioning wellbeing greater than or equal to the average increases for all geopolitical zones as compared to the Northwest zone, although the South West Zone has the highest increase in likelihood.

4.4 Result of the Marginal Effects

The predicted probability of household attaining the average well being level is 0.4073 for non single, male household heads above 20 years old, with greater than 5 members on the average, who are in other occupational

groups except public sector, with at least primary education, and who do not live in the North West geopolitical zone.

The marginal effect for female headed household is 0.074. This implies that the probability of a female headed household attaining the average well being level is 7.4% greater than for male headed household, holding other variables constant.

A move from age category <20 years to 21-40 increases achieved functioning well being by 1.41%; 6.73% from 21-40 years to 41-60 and 14.59% from 41-60 to >60 years.

In terms of educational status, a progressive change in category of educational level increases achieved functioning well being. Also, the highest increase of 30.99% is found in a change in educational level from completed secondary education to post secondary education level for the household head. This is consistent with literature that links increased well being to improved educational levels.

The marginal effect in terms of occupation groups shows that wellbeing increases significantly by 4.6% only for being in private (formal) occupation than being in the public sector. However, being in the agricultural sector has the highest significant reduction at 20% than being in the public sector.

5. Conclusion and Recommendation

The study used the Nigerian Core Welfare Indices survey to establish that rural Nigeria, which is primarily agriculture based, has low well being in terms of achieved functioning. Well being condition was found to be low in all dimensions considered, however, housing and utility was the dimension with the highest level of achievement.

The federal capital territory has the highest well being level, followed by Bayelsa state. The study also found that female headed households, as well as large households have high well being achievement. Engaging in agriculture, which is the primary occupation of rural areas, confers low well being on the households practicing it. Higher levels of education, especially post secondary education leads to an increase in the well being of rural Nigeria from the analyses.

The study was able to bring to the fore the crucial need for human capital development within the rural sector of Nigeria. Development of formal education as well as capacity building of the mainly farming communities will go a long way in improving the general well being of Nigeria's rural populace.

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Appendix 1: Functioning Dimensions and Indicators Used in the Study

- a. Housing (λ_1): there are eleven indicators for this dimension;
 - λ_{11} : Dwelling Ownership
 - λ_{12} : Material of roof of house
 - λ_{13} : Material of Wall of house
 - λ_{14} : Material of floor of house
 - λ_{15} : Housing Unit type
 - λ_{16} : Source of drinking water
 - λ_{17} : Type of toilet facility
 - λ_{18} : Source of Electricity
 - λ_{19} : Main Fuel used for lightening
 - $\lambda_{11.0}$: Main fuel used for cooking
 - $\lambda_{11.1}$: Refuse Disposal
- b. Infrastructure(λ_2): this has five indicators;
 - λ_{21} : water/borehole project in the last 5 years
 - λ_{22} : Piping of water project in the past 5 years
 - λ_{23} : Rehabilitation of pipeborne water in the last 5 years
 - λ_{24} : Electrification
 - λ_{25} : Rehabilitation of Electrical Facility in the last 5 years
- c. Health(λ_3): there are three main indicators for this dimension;
 - λ_{31} : Measures to prevent malaria
 - λ_{32} : health facility construction in the last 5 years
 - λ_{33} : health facility rehabilitation in the last 5 years
- d. Education(λ_4): education dimension has two indicators;
 - λ_{41} : school construction in the last 5 years
 - λ_{42} : School rehabilitation in the last 5 years
- e. Asset/Income(λ_5):
 - λ_{51} : Anyone receives pension?
 - λ_{52} : Agricultural input on credit in the last 5 years
- f. Information/Knowledge Flow(λ_6):
 - λ_{61} : Road construction in the last 5 years
 - λ_{62} : tarring/grading of road in the last 5 years

λ_{63} : transport service project in the last 5 years

Appendix 2: Test of Goodness of Fit of Regression

Pearson Goodness of Fit Test for logistic Regression

Number of Observations = 29391

Number of covariate patterns = 3445

Pearson Chi2(3160) = 3963.92

Prob>chi2 = 0.0000