Spatial Dimension of Vulnerability to Poverty in Rural Nigeria

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Abstract

Poverty has been intractable because policies and programmes are based on static poverty analysis in Nigeria. There is the need for a forward looking approach (vulnerability to poverty) to be adopted in poverty analysis, hence this study. This study investigated the vulnerability to poverty across geopolitical zones in rural Nigeria, using the 2004 NLSS data. The result of the 3-Stage Feasible Generalized Least Squares showed that at the standard vulnerability threshold of 0.5, vulnerability to poverty (VP) was highest in North-east Nigeria (71.0%) and lowest in the South-west (28.8%). Male headed households (59.8%) were more vulnerable to poverty than their female counterpart (43.9%). The consumption variance index is 0.0326, 0.0481 and 0.0373 in South-south, South-east and South-west which is higher than the national average of 0.0284. While the mean consumption index is 0.0195, 0.0228 and 0.0119 in the North-east, North-west and North-central lower than the national average of 0.0585. Rural households' vulnerability to poverty varied across the geopolitical zones in Nigeria with the northern part been worse off.

Keywords: geopolitical zones, rural Nigeria, vulnerability to poverty
JEL: I30, R20

1 Introduction

Nigeria suffers from high levels of poverty and vulnerability to poverty with inadequate social risk management. The country belongs to the group of lower-income countries (GNP per capita of 2,300 USD at PPP in 2008), with a high incidence of poverty (69 percent in 2010). The vulnerable groups within the population are those that suffer from the consequences of man-made or natural shocks. Many development practitioners and researchers have long recognised that individuals, households and communities face a large number of risks, related to for example climate, health or economic shock. However, sustainable poverty reduction is immensely difficult to achieve in the absence of mechanisms designed to assist households manage shocks. No one-size-fits-all risk management tool exists. Appropriate interventions depend on the nature of the risk involved. Shocks can be idiosyncratic, locally covariate and national covariate in nature. Idiosyncratic shocks are those specific to individuals. Examples include illness, loss of job and death. Locally covariate risks are shocks that affect communities such as flood, landslide and violence. Covariate risk is shock affecting the nation as a whole. Wars, financial crisis, price change and coups are examples of national covariate risk.

Vulnerability has also been defined as "a human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard" (UNDP, 2004). Vulnerability is a forward-looking ex-ante measure of household's well-being which shows that a household whether or not is poor today, will find itself poor tomorrow (CHAUDHURI, 2002). In another dimension today's poor may or may not be tomorrow's poor. Currently non-poor households, who face a high probability of a large adverse shock, may, on experiencing the shock, become poor tomorrow. And the currently poor households may include some who are only transitorily poor as well as other who will continue to be poor (or poorer) in the future. This definition was adopted for this study.

CHRISTIANSEN and SUBBARAO (2004) submitted that the need for addressing vulnerability in any development strategy in conjunction with poverty is twofold. First, not being vulnerable has intrinsic value. To be well, a person must not only have enough to live a comfortable life today, but he must also have good prospects today that he will have enough to live a comfortable life tomorrow. Put differently, to be well a person must not only be poor today; today he must also not be vulnerable. Poverty and vulnerability constitute two related, but distinct, dimensions of a person's well-being and both must be simultaneously fulfilled.

Second, addressing vulnerability also has instrumental value. Because of the many risks households face, they often experience shocks leading to a wide variability in their income. In the absence of sufficient assets or insurance to smooth consumption, such shocks may lead to irreversible losses, such as distress sale of productive assets, reduced nutrient intake, or interruption of education that permanently reduces human capital (JACOBY and SKOUFIAS, 1997), locking their victims in perpetual poverty.

There has been high incidence of poverty in the rural area in Nigeria and poverty studies have over the years used static rather than a forward looking concept in its analysis. Observed (static) poverty status might not be a good indicator of the household's general poverty risk (its vulnerability to poverty). Thus, recent literature has emphasized the need for poverty to be considered as a dynamic issue through vulnerability of households. However, empirical evidence of spatial dimensions of vulnerability is scarce in Nigeria, therefore, the vulnerability to poverty in Nigeria was investigated. The specific objective of this paper is to present the vulnerability to poverty profile of rural Nigeria across the geopolitical zones. This will give indicators that government should target in formulating policies for specific zones.

2 Theoretical Framework for Vulnerability

HODDINOTT and QUISUMBING (2003) identified three approaches to assessing vulnerability. These are vulnerability as expected poverty (VEP), vulnerability as low expected utility (VEU) and vulnerability as uninsured exposure to risk (VER). According to the authors, these three approaches share a common characteristic since each of them constructs a model that predicts a measure of welfare. Further VEP and VEU shares two characteristics viz: they make reference to benchmark for the welfare indicator and enunciate a probability of falling below this benchmark. VEP and VEU approaches measure vulnerability at individual level, summing over all individuals or households give a measure of aggregate vulnerability. However, VER according to HODDINOTT and QUISUMBING does not measure vulnerability because it does not construct probabilities. Instead, VER assesses whether observed shocks generate welfare losses.

VEP approach has advantage in terms of its capability to identify households “at risks” who are not poor and the fact that it can be estimated with single cross-sectional data, this study adopts the VEP approach as its theoretical framework. This becomes imperative since only cross sectional data are presently available in Nigeria to carry out welfare studies. Panel data are rare in developing countries, due to costs of data collection, panel data often suffer from small sample sizes and hence, lack of representativeness. Panel data sets in developing countries also tend to be of shorter durations and therefore not as comprehensive as required for vulnerability assessments. Therefore, the second best option to assess vulnerability to poverty is to use cross-sectional household surveys with detailed data on household characteristics, consumptions and incomes. CHAUDHURI et al. (2002) developed a methodology for estimating vulnerability to poverty using cross-sectional data.

Table 1. Approaches to vulnerability

	Vulnerability as expected poverty	Vulnerability as expected low utility	Vulnerability as uninsured exposure to risk
Definition	Vulnerability of household h at time t, V_{ht} is probability that household's welfare (consumption) at time t + 1 (c_{ht} + 1) will be below the benchmark (consumption poverty line, z): $V_{ht} = Pr(c_h, t + 1 = z)$	Difference between utility from certainty-equivalent consumption, Z_{CE} at/ above which household not considered vulnerable and expected utility of consumption. $V_h = U_i(Z_{CE}) – EU_h(c_h)$ or $V_h = [U_h(Z_{CE}) – Uh(E_{ch})] + [U_h (E\ c_h) - EU_h (c_h)]$	An *ex post* assessment of the extent to which a negative shock caused a welfare loss
How calculated	1. Predict consumption for each household. 2. Derive the variance of consumption for each household 3. Make assumptions regarding the distribution of consumption, the poverty threshold and the threshold probability value above which a household is considered vulnerable.	1. Make an assumption regarding the functional form regarding U. 2. Specify a conditional expectation of consumption Ech as a function of covariate and idiosyncratic/ household characteristics 3. Calculate the two parts of the vulnerability measure (the risk component can be further broken down into covariate, idiosyncratic and unexplained/ measurement error components).	1. Define $\Delta lnch_{tv}$ as the change in log consumption between t and = t-1, $S(i)_{tv}$ denote covariate shocks, $S(i)_{htv}$ idiosyncratic shocks, D_v community dummy variables, X household characteristics, d, b, λ , γ d, are parameters to be estimated and $\Delta\varepsilon_{htv}$ is the error term 2. Estimate: $\Delta Inc_{htv} = \lambda S(i)_{tv} + bS(i)_{htv} + dD_v + dX + \Delta\varepsilon_{htv}$
Advantages	• Produces "headline" vulnerability figure • May identify households "at risk" who are not poor • Relatively straightforward to calculate • Can be estimated with a single cross-section	• Not vulnerable subject to the perverse implications of the VEP measure • Provides clean disaggregation between vulnerability due to poverty and vulnerability due to uninsured risk • Can also be used to calculate an aggregate measure of vulnerability	• Can indicate whether covariate or idiosyncratic shocks are the principal cause of welfare losses. • Can be adapted to determine whether shocks have different effects across different groups. • Easy to estimate.
Disadvantages	• strong assumption that cross sectional variability captures temporal variability • Could generate wrong policy recommendations, that exposing households to increased levels of un-insured risk doesn't make them more Vulnerable	• Probably the hardest measure to calculate • Units of measurement somewhat difficult to convey to individuals with little formal training in economics.	• Does not produce a "headline" vulnerability estimate (though it can be adapted to estimate "cost of shocks") • ex post rather than ex-ante • Really requires panel data (with three or more rounds) to be credibly Estimated
e.g	CHAUDHURI et al. (2002)	LIGON and SCHECHTER (2004)	SKOUFIAS (2002), QUISUMBING, (2002)

Source: adapted from HODDINOTT and QUISUMBING (2003): 45f.

3 Methodology

Study Area

Nigeria is one of the Sub-Saharan African (SSA) nations located in the western part of Africa. The country has 36 states plus the Federal Capital Territory (FCT). Nigeria shares its boundaries with the Republic of Benin to the west, the Niger Republic to the north, the Republic of Cameroon and the Chad Republic to the east, and the Atlantic Ocean forms a coastline of about 960 km^2 to the south.

Sources of Data

The study used merged data from the National Living Standard Survey (NLSS) and NBS Annual Abstract of Statistics for the same year 2004. The National Living Standard Survey (2004) of households was carried out between September 2003 and August 2004.

Sampling Procedure

The NLSS covered both the urban and rural areas of all the 36 states of the federation including Federal Capital Territory. The sample design used was the two-staged stratified sampling. The first stage involves the Enumeration Areas (EAs), while Housing Units constitute the second stage. Clusters of 120 housing units called Enumeration Areas (EA) were randomly selected per state, **while sixty enumeration areas were selected at the Federal Capital Territory (FCT).** The second stage involved a random selection of 5 housing units from the selected EAs. A total of 600 households were randomly selected from each state and 300 from the FCT, summing up to 21,900 households in all. However, data available for the rural areas were 14,512 households. Data on consumption expenditure, demographic characteristics, education attainment, type of housing units available, membership of any social organisations and other socio-economic characteristics were got from NLSS. While state specific covariate data like unemployment rate, amount of rainfall, reported cases of armed robbery, reported cases of AIDS, malaria and river blindness were obtained from NBS Annual Abstract of Statistics.

Analytical Technique

Three Stage Feasible Generalized Least Squares Model

This study used the three-step feasible generalised least squares (FGLS) approach to assess the vulnerability of households to poverty. See CHAUDHURI (2002), the step by step method of 3-FGLS.

Decomposition of Vulnerability Sources

In order to inform policy, following the literature of (e.g. BIDANI and RICHTER, 2001; ALAYANDE and ALAYANDE, 2004; ONI and YUSUF; 2007), we divided the pool of vulnerable households into two mutually exclusive groups namely (i) those who are vulnerable due to the high volatility of their consumption and (ii) those who are vulnerable due to their low expected mean consumption. The objective to decompose sources of vulnerability to poverty was achieved by adopting equation 16. First chose a reference household with an associated bundle of characteristics, X_r. The vulnerability of other households was then assessed relative to this reference household. The difference between the vulnerability level of a household with characteristics X_h and that of the reference household was decomposed as follows

$$\hat{v}_h - \hat{v}_r = v\left(\hat{\mu}_h^c, \hat{\sigma}_h^c\right) - v\left(\hat{\mu}_r^c, \hat{\sigma}_r^c\right)$$

$$\left[v\left(\hat{\mu}_h^c \hat{\sigma}_h^c\right) - v\left(\hat{\mu}_r^c, \hat{\sigma}_h^c\right)\right]$$

$$\left[v\left(\hat{\mu}_h^c\right) - v\left(\hat{\mu}_r^c, \hat{\sigma}_r^c\right)\right]$$

Where

$\hat{v}_h$ = vulnerability level of household
$\hat{v}_r$ = vulnerability level of reference household
$\hat{\mu}_h^c$ = mean consumption of household
$\hat{\mu}_r^c$ = mean consumption of reference household
$\hat{\sigma}_h^c$ = variance of consumption of household
$\hat{\sigma}_r^c$ = variance of consumption of reference household

This decomposition exercise is useful because it can be explained as follows. If two groups in the population are estimated to be equally vulnerable relative to the reference household, but in one case it is due to low levels of mean consumption, and in the other because of high consumption variance. The appropriate policies for mitigating the vulnerability of these two groups will in general differ and it will therefore be important, for policy purposes, to be able to discriminate between the different sources of vulnerability.

4 Results and Discussion

Table 2 reveals that the average age in rural Nigeria is 47 ± 14.5years and the average household size is five. Mean unemployment rate is 13.90 ± 9.72 while the mean per capita household consumption expenditure was ₦31, 875.66 ± 43361.00 per annum.

Table 2. Mean value of sex, household size, unemployment and per capita expenditure in rural Nigeria

Variable	Mean	Standard deviation
Age	47.88	14.54
Household size	4.87	2.92
Unemployment Rate (%)	13.90	9.72
Per capita expenditure	31875.66	43361.69

Source: authors' computation

4.1 Determinants of Rural Household Consumption

The explanatory variables used in the regressions were chosen based on extensive review of various literatures on vulnerability to poverty: ONI and YUSUF, 2006; OYEKALE and OYEKALE, 2008; GAIHA et al., 2007; OLUWATAYO, 2007; CHRISTIAENSEN and SUBBARAO, 2004; ALAYANDE and ALAYANDE, 2004.

Tables 3, 4, 5, 6, 7 and 8 presents the regression results for consumption estimates for the six geopolitical zones in rural Nigeria. The results for log mean per capita consumption expenditure (MPCE) was later used to assess the level of vulnerability of households. First, to correct for multicollinearity, a pairwise correlation analysis was carried out to remove explanatory variables that were collinear and to select those that were highly correlated with the dependent variable. Household size and dependency ratio for instance, were found to be collinear with causing multicollinearity. However, dependency ratio was dropped because it was collinear other explanatory variables. Secondly, the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity was used to see if there was heteroskedasticity among the variables. Thirdly, omitted variable bias would have been removed as it moved from one stage to another. As indicated in the analytical framework, a three-stage Feasible Generalised Least Squares (FGLS) was used to estimate the variance and mean of consumption function.

Controlling for all other characteristics, in all the six geopolitical zones male headed households were found to be associated with significantly higher mean for future consumption. The age of the household heads affected log per capita household consumption negatively and is significant at ($P<0.01$) while the age squared affects log per capita consumption positively in the South-south, North-central and North-east. This means that the probability of a household per capita consumption decreases as age of the household head increases. However, the coefficient of age of the household heads in the South-east, South-west and North-west was negative and significant, indicating the non-linearity relationship with the log consumption per capita. Hence households with older heads fare better, that is have higher expectation of future consumption.

Household size has social and economic implications to household demand (DAUDA, 2002). Thus, the larger the household size the lower the per capita consumption. Household size was negative and significant ($P<0.01$), which implies that as household size increases per capita consumption decreases. A one percent increase in the household size, tertiary will increase per capita consumption by 0.62, 0.70, 0.65, 0.71, 0.87 and 0.92 percent in the South-south, South-east, South-west, North-central, North-east and North-west respectively. According to OKURUT et al. (2002) in a subsistence economy, the large household size tends to increase competition for land resource use between food crops and cash crops which coupled with declining soil productivity may result in low output leading to low consumption.

Also in all the zones household heads with secondary and tertiary education significantly affects per capita consumption positively except in the south-south where heads with secondary had a negative effect on per capita consumption. A one percent increase in the level of education; tertiary education will increase per capita consumption by 0.44, 0.29, 0.52, 0.55, 0.27 and 0.009 percent in the South-south, South-east, South-west, North-central, North-east and North-west, respectively. Education can affect the household's standard of living through a number of ways, it helps skill creation resulting in higher marginal productivity of labour that eventually enables them to engage in better paying jobs.

The household heads whose occupation is farming only had a positive effect on per capita consumption in the North-central zone. The use of modern wall as construction material increased per capita consumption by 0.34 percent in the south-west zone. Farm size of the household heads is an asset to the household was significant and had a positive effect on per capital consumption in the south-south, South-west, North-east and North-west zones. Electricity wass an important determinant of per capita consumption in all the zones except South-south. Owning a house was only significant in the South-south zone and had a positive relationship with per capita consumption. Access to credit was only significant in the North-west zone. Malaria cases had a negative effect on per capita consumption in the South-west and North-central. Also armed robbery cases had a negative effect on per capita consumption in the South-west and South-south. In the South-east and South-west HIV/AIDS had a negative effect on per capita consumption, implies that as the cases of HIV/AIDS increase, per capita consumption decreases.

Table 3. Last stage of the 3FGLS estimates for South-south

Variable	Coefficient	Std Err.	t	P>(t)	Marginal effect
ageyears	-.0007192	.0071826	-0.10	0.920	
ageyearsq	.0000528	.0000665	0.79	0.428	
sex	.1273819***	.0434242	2.93	0.003	1.222
Hhsize	-.1145348***	.0072856	-15.72	0.000	4.312
occ	-.1810408***	.0475384	-3.81	0.000	0.623
noedu	-.3859122***	.1044321	-3.70	0.000	0.292
pri	-.3663837***	.1129158	-3.24	0.001	0.088
secon	-.2405826**	.1003135	-2.40	0.017	0.532
tert	.0001855**	.000079	2.35	0.019	0.044
hytoilet	.0480009	.1385488	0.35	0.729	0.338
modernwall	.1584969***	.0370865	4.27	0.000	0.512
safewater	-.008958	.0754734	-0.12	0.906	0.402
houseown	.0997181**	.0448108	2.23	0.026	0.716
reason2	.0930735	.0727727	1.28	0.201	0.046
reason3	.0307774	.0547399	0.56	0.574	0.081
reason4	-.042017	.0627066	-0.67	0.503	0.074
reason5	.0839492	.0540566	1.55	0.121	0.092
reason6	-.0047633	.084158	-0.06	0.955	0.085
reason7	.1685907*	.096302	1.75	0.080	0.046
unemploy	(dropped)				
rain	(dropped)				
aids	1.09e-07	2.99e-06	0.04	0.971	
malaria	.000012	.0000389	0.31	0.759	
rivblind	-.0001948	.0005588	-0.35	0.727	
tempera	(dropped)				
humidity	(dropped)				
armrob	-.003238***	.0004419	-7.33	0.000	
memberco	.1524437	.1152794	1.32	0.186	0.953
credit	.0210143	.0365892	0.57	0.566	0.695
electricity	.0450646	.0421573	1.07	0.285	0.220
farmsize	.0004124***	.0001346	3.06	0.002	
singleroom	-.0838958	.1577557	-0.53	0.595	0.563
apart	.0159629	.1786015	0.09	0.929	0.033
duplex	-.1676292	.2099584	-0.80	0.425	0.008
wbuilding	-.0817514	.1586119	-0.52	0.606	0.381
cons	11.2862***	.5922464	19.06	0.000	

***significant at 1% **significant at 5% *significant at 10%
Observations 2,363 R Squared = 5,937 Adj R Squared = 5,751
Joint significance F() = Prob> F = 0.000

Source: authors' computation

Table 4. Last stage of the 3FGLS estimates for South-east

Variable	Coefficient	Std Err.	t	P>(t)	Marginal effect
ageyears	.0017726	.0063344	0.28	0.780	
ageyearsq	-.0000278	-.0000548	-0.51	0.612	
sex	.0505626**	.0207721	2.43	0.015	1.296
Hhsize	-.1089502***	.0058199	-18.72	0.000	4.522
occ	-.1446906***	.0347451	-4.16	0.000	0.709
noedu	.0332278**	.0161645	2.06	0.040	0.415
pri	-.0879422*	.0510126	1.72	0.085	0.115
secon	.1406669**	.0682552	2.06	0.039	0.414
tert	.0344867**	.0148799	2.32	0.020	0.029
hytoilet	.164698***	.0556567	2.96	0.003	0.076
modernwall	.1152091***	.0353298	3.26	0.001	0.068
safewater	.1101853*	.0621862	1.77	0.077	0.059
houseown	.0297547	.056309	0.53	0.597	0.892
reason2	.0946225*	.0533871	1.77	0.076	0.065
reason3	.0690124	.0493396	1.40	0.162	0.073
reason4	.0595824	.0812584	0.73	0.462	0.195
reason5	-.0002857	.0455114	-0.01	0.995	0.101
reason6	-.0100019	.0609761	-0.16	0.870	0.045
reason7	.1341713	.1142644	1.17	0.240	0.021
unemploy	(dropped)				
rain	(dropped)				
aids	-.0000107***	1.83e-06	-5.87	0.000	
malaria	9.47e-06	7.20e-06	1.32	0.188	
rivblind	-.0001454**	.0000679	-2.14	0.032	
tempera	(dropped)				
humidity	(dropped)				
armrob	-.0003095	.0013544	-0.23	0.819	
memberco	-.0436967	.1348714	-0.32	0.746	0.987
credit	.037818	.0315581	1.20	0.231	0.758
electricity	.0713031**	.0330349	2.16	0.031	0.312
farmsize	.0000912	.0001022	0.89	0.372	44.75
singleroom	-.086895	.1040597	-0.84	0.404	0.254
apart	.0073967	.1444603	0.05	0.959	0.016
duplex	-.1651336	.1592667	-1.04	0.300	0.004
wbuilding	-.0288319	.1017013	-0.28	0,777	0.709
cons	11.60533***	.372949	31.12	0.000	

***significant at 1% **significant at 5% *significant at 10%
Observations 2,351 R Squared = 5,766 Adj R Squared = 5,648
Joint significance F() = Prob> F = 0.000

Source: authors' computation

Table 5. Last stage of the 3FGLS estimates for South-west

Variable	Coefficient	Std Err.	t	P>(t)	Marginal effect
ageyears	.0087281	.008193	1.07	0.287	
ageyearsq	-.0000437	.0000724	-0.60	0.547	
sex	.1881789***	.0654401	2.88	0.004	1.231
Hhsize	-.1824939***	,0110796	-16.47	0.000	3.277
occ	-.0601786 ***	.0137467	-4.38	0.000	0.650
noedu	-.4990996***	.1533968	-3.25	0.001	0.512
pri	-.3221778*	.1788832	-1.80	0.072	0.036
secon	.3636699**	.1510486	2.41	0.016	0.368
tert	.1063971***	.0332724	3.20	0.001	0.052
hytoilet	-.0265071	.1080845	-0.25	0.806	0.047
modernwall	.0180492	.0490613	0.37	0.713	0.345
safewater	.034665	.1083562	0.32	0.749	0.080
houseown	-.0742133	.0478514	-1.55	0.122	0.661
reason2	.1744508**	.0800484	2.18	0.030	0.063
reason3	.0190307	.0737179	0.26	0.796	0.092
reason4	-.0045459	.0724176	-0.06	0.950	0.064
reason5	-.0276192	.0593724	-0.47	0.642	0.101
reason6	-.205684	.1820968	-1.13	0.259	0.067
reason7	.0892196	.1362705	0.65	0.513	0.032
unemploy	(dropped)				
rain	(dropped)				
aids	-.0000196***	3.97e-06	-4.93	0.000	
malaria	-.000055	.000095	-0.58	0.563	
rivblind	-.0002801***	.0000741	-3.78	0.000	
tempera	(dropped)				
humidity	(dropped)				
armrob	-.0050447***	.001324	-3.81	0.000	
memberco	.2658728***	.0745913	3.56	0.000	0.750
credit	.0288813	.0476061	0.61	0.544	0.239
electricity	.12306*	.0677972	1.82	0.070	0.201
farmsize	-.0003461**	.0001619	-2.14	0.033	38.70
singleroom	-1.024801**	.4111807	-2.49	0.013	0.708
apart	.8710851	.4560633	1.91	0.057	0.008
duplex	.1382789	.4123501	0.34	0.737	0.009
wbuilding	1.103384***	.4110336	2.68	0.007	0.268
Cons	12.6268***	.5525993	22.85	0.000	

***significant at 1% **significant at 5% *significant at 10%
Observations 1,193 R Squared = 6,298 Adj R Squared = 5,974
Joint significance F() = Prob> F = 0.000

Source: authors' computation

Table 6. Last stage of the 3FGLS estimates for North-central

Variable	Coefficient	Std Err.	t	P>(t)	Marginal effect
ageyears	-.0257219***	.0073092	-3.52	0.000	
ageyearsq	.0002624***	.0000722	3.64	0.000	
sex	.1673875**	.0846919	1.98	0.048	1.107
Hhsize	-.0922457***	.0068854	-13.40	0.000	4.921
occ	.1503127***	.0214299	7.01	0.000	0.710
noedu	-.3236357***	.0848739	-3.81	0.000	0.552
pri	-.2729875**	.1128619	-2.42	0.016	0.040
secon	.3408289***	.0904898	3.77	0.000	0.306
tert	.1244474**	.0593299	2.10	0.036	0.055
hytoilet	-.048187	.1142139	-0.42	0.673	0.059
modernwall	.085295*	.047069	1.81	0.070	0.245
safewater	.042866	.075315	0.57	0.569	0.089
houseown	-.032339	.0693085	-0.47	0.641	0.837
reason2	.03757	.0653688	0.57	0.566	0.071
reason3	.1100554**	.049001	2.25	0.025	0.077
reason4	.2287331***	.0828	2.76	0.006	0.034
reason5	-.0915414	.079149	-1.16	0.248	0.057
reason6	.0702954	.1215995	0.58	0.563	0.044
reason7	.3711887***	.1156273	3.21	0.001	0.032
unemploy	(dropped)				
rain	(dropped)				
aids	3.16e-06***	7.42e-07	4.26	0.000	
malaria	-.0001021***	.00002	-5.10	0.000	
rivblind	-.1462806	.0001056	0.32	0.752	
tempera	(dropped)				
humidity	(dropped)				
armrob	-.0011217	.0008547	-1.31	0.190	
memberco	-.1462806***	.0483911	-3.02	0.003	0.868
credit	.0338405	.0482206	0.70	0.483	0.845
electricity	.1811748***	.0553091	3.28	0.001	0.210
farmsize	-.0000827	.0001152	-0.72	0.473	48.51
singleroom	-.050403	.0939033	-0.54	0.592	0.684
apart	.010723	.1531055	0.07	0.944	0.023
duplex	.0401601	.164666	0,24	0.807	0.002
wbuilding	-.0258459	.0990645	-0.26	0.794	0.264
Cons	11.91375***	.3316357	35.92	0.000	

***significant at 1% **significant at 5% *significant at 10%
Observations 2,751 R Squared = 5,991 Adj R Squared = 5,788
Joint significance F() = Prob> F = 0.000

Source: authors' computation

Table 7. Last stage of the 3FGLS estimates for North-east

Variable	Coefficient	Std Err.	t	P>(t)	Marginal effect
ageyears	-.0097109*	.0051851	-1.87	0.061	
ageyearsq	.0001043*	.0000519	2.01	0.045	
sex	.1601504**	.0669142	2.39	0.017	1.044
Hhsize	-.087162***	.0045741	-19.06	0.000	5.243
occ	-.2038409***	.0559592	-3.64	0.000	0.872
noedu	-.038363**	.0184637	-2.08	0.038	0.695
pri	.0312182**	.0154806	2.02	0.044	0.027
secon	.0401233*	.022766	1.76	0.078	0.173
tert	.0654626***	.0189196	3.46	0.001	0.023
hytoilet	-.0910818	.0930222	-0.98	0.328	0.018
modernwall	.1648579***	.0432902	3.81	0.000	0.097
safewater	-.0205986	.0680298	-0.30	0.762	0.028
houseown	-.0364634	.0680081	-0.54	0.592	0.939
reason2	.0080747	.0404848	0.20	0.842	0.099
reason3	-.0297986	.042418	-0.70	0.482	0.087
reason4	-.0235742	.1082794	-0.22	0.828	0.021
reason5	.0694024	.0498057	1.39	0.164	0.064
reason6	.1179334	.1624063	0.73	0.468	0.014
reason7	.0988188	.0968401	1.02	0.308	0.021
unemploy	(dropped)				
rain	(dropped)				
aids	-5.56e-06	4.26e-06	-1.30	0.192	
malaria	(dropped)				
rivblind	-.0007523	.001167	-0.64	0.519	
tempera	(dropped)				
humidity	(dropped)				
armrob	-.0009568	.0009515	-1.01	0.315	
memberco	.0654073**	.0275308	2.38	0.018	0.705
credit	.0503743	.0316814	1.59	0.112	0.793
electricity	.1677033***	.0502277	3.34	0.001	0.068
farmsize	.0001855**	.000079	2.35	0.019	50.11
singleroom	.2674308***	.0867719	3.08	0.002	0.860
apart	.4145389***	.1223412	3.39	0.001	0.025
duplex	.722718***	.2154976	3.35	0.001	0.002
wbuilding	.4095467***	.0981255	4.17	0.000	0.096
cons	10.97837***	.5536897	19.83	0.000	

***significant at 1% **significant at 5% *significant at 10%
Observations 2,732 R Squared = 5,968 Adj R Squared = 5,833
Joint significance F() = Prob> F = 0.000

Source: authors' computation

Table 8. Last stage of the 3FGLS estimates for North-west

Variable	Coefficient	Std Err.	t	P>(t)	Marginal effect
ageyears	.0106578**	.0049944	2.13	0.033	
ageyearsq	-.0001107**	-.000049	-2,26	0,024	
sex	-.0468964**	.0205637	-2.28	0.023	1.01
Hhsize	-.0770964***	.003639	-21.19	0.000	5.844
occ	-.1542815***	.0207343	-7.44	0.000	0.922
noedu	-.186539***	.0280045	-6.66	0.000	0.630
pri	-.0796306**	.034062	-2.34	0.019	0.022
secon	.0423824*	.0222539	1.90	0.057	0.109
tert	.4996888***	.1454131	3.44	0.001	0.009
hytoilet	.4559324***	.114497	3.98	0.000	0.008
modernwall	.1266351**	.0509802	2.48	0.013	0.056
safewater	-.0082983	.0526459	-0.16	0.875	0.064
houseown	.0441639	.0868972	0.51	0.611	0.977
reason2	-.0013197	.0375832	-0.04	0.972	0.074
reason3	-.0548605	.0365485	-1.50	0.134	0.063
reason4	.0846045	.0839139	1.01	0.313	0.015
reason5	-.0556763	.0487418	-1.19	0.234	0.044
reason6	.2323077	.1350424	1.72	0.086	0.012
reason7	.1556365	.1192001	1.31	0.192	0.032
unemploy	.0271061	.0605114	0.45	0.654	
rain	(dropped)				
aids	.0000274	.000064	0.43	0.669	
malaria	.0000467	.000152	0.31	0.759	
rivblind	.0003295	.0009808	0.34	0.737	
tempera	(dropped)				
humidity	(dropped)				
armrob	-.0168281	.062706	-0.27	0.788	
memberco	.0388874	.0250431	1.55	0.121	0.712
credit	.085154***	.0313558	2.72	0.007	0.857
electricity	.1877269***	.0450665	4.17	0.000	0.070
farmsize	.0003553**	.0001743	2.04	0.042	
singleroom	.0077038	.1559942	0.05	0.961	0.820
apart	-.1874928	.2039958	-0.92	0.358	0.030
duplex	.0437432	.2604744	0.17	0.867	0.004
wbuilding	-.1469904	.1597172	-0.92	0.358	0.132
cons	7.634223	7.20898	1.06	0.291	

***significant at 1% **significant at 5% *significant at 10%
Observations 3,122 R Squared = 5,638 Adj R Squared = 5,833
Joint significance F() = Prob> F = 0.000

Source: authors' computation

4.2 Vulnerability/Observed Poverty Profile across Geopolitical Zones in Nigeria

The vulnerability/observed poverty profile for demographic and idiosyncratic characteristics for the six geopolitical zones are on tables 10, 11 and 12.

Geopolitical Zones

At the standard vulnerability threshold of 0.5, table 9 shows that vulnerability to poverty (VP) is highest in North-east (71.0%), while it is lowest in the South-west (28.8%). Vulnerability to poverty in South-south, South-east, North-west and North-central are 59.6%, 36.4%, 68.6% and 69.3%, respectively. Although expected poverty in the northern zones was higher than the southern zones, the South-south had the highest ratio of expected/ observed poverty of 1.12. The relativity of predicted poverty to the observed poverty level shows that for every hundred poor people in the South-south, 12 more are expected to be poor in the future. Households are expected to move out of poverty in all the other geopolitical zones in the future.

Table 9. Expected/observed poverty profile of rural households in Nigeria by demographic/socioeconomic characteristics across the six geopolitical zones

Demographic\socioeconomic characteristics	Expected poverty	Observed poverty	Expected\observed poverty ratio
Geopolitical zone			
South-south	0.5969	0.5329	1.12
South-east	0.3643	0.4198	0.86
South-west	0.2886	0.4677	0.61
North-east	0.7107	0.7362	0.96
North-west	0.6964	0.7095	0.98
North-central	0.6632	0.6953	0.95

Source: authors computation

The educational attainment of household heads was a very important determinant of poverty and vulnerability to poverty. In general, people who live in households headed by individuals with less education are poorer and more vulnerable to poverty. In the North-east, North-central and North-west household heads with no formal education had the highest expected poverty. For every 100 poor households, 14, 15 and 10 more households will become poor for households whose head do not have any formal education in the North-central, North-east and North-west, respectively, in the future.

While households in the southern part of Nigeria expected poverty is highest in households with primary education, for every 100 poor households with heads having primary school education, 11, 46 and 9 more households will become poor in the South-south, South-east and South-west, respectively, in the future. This might be so the southern part of Nigeria because households head with no formal education might be willing to any kind of odd job which a primary school certificate holder may consider unattractive. They might not get the types of jobs they want and for this reason resolve to remain unemployed. However, tertiary education had the lowest expected poverty in all the zones. JALAN et al. (1999); RAVALLION (2000); ONI and YUSUF (2007), for Pakistan, China and Nigeria, respectively, found similar evidence that households with maximum education higher than secondary school level face significantly lower vulnerability than those with lower educational attainment.

Tables 10, 11 and 12 shows that in all the zones expected poverty is higher in households from the farming occupational group than households from the non-farming group except in the North-central zone where the reverse is the case. For every 100 poor households, 9, 19, 4, 6 and 14 more households will become poor among farming households in the South-south, South-east, South-west, North-east and North-west respectively in the future. Farming is affected by a number of factors that cannot be controlled by individuals. Some of them still use primitive methods on their farmlands. This may reduce their output and in turn their income and consumption. In the South-west both the farming and non-farming groups have high probability of exiting poverty. In South-south both farming and non-farming will probably not exit poverty in the future. In the South-east, North-east and North-west non farming will exit poverty while farming will not. According to ERSADO (2006) in his study in Serbia, households and regions with greater share of their livelihood sources depending on agricultural activities are more at risk of vulnerability and poverty than those with a significantly higher share coming from non-agricultural sources.

An assessment of the gender of household head showed that the poverty and vulnerability to poverty index of the male headed household is higher than that of their female counterparts. The predicted/observed poverty ratio of female headed households was 0.91 in the South-south, 0.82 in the South-east, 0.74 in the South-west, 0.98 in the North-central, 1.08 in the North-east and 0.84 in the North-west. The result shows that female household heads are likely to exit poverty in all the zones except North-east. On the other hand, the male headed households will only exit poverty in the South-west and North-west.

There was no clear effect of age of household heads on household vulnerability. For instance, in all the zones households with an older head (60 years and above) tend to have a low expected/observed poverty ratio. This means that all the households in this category are likely to exit poverty in future except in the south-west zone. In contrast, household heads with ages between 40-49 years and 50-59 years in the South-west and South-east will probably be vulnerable to poverty in future. In the North-west, however, all the households in their different age groups will probably exit poverty in future. The households headed by age group between 10-19 years will be vulnerable to poverty. The age group between 40-49 years in the South-south will exit poverty. The age group between 30-39 years and 40-49 years in the North-Central is likely to exit poverty.

Poverty and vulnerability as expected increased with larger household size in all the zones. Household size is smaller in the south than in the north. In the South-south, South-east and South-west, household size between 1-5 and 6-10 members will probably exit poverty while 11-15 members will probably be more vulnerable to poverty. In the North-central, household size between 1-5 and 6-10 members will exit poverty while the other groups, 11-15 and 16-20 members will probably be vulnerable to poverty. In the North-east, household size between 6-10 members will probably exit poverty, while the other groups 1-5, 11-15, 16-20 and above 20 will be vulnerable to poverty. In the North-west household size between 1-5 and 6-10 members will probably exit poverty while the groups between 11-15, 16-20 above 20 are likely to be vulnerable to poverty. MCCULLOCH and BAULCH (2000), JALAN and RAVALLION (1999 and 2001), ALIBER (2001) and ONI and YUSUF (2007) had similar evidence from Pakistan, rural China, South Africa and Nigeria, respectively.

Access to electricity had a significant role to play in the reduction of poverty and vulnerability across the zones. In all the zones, households that have access to electricity had better chances of exiting poverty and those without electricity will probably be vulnerable to poverty in the future. Expected poverty was 0.92, 0.96, 0.86, 0.90, 0.96 and 0.98 for South-south, South-east, South-west, North-central, North-east and North-west, respectively.

Table 10. Expected/observed poverty profile of rural households by demographic/ idiosyncratic characteristics in the South-south and South-east

Demographic\ socioeconomic characteristics	SS expected poverty	Observed poverty	Expected\ observed poverty ratio	SE expected poverty	Observed poverty	Expected\ observed poverty ratio
Educational level						
No formal education	0.4812	0.5316	0.90	0.4994	0.4362	1.14
Primary education	0.6188	0.5550	1.11	0.6380	0.4368	1.46
Secondary education	0.4653	0.4984	0.93	0.3375	0.4102	0.82
Tertiary education	0.3396	0.3458	0.98	0.2497	0.3145	0.79
Farming/non-farming						
Farming	0.5899	0.5401	1.09	0.5439	0.4539	1.19
Non-farming	0.4876	0.4480	1.08	0.3264	0.3587	0.90
Gender						
Male	0.4867	0.5141	0.94	0.4865	0.4408	1.10
Female	0.4099	0.4493	0.91	0.3015	0.3670	0.82
Age household head						
10-19yrs	0.5033	0.4701	1.07	0.5333	0.5285	1.00
20-29yrs	0.3909	0.3563	1.09	0.4385	0.4657	0.94
30-39yrs	0.4706	0.4029	1.16	0.5344	0.4112	1.29
40-49yrs	0.4903	0.5125	0.95	0.5350	0.4723	1.13
50-59yrs	0.4233	0.4412	0.95	0.5350	0.4508	1.17
60 and above	0.2781	0.3863	0.71	0.5084	0.5776	0.81
Household size						
1-5	0.4405	0.4514	0.97	0.3571	0.3651	0.97
6-10	0.5227	0.6250	0.83	0.5315	0.5335	0.99
11-15	0.6595	0.6115	1.07	0.6785	0.5711	1.18
16-20	--------	--------	-----	--------	--------	-----
>20	--------	--------	-----	--------	--------	-----
Access to electricity						
Yes	0.4607	0.4992	0.92	0.4088	0.4240	0.96
No	0.4851	0.5030	0.96	0.4557	0.4488	1.01
Access to drinking water						
Yes	0.3243	0.3604	0.90	0.4577	0.4760	0.96
No	0.4270	0.3652	1.17	0.4913	0.4890	1.00
Modern wall						
Yes	0.3600	0.4509	0.80	0.4597	0.4129	1.11
No	0.4250	0.3596	1,18	0.4125	0.3979	1.05

Source: authors' computation

Table 11. Expected/observed poverty profile of rural households by idiosyncratic characteristics in the South-west and North-central

Demographic\ socioeconomic characteristics	SW expected poverty	Observed poverty	Expected\ observed poverty ratio	NC expected poverty	Observed poverty	Expected\ observed poverty ratio
Educational level						
No formal education	0.4769	0.4566	1.04	0.7602	0.6625	1.14
Primary education	0.6125	0.5592	1.09	0.5029	0.5874	0.85
Secondary education	0.4172	0.4912	0.84	0.3647	0.4122	0.88
Tertiary education	0.3118	0.3606	0.86	0.3019	0.3838	0.78
Farming/non-farming						
Farming	0.5008	0.4805	1.04	0.5896	0.6174	0.95
Non-farming	0.3925	0.4627	0.84	0.6495	0.6309	1.02
Gender						
Male	0.3115	0.4953	0.62	0.6729	0.6259	1.07
Female	0.2789	0.3757	0.74	0.5438	0.5501	0.98
Age household head						
10-19yrs	0.3402	0.3776	0.90	0.5533	0.5867	1.18
20-29yrs	0.3725	0.3906	0.95	0.5942	0.4930	1.20
30-39yrs	0.3817	0.4496	0.84	0.5961	0.5704	0.97
40-49yrs	0.5713	0.5233	1.09	0.6914	0.6532	0.98
50-59yrs	0.5666	0.4932	1.14	0.6928	0.6712	1.02
60 and above	0.4963	0.4321	1.14	0.5403	0.6799	0.87
Household size						
1-5	0.3822	0.4277	0.89	0.5263	0.5929	0.88
6-10	0.3293	0.4241	0.77	0.6785	0.6849	0.99
11-15	0.6	0.5146	1.04	0.9568	0.9203	1.03
16-20	--------	--------	-----	1	0.9634	1.03
>20	--------	--------	-----			
Access to electricity						
Yes	0.4025	0.4632	0.86	0.5310	0.5856	0.90
No	0.4922	0.4685	1.05	0.5715	0.6189	0.92
Access to drinking water						
Yes	0.2418	0.3343	0.72	0.2958	0.4162	0.71
No	0.3500	0.3448	1.01	0.4599	0.4288	1.07
Modern wall						
Yes	0.1666	0.2274	0.72	0.4493	0.3688	1.21
No	0.2430	0.1889	1.29	0.5454	0.4282	1.27

Source: authors' computation

Table 12. Expected/observed poverty profile of rural households by idiosyncratic characteristics in the North-east and North-west

Demographic\ socioeconomic characteristics	NE expected poverty	Observed poverty	Expected\ observed poverty ratio	NW expected poverty	Observed poverty	Expected\ observed poverty ratio
Educational level						
No formal education	0.7188	0.6591	1.15	0.6613	0.6414	1.10
Primary education	0.6861	0.6343	1.08	0.4845	0.5545	0.87
Secondary education	0.4659	0.5600	0.83	0.3474	0.4782	0.72
Tertiary education	0.3566	0.3733	0.95	0.3117	0.3879	0.80
Farming/non-farming						
Farming	0.7179	0.6741	1.06	0.7688	0.6686	1.14
Non-farming	0.4557	0.4602	0.99	0.5141	0.4338	0.95
Gender						
Male	0.6809	0.6330	1.07	.3874	.4156	0.93
Female	0.5429	0.5016	1.08	.3142	.3740	0.84
Age household head						
10-19yrs	0.5	0.5235	0.95	0.4333	0.5279	0.82
20-29yrs	0.5618	0.5543	1.01	0.3843	0.4562	0.84
30-39yrs	0.6719	0.6134	1.09	0.4174	0.5673	0.73
40-49yrs	0.6744	0.6400	1.05	0.5112	0.6434	0.79
50-59yrs	0.4278	0.5621	0.76	0.5176	0.6364	0.81
60 and above	0.4431	0.5343	0.82	0.5095	0.6452	0.78
Household size						
1-5	0.5978	0.5671	1.05	0.4594	0.5359	0.85
6-10	0.5759	0.6942	0.82	0.5812	0.6657	0.87
11-15	0.7813	0.7587	1.02	0.7581	0.7321	1.03
16-20	0.7884	0.7745	1.01	0.7583	0.7126	1.06
>20				0.8500	0.8224	1.03
Access to electricity						
Yes	0.5972	0.6198	0.96	0.5779	0.5887	0.98
No	0.6448	0.6272	1.02	0.6089	0.6455	0.94
Access to drinking water						
Yes	0.6088	0.6358	0.95	0.3662	0.4042	0.91
No	0.7390	0.6870	1.17	0.4552	0.4386	1.04
Modern wall						
Yes	0.7000	0.7392	0.94	0.3000	0.3395	0.88
No	0.7357	0.6063	1.21	0.3744	0.4005	0.93

Source: authors' computation

4.3 Decomposition of Expected Poverty by Sources

Understanding the source of vulnerability is a prerequisite for formulating a appropriate social risk management strategy. The decomposition of the expected poverty was arrived at by comparing the expected poverty of household, with a reference household which is the one with the highest level of expected poverty in the population. The decomposition was done based on the significant variables in the 3FGLS. This led to the selection of variables relating to geographical zonings, educational status, occupation, gender, age of household head and household size. This decomposition was done by estimating the relativity of the expected per capita consumption of a given household to the household with the highest level of expected poverty keeping the variance constant. The difference in the variance of expected consumption was obtained using the relativity of the variance of a given household to the reference household keeping the expected log of consumption constant. The results of the decomposition are presented in Tables 13, 14 and 15.

In the south-south zone household heads with tertiary education had the highest average consumption and second lowest consumption variance. Household heads with primary education had the highest consumption variance (0.06945). The predicted poverty of female headed households is driven more by high consumption variance. Farming households had the highest mean consumption (0.04334) and the lowest consumption variance (0.00128). The key mitigating strategies against high level of expected poverty among non-farming households is raising per capita consumption and stabilizing consumption. Female headed households had the highest mean consumption (0.04276) and the highest consumption variance (0.05075).

While in the South-east household heads having secondary school education (0.06055) had the highest mean consumption followed by household heads with tertiary education (0.05866). Also household heads having secondary school education had the lowest consumption variance (0.00065) followed by household heads with tertiary education (0.00887). Household heads without any formal education had the highest consumption variance. This suggests that consumption smoothening strategies should be the key policy focus to mitigate expected poverty. Male headed households and non-farming households had the highest mean consumption and the lowest consumption variance when compared with their female headed and non-farming households. This suggests that the expected poverty of female headed households is driven more by low mean consumption and high consumption variance. In the South-west zone household heads with tertiary education had the highest mean consumption and highest consumption variance. This suggests that consumption smoothening should be the key policy focus to mitigate expected poverty. Farming (0.02317) and non-farming (0.02395) households had almost the same mean consumption but farming had the highest consumption variance. This suggests that both consumption smoothening should be the key policy focus to mitigate expected poverty. Female headed households had the highest mean consumption (0.02525) and the lowest consumption variance (0.10300). Household size between 1-5 (0.04168) members had the lowest mean consumption and the lowest consumption variance.

In the North-central zone household heads with tertiary education had the highest average consumption and highest consumption variance; therefore, consumption smoothening strategies are key to mitigating against expected poverty. Male headed households (0.0563) and farming households (0.05618) had the highest mean consumption and the lowest consumption variance when compared with their female headed (0.05252) and non-farming households (0.05540). This suggests that the expected poverty of female headed households is driven more by low mean consumption and high consumption variance.

In the North-east zone household heads with secondary education and farming as their primary occupation had the highest average consumption and highest consumption variance; therefore consumption smoothening strategies are key to mitigating against expected poverty. Female headed households had the lowest mean consumption (0.00697) and the highest consumption variance (0.0894). The key mitigating strategies against high level of expected poverty among female headed households is raising per capita consumption and stabilizing consumption. Households with more than twenty members had the highest expected poverty, lowest mean consumption (0.0082) and lowest consumption variance.

In the North-west households with tertiary education had the highest mean consumption and the second lowest consumption variance. Farming households had the highest mean consumption (0.3165) and the lowest variance (0.1373). Female headed households had the highest mean consumption but the highest consumption variance. This suggests that the expected poverty of female headed households is driven more by high consumption variance.

Table 13. Decomposed different sources of expected poverty among rural households in the South-south and the South-east zone

Demographic\ socioeconomic characteristics	SS expected poverty	Mean consump-tion index	Consump-tion variance index	SE expected poverty	Mean consump-tion index	Consump-tion variance index
Educational level						
No formal education	0.4466	0.04260	0.01768	0.5938	0.04692	0.05264
Primary education	0.4122	0.03955	0.06945	0.5378	0.05741	0.01811
Secondary education	0.3322	0.04117	0.01225	0.4334	0.06055	0.00065
Tertiary education	0.1859	0.04459	0.01962	0.3839	0.05866	0.00887
Farming/non-farming						
Farming	0.4811	0.04334	0.00128	0.5618	0.04887	0.01505
Non-farming	0.3808	0.03938	0.01999	0.5052	0.06378	0.04204
Gender						
Male	0.4318	0.04131	0.00196	0.4549	0.05407	0.02232
Female	0.3269	0.04276	0.05075	0.4709	0.05456	0.03080
Age household head						
10-19yrs	0.5000	0.03755	0.00921	0.4960	0.01013	0.02073
20-29yrs	0.3948	0.04371	0.01549	0.3505	0.05947	0.02725
30-39yrs	0.3061	0.04106	0.00888	0.3620	0.05018	0.01823
40-49yrs	0.4940	0.03980	0.00512	0.4519	0.05914	0.01848
50-59yrs	0.4371	0.03992	0.00299	0.4656	0.05251	0.02331
60 and above	0.2785	0.04545	0.01963	0.3293	0.05309	0.03147
Household size						
1-5	0.4411	0.04168	0.00698	0.3373	0.05325	0.02037
6-10	0.4944	0.04148	0.00794	0.5073	0.05887	0.03294
11-15	0.4753	0.04160	0.00795	0.5485	0.01959	0.04642
16-20	--------	--------	--------	--------	--------	--------
>20	--------	--------	--------	--------	--------	--------

Source: authors' computation

Table 14. Decomposed different sources of expected poverty among rural households in the South-west and the North-central zone

Demographic\ socioeconomic characteristics	SW expected poverty	Mean consump-tion index	Consump-tion variance index	NC expected poverty	Mean consump-tion index	Consump-tion variance index
Educational level						
No formal education	0.3242	0.02366	0.09022	0.5938	0.05320	0.01665
Primary education	0.2758	0.02287	0.14140	0.5378	0.04693	0.03642
Secondary education	0.1486	0.02364	0.23660	0.4334	0.05072	0.01926
Tertiary education	0.3367	0.02572	0.15230	0.3839	0.06897	0.02524
Farming/non-farming						
Farming	0.2623	0.02317	0.17620	0.5618	0.05618	0.01751
Non-farming	0.2347	0.02395	0.13880	0.5052	0.05540	0.02038
Gender						
Male	0.3804	0.02328	0.18460	0.4549	0.05635	0.01820
Female	0.1285	0.02525	0.10300	0.4709	0.05252	0.02212
Age household head						
10-19yrs	0.3333	0.02436	0.41031	0.4960	0.06240	0.02655
20-29yrs	0.0503	0.02473	0.35870	0.3505	0.06705	0.02324
30-39yrs	0.1441	0.02370	0.19230	0.3620	0.06230	0.01984
40-49yrs	0.3276	0.02257	0.12500	0.4519	0.05475	0.01691
50-59yrs	0.4300	0.02346	0.11840	0.4656	0.04942	0.01695
60 and above	0.2534	0.02433	0.14410	0.3293	0.04942	0.01907
Household size						
1-5	0.1560	0.02489	0.19480	0.3163	0.05896	0.02186
6-10	0.5808	0.01932	0.05018	0.6785	0.05081	0.01382
11-15	0.9000	0.01907	0.00981	0.9568	0.04247	0.00327
16-20	--------	--------	--------	1	0.03476	0.00253
>20	--------	--------	--------	---------	---------	---------

Source: authors' computation

Table 15. Decomposed different sources of expected poverty among rural households in the North-east and the North-west zone

Demographic\ socioeconomic characteristics	NE expected poverty	Mean consump-tion index	Consump-tion variance index	NW expected poverty	Mean consump-tion index	Consump-tion variance index
Educational level						
No formal education	0.7365	0.01618	0.04235	0.4845	0.02688	0.06137
Primary education	0.6500	0.01492	0.1494	0.2615	0.03036	0.06215
Secondary education	0.5313	0.01613	0.05278	0.1554	0.03188	0.01149
Tertiary education	0.3125	0.02220	0.04752	0.0967	0.03668	0.03014
Farming/non-farming						
Farming	0.7746	0.01708	0.04782	0.4414	0.02756	0.05428
Non-farming	0.7248	0.01291	0.04421	0.1740	0.03165	0.01375
Gender						
Male	0.6293	0.01664	0.06833	0.3804	0.02850	0.05241
Female	0.6504	0.00697	0.08942	0.1285	0.02868	0.04926
Age household head						
10-19yrs	0.3750	0.02721	0.08014	----------	0.04034	0.01379
20-29yrs	0.5822	0.02016	0.03654	0.2254	0.03212	0.03834
30-39yrs	0.6421	0.01619	0.07729	0.3261	0.02954	0.04118
40-49yrs	0.6445	0.01445	0.07629	0.4048	0.02816	0.04811
50-59yrs	0.6810	0.01237	0.07616	0.3968	0.02811	0.04242
60 and above	0.6026	0.02018	0.06042	0.4266	0.02703	0.04628
Household size						
1-5	0.6289	0.01667	0.05879	0.3109	0.03030	0.04785
6-10	0.6366	0.01594	0.8155	0.4145	0.02751	0.04222
11-15	0.7992	0.01238	0.09078	0.4981	0.02503	0.03467
16-20	0.7884	0.02550	0.09084	0.5000	0.02169	0.02304
>20	1.0000	0.00822	0.02366	0.7500	0.02049	0.00356

Source: authors' computation

5 Conclusion and Policy Recommendation

In this paper, vulnerability was considered alongside static poverty for rural Nigeria because the current poverty level may not necessarily be a good guide to expected poverty in the future. Expected poverty approach was used to assess vulnerability. The key factors that impact significantly on rural household's consumption differ in the different geopolitical zones. In all the zones, household heads with no formal education, household size and high unemployment rate had negative effect on consumption. On the other hand household heads with tertiary education had a positive impact on consumption in all the zones. Policies that can lead to an improvement in education, reduction in household size and unemployment rate is highly recommended. Access to electricity had positive effect on consumption in all the zones except South-south zone. Farm size had positive effect on consumption in the South-south, South-west, North-east and North-west. Government should facilitate easy and timely access to electricity and farm land in these zones.

The rural North-eastern part of Nigeria had the highest level of expected poverty, while the South-west has the least expected poverty level. Rural households in the northern zones of Nigeria have high expected poverty values than the southern zones. Poverty alleviation programmes should intensified especially in the North-east and other zones in the North. Education was found to be a key element in reducing vulnerability to poverty. For every 100 poor households, 14, 15 and 10 more households will become poor for households whose head do not have any formal education in the North-central, North-east and North-west, respectively, in the future. In the southern part of Nigeria expected poverty is highest in households with primary education. For every 100 poor households with heads having primary school education, 11, 46 and 9 more households will become poor in the South-south, South-east and South-west, respectively, in the future. Households headed by individuals with more than secondary school education were significantly better poised to cope with risk and uncertainty. In essence, investment in human capital along with other means of social protection for this group will be instrumental to poverty reduction in Nigeria.

There is an evidence of higher level of poverty among rural farming households (whether predicted or observed) when compared to their rural non-farming household counterpart except in the North-central zone. In the South-east, North-east and North-west non farming will exit poverty while farming will not. Agricultural household are also more vulnerable than non-agricultural households, which indicate the need for more protection of the agricultural community in all the zones except North-central zone. Government at all levels should encourage farmers on the need to adopt improved or modern agricultural technology as it will translate to increased output and invariably improve income of the households. Also farming households should be targeted for social protection and poverty reduction programmes aimed at reducing adverse shocks and removing bottlenecks in production and marketing of produce.

The result by decomposing vulnerability by age groups shows that the younger age groups, who are endowed with greater human capital stock, are less vulnerable and show greater resilience to vulnerability. Decomposition by household size shows that large household size from 6-10 members will obviously face the risk of grappling with lower per capita income in future, given Nigerians' ever dwindling purchasing power, and are likely to become poorer in future.

In all the zones households with an older head (60 years and above) tend to have a low expected/observed poverty ratio except in the south-west zone. This means that all the households in this category are likely to exit poverty in future. In contrast, household heads with ages between 40-49 years and 50-59 years in the South-west and South-east will probably be vulnerable to poverty in future. In the North-west, however, all the households in their different age groups will probably exit poverty in future. The households headed by age group between 10-19 years will be vulnerable to poverty. The age group between 40-49 years in the South-south will exit poverty. The age group between 30-39 years and 40-49 years in the North Central is likely to exit poverty. The groups that vulnerable to poverty in each zone should be targeted for social protection policies

Rainfall affects consumption per capita positively therefore efforts should be made to irrigate farms and stop relying solely on rainfall since inadequate rainfall can affect average consumption and cause or increase expected poverty.

Malaria cases had a negative effect on per capita consumption in the South-west and North-central. In the South-south malaria has a devastating effect on the expected poverty of household when it occurs. The government needs to intensify anti malaria campaign especially in the South-south. A healthy and energized citizenry raises the country's chances for sustainable development and prosperity which in turn will reduce the incidences of poverty in the country.

The consumption variance index is 0.0326, 0.0481 and 0.0373 in South-south, South-east and South-west which is higher than the national average of 0.0284; therefore, consumption smoothening strategies are key to mitigating against expected poverty. While the mean consumption index is 0.0195, 0.0228 and 0.0119 in the North-east, North-west and North-central lower than the national average of 0.0585. The key mitigating strategies against high level of expected poverty in these zones is raising per capita consumption. Rural households in the North-east zone have the least mean consumption followed by North-central, South-east and South-west has the highest consumption variance. In general, mean consumption increases with the level of educational status. On the other hand, the consumption variance is highest for households headed by primary school leavers in the South-south and North-east, consumption variance is also highest for household heads with tertiary education in the South-west and North-central. Male headed households have lower mean consumption and higher consumption variance compared with female headed households in the South-west and North-west zones. Logically therefore, and consumption smoothening strategies are key to mitigating against expected poverty of male headed households. In the North-central and North-east, the female headed households had the lowest mean consumption and the highest consumption variance. The key mitigating strategies against high level of expected poverty among female headed households is raising per capita consumption and stabilizing consumption.

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