

Vulnerability to Poverty among Rural Households in Northeastern and Southwestern Nigeria

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Abstract

This study examined determinants of poverty vulnerability among rural households in Nigeria's North-East and South-West zones using the General Household Survey, Wave 5. Poverty was measured with the Foster–Greer–Thorbecke indices. The poverty line was set at two-thirds of mean per capita consumption. Vulnerability was estimated as expected poverty with a three-stage Feasible Generalized Least Squares (FGLS) model. Households with a probability of 0.5 or more were classified as vulnerable. The determinants of vulnerability were analyzed with a fractional logit model, reported as average marginal effects. Overall poverty incidence was 79.7% (North-East 88.6%, South-West 49.8%). Overall vulnerability was 77.7%, 95.4% in the North-East, and 18.0% in the South-West. Vulnerability to poverty largely depends on the socio-economic and demographic features of the rural dwellers. Access to social protection, education and productive assets ranked highest among the coping strategies.

Keywords: Vulnerability to Poverty; GHS-wave 5; Vulnerability as Expected Poverty; fractional logit; Nigeria

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1.0 Introduction

Poverty is a multidimensional phenomenon affecting millions of people, particularly in developing countries. It is still a major development challenge in Nigeria, particularly in rural areas where livelihoods depend heavily on agriculture and households are exposed to production, environmental, market, and other shocks. More recent national evidence indicates substantial deprivation, with the National Bureau of Statistics (NBS) reporting that 63% of Nigerians were multidimensionally poor in 2022 (National Bureau of Statistics,

2022). Poverty levels also vary considerably across states, with the incidence of multidimensional poverty ranging from 27% in Ondo State to 91% in Sokoto State. This substantial variation indicates that multidimensional deprivation is considerably more prevalent in Sokoto State than in Ondo State, particularly across dimensions such as health, education, and living standards (NBS, 2022).

The variations in poverty across regions sometimes depend on the measurement approach. Conventional measures based on

income or consumption provide relatively static assessments of welfare and may not fully capture changes in household welfare over time. Evidence from longitudinal studies shows that households frequently move into and out of poverty, highlighting the distinction between chronic and transitory poverty. These limitations have increased interest in vulnerability to poverty, which focuses on the risk of future poverty and households' capacity to withstand adverse shocks (Ward, 2016). Generally, Vulnerability is a multidisciplinary concept applied across fields such as sociology, public health, geography, and disaster studies. Broadly, it refers to the susceptibility of individuals or groups to risks and potential losses. Recent literature emphasizes that vulnerability is shaped by structural inequalities and socio-economic conditions that influence exposure, sensitivity, and coping capacity (Biswas and Nautiyal, 2023).

Vulnerability to poverty adds a forward-looking dimension by measuring the probability that a household will fall below the poverty line based on its expected future consumption (Chaudhuri *et al.*, 2002). This distinction is important for policy because it identifies currently non-poor households that face a high risk of poverty, as well as poor households that may have a lower probability of remaining poor. Where sufficiently long panel data are unavailable, Chaudhuri *et al.* (2002) showed that vulnerability can be estimated from a single cross-section as expected poverty, using information on expected consumption and its variance. This approach has subsequently been applied in Nigeria (Agbaje *et al.*, 2014), Ethiopia (Abebe and Minch, 2016), and China (Zhang *et al.*, 2025).

The Nigeria Multidimensional Poverty Index (MPI) 2022 shows that rural households experience greater deprivations in electricity,

water, and cooking fuel, alongside greater exposure to shocks (NBS and OPHI, 2022). Repeated exposure to such shocks can deepen existing service deprivations, creating a reinforcing cycle that entrenches vulnerability among rural households. Vulnerability to poverty is also associated with household characteristics such as age, household size, and sex of the household head, as well as regional location, with the North-East particularly affected (Ogebe *et al.*, 2020).

Abebe and Minch (2016), in a study of vulnerability to poverty among rural households in Southern Ethiopia, found that chronic poverty affected 24.2% of households. Using an observed poverty rate of 29.8% and a vulnerability threshold of 0.5, the study classified 28.6% of households as highly vulnerable, 5.6% as low vulnerable, and 65.8% as not vulnerable. Among poor households, 81.75% were highly vulnerable, 3.25% were low vulnerable, and 15% were not vulnerable. The study also reported a higher proportion of highly vulnerable households among female-headed households (36.06%) than among male-headed households (27.56%). In Nigeria, the evidence points to a strong spatial pattern. Using the 2004 Nigeria Living Standards Survey and a three-stage feasible generalized least squares (FGLS) model, Agbaje *et al.* (2014) found that, at the standard vulnerability threshold of 0.5, vulnerability among rural households was highest in the North-East (71.0%) and lowest in the South-West (28.8%). Mba *et al.* (2018), using the 2010 General Household Survey, reported that female-headed households, rural residence, and larger household size increased vulnerability, while vulnerability declined as the age of the household head increased. Oni and Yusuf (2008), using 1996 survey data, also found higher expected poverty in the North-East, while Adepoju and

Yusuf (2012) reported that 55.7% of 582 rural households in the South-West were vulnerable.

The key comparative evidence on vulnerability in the North-East and South-West relies largely on relatively old household surveys. Evidence from the 2023/2024 GHS-Panel Wave 5 is therefore needed to assess whether the contrast between the two zones persists and which household characteristics are associated with vulnerability. Audu *et al.* (2021) assessed household vulnerability to poverty in Yobe State, Nigeria. Using the FGT index, the study found a high poverty incidence of 63%, leaving 37% of households non-poor. Its vulnerability analysis classified 58.7% of households as vulnerable to poverty, compared with 41.3% classified as non-vulnerable. Nancy *et al.* (2016) measured vulnerability to poverty among rural households in Malawi and found that, in 2010, two-fifths of households had at least a 40% probability of falling below the poverty line in the future. The findings indicate that vulnerability to poverty was widespread among rural households. Similarly, Alayande and Alayande (2004) found that about 68.5% of Nigerians were vulnerable to future poverty, largely due to low consumption levels rather than income fluctuations. Vulnerability was also higher among rural households, residents of the northern regions, less-educated individuals, and those engaged in agriculture and related activities.

Several empirical studies have reported vulnerability rates that exceed observed poverty rates, suggesting that a substantial proportion of currently non-poor households may face a high probability of becoming poor in the future (Ayantoye *et al.*, 2024). Several factors contribute to this vulnerability, including low educational attainment, large household size, weak asset ownership, high

dependency ratios, limited livelihood diversification, inadequate infrastructure, and exposure to production and market shocks (Mba *et al.*, 2018; Adeleye and Obabire, 2020).

Multidimensional analyses show that poverty in rural Nigeria varies systematically across geopolitical zones, highlighting the importance of zone-disaggregated rather than uniform national assessments (Amao *et al.*, 2017). Complementary approaches, such as the Livelihood Vulnerability Index, have also been applied to assess household exposure, sensitivity, and adaptive capacity to climatic and resource-related shocks among rural farming households (Adu *et al.*, 2018). Policy responses to rural poverty have increasingly included social protection and investment programmes under the National Social Investment Programme (NSIP), including N-Power and the National Cash Transfer Programme. Despite these interventions, persistent poverty and vulnerability among rural households underscore the need for targeted policies that account for location-specific sources of vulnerability (Adepoju and Oyewole, 2020; NBS, 2022).

The household characteristics associated with vulnerability are not settled in the literature, and the evidence on headship is mixed. Agbaje *et al.* (2014) found higher vulnerability among male-headed households (59.8%) than among female-headed households (43.9%). Oni and Yusuf (2008) likewise found higher expected poverty among male-headed households, while Baffoe and Matsuda (2018) reported a higher, though statistically insignificant, livelihood vulnerability score for male-headed households in rural Ghana. In contrast, Mba *et al.* (2018) and Abebe and Minch, (2016) found female-headed households to be more vulnerable. Addai *et al.* (2022) found no statistically significant

difference in vulnerability to food poverty between male- and female-headed households in Ghana, while Zhang *et al.* (2025) found no overall disparity in rural China but reported greater vulnerability among de jure female-headed households. For other characteristics, Abebe and Minch, (2016) found that large family size and poor access to roads and markets increased vulnerability in southern Ethiopia, whereas credit use, land size, and farm income reduced it. These mixed findings suggest that vulnerability may depend on household characteristics, access to services and productive assets, exposure to shocks, and geographical location.

Despite the existing evidence, there remains limited recent empirical evidence that simultaneously examines the extent of vulnerability to poverty, its distribution across the North-East and South-West, and the household characteristics associated with vulnerability using recent nationally collected household data. Without an empirically grounded comparative understanding of these factors across two structurally divergent zones, efforts to reduce poverty may fail to adequately address the location-specific conditions that shape future poverty. Therefore, this study aimed to examine vulnerability to poverty and its determinants among rural households in the North-East and South-West zones of Nigeria.

2.0 Material and methods

2.1 Data and Sampling Design.

The study used the General Household Survey (GHS) Panel Wave 5 (2023/2024), conducted by the National Bureau of Statistics (NBS). The survey follows a stratified multi-stage sampling design implemented by the NBS, and no additional sampling was carried out for this study. The analytical sample comprises rural households with complete information in 12 states of two

geopolitical zones: Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe in the North-East, and Ekiti, Lagos, Ogun, Ondo, Osun and Oyo in the South-West. After excluding observations with missing information using Classification and Regression Tree (CART) method, the sample consisted of 896 households (691 in the North-East and 205 in the South-West). Welfare was measured by annual per capita consumption expenditure, constructed from the food and non-food expenditure modules of the survey; items reported for 7-day, 30-day and 12-month recall periods were converted to annual values and divided by household size.

2.2 Poverty measurement.

Poverty was measured with the Foster–Greer–Thorbecke (FGT) class of indices (Foster *et al.*, 1984):

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left(\frac{Z - c_i}{Z} \right)^{\alpha} \quad (1)$$

where n is the number of households, q the number of poor households, c_i the annual per capita consumption of household i , Z the poverty line, and $\alpha = 0, 1$ and 2 give the headcount (P0), the poverty gap (P1) and the severity (P2). The poverty line was set at two-thirds of the sample mean per capita consumption (₦187,825.6), which gives ₦125,217.10 per person per year. This is a relative line, so the results are interpreted relative to the consumption distribution of the sample and not to an absolute basic-needs standard.

2.3 Vulnerability as expected poverty.

Following Chaudhuri *et al.* (2002), the vulnerability of household i is the probability that its consumption will fall below the poverty line in the next period, given its characteristics X_i :

$$V_i = \Pr(\ln c_{i,t+1} < \ln Z | X_i) \quad (2)$$

Log consumption is assumed to be normally distributed, with a mean and a variance that depend on household characteristics:

$$\ln c_i = X_i\beta + e_i \quad (3)$$

$$\sigma_{e,i}^2 = X_i\theta \quad (4)$$

The parameters were estimated by three-stage FGLS (Chaudhuri *et al.*, 2002). In the first stage, Equation 3 was estimated by ordinary least squares and the residuals were obtained. In the second stage, the squared residuals were regressed on the same regressors to estimate θ , and the fitted values gave the estimated variance $X_i\hat{\theta}$. For 24 households (2.7% of the sample) the fitted variance was zero or negative; the smallest positive fitted variance (0.0199) was used for them so that no household received an excessive weight. In the third stage, Equation 3 was re-estimated by weighted least squares with weights equal to the inverse of the estimated variance. The consumption model included the variables listed in Table 1.

The estimated vulnerability is:

$$\hat{V}_i = \Phi \left[\frac{\ln Z - X_i\hat{\beta}}{\sqrt{X_i\hat{\theta}}} \right] \quad (5)$$

where $\Phi(\cdot)$ is the standard normal distribution function. Households with $\hat{V}_i \geq 0.5$ were classified as vulnerable. Because the data are a single cross-section, the approach assumes that the process generating consumption is stable over time (Chaudhuri *et al.*, 2002).

2.4 Determinants of vulnerability.

The estimated index is a proportion between zero and one, so a fractional logit model was used as the principal model (Papke & Wooldridge, 1996). It was estimated by quasi-maximum likelihood (quasi-binomial family with a logit link):

$$E(\hat{V}_i|X_i) = G(X_i\gamma) = \frac{\exp(X_i\gamma)}{1 + \exp(X_i\gamma)} \quad (6)$$

Average marginal effects (AMEs) are reported. The estimates are unweighted and standard errors are not adjusted for survey clustering. Analyses were carried out in R.

Table 1. Variables used in the consumption and determinants models

Variable	Definition and measurement
Sex of household head	1 = male, 0 = female (reference: female)
Age	Age of household head in years; age squared also included
Household size	Number of household members
Marital status	Married, monogamous (reference); married, polygamous; informal union; divorced; separated; widowed; never married
Education	Highest level of the head: no formal education (reference); primary; Qur'anic/Islamic; secondary; tertiary
Water-fetching time	Minutes per week summed over household members (entered in units of 100 minutes in the determinants models)
Farm size	Hectares, self-reported plot areas summed over plots
Credit application	1 = yes, 0 = no
Shocks	1 = household reported at least one shock, 0 = none
Zone	1 = South-West, 0 = North-East (reference)

Note: credit application records whether the household applied for credit, not whether credit was received. Source: GHS-Panel Wave 5 (2023/2024).

2.5 Coping strategies and descriptive analysis.

Coping strategies reported by households that experienced shocks were grouped into erosive strategies (for example sale of assets, borrowing, delayed payments, migration and

withdrawing children from school), non-erosive strategies (for example assistance, additional income, savings, formal credit and insurance), reduced consumption, and no action. Each household was assigned to one category by this order of priority. Percentages were computed among households that reported a shock. Differences between groups were tested with chi-square or Fisher's exact tests for categorical variables and Wilcoxon rank-sum tests for continuous variables.

3.0 Results and discussion

3.1 Household characteristics by vulnerability status.

Table 2 profiles the households by vulnerability status. Zone is the clearest separator: 95% of vulnerable households are in the North-East, against 16% of non-vulnerable households ($p < 0.001$). Household size also differs sharply. Of the non-vulnerable households, 59% have three or fewer members, compared with 5.6% of the vulnerable households, while 29% of

vulnerable households have ten or more members and no non-vulnerable household does. Vulnerable households also spend much more time fetching water (median 420 against 43 minutes per week). Heads in polygamous marriages account for 28% of the vulnerable and 8.5% of the non-vulnerable households, and Qur'anic/Islamic schooling is concentrated among the vulnerable (16% against 2.5%). Female-headed households make up 11% of the vulnerable and 35% of the non-vulnerable group, but this largely reflects their larger share in the South-West (26%, against 13% in the North-East), where vulnerability is far lower; the relationship is examined below after controlling for zone. Applying for credit is less common among vulnerable households (10% against 17%, $p = 0.020$) and shock experience is more common (87% against 79%, $p = 0.005$). Farms of up to 2 ha are less common among vulnerable households (69% against 85%), which again reflects the concentration of larger holdings in the North-East.

Table 2. Characteristics of households by vulnerability status

Characteristic	Not vulnerable (N = 200)	Vulnerable (N = 696)	Overall (N = 896)	p-value
Zone				
North-East	32 (16%)	659 (95%)	691 (77%)	<0.001
South-West	168 (84%)	37 (5.3%)	205 (23%)	
Sex of household head				
Female	69 (35%)	74 (11%)	143 (16%)	<0.001
Male	131 (66%)	622 (89%)	753 (84%)	
Age group (years)				
≤ 20	1 (0.5%)	3 (0.4%)	4 (0.4%)	<0.001
21–40	41 (21%)	168 (24%)	209 (23%)	
41–60	79 (40%)	386 (55%)	465 (52%)	
61–80	69 (35%)	124 (18%)	193 (22%)	
81–100	10 (5.0%)	15 (2.2%)	25 (2.8%)	
Household size				
1– 3	117 (59%)	39 (5.6%)	156 (17%)	<0.001
4–6	76 (38%)	205 (29%)	281 (31%)	
7–9	7 (3.5%)	251 (36%)	258 (29%)	
≥10	0 (0%)	201 (29%)	201 (22%)	
Marital status				
Married, monogamous	81 (41%)	406 (58%)	487 (54%)	<0.001
Married, polygamous	17 (8.5%)	196 (28%)	213 (24%)	
Informal union	3 (1.5%)	7 (1.0%)	10 (1.1%)	
Divorced	10 (5.0%)	1 (0.1%)	11 (1.2%)	
Separated	19 (9.5%)	7 (1.0%)	26 (2.9%)	
Widowed	56 (28%)	74 (11%)	130 (15%)	
Never married	14 (7.0%)	5 (0.7%)	19 (2.1%)	
Educational attainment				
No formal education	61 (31%)	231 (33%)	292 (33%)	<0.001
Primary	59 (30%)	110 (16%)	169 (19%)	
Secondary	56 (28%)	163 (23%)	219 (24%)	
Tertiary	19 (9.5%)	83 (12%)	102 (11%)	
Qur'anic/Islamic	5 (2.5%)	109 (16%)	114 (13%)	
Water-fetching time (minutes per week)				
Median (IQR)	43 (4, 180)	420 (120, 930)	300 (60, 780)	<0.001
Applied for credit				
Yes	33 (17%)	71 (10%)	104 (12%)	0.020
Experienced a shock				
Yes	157 (79%)	605 (87%)	762 (85%)	0.005
Farm size				
0–2 ha	170 (85%)	481 (69%)	651 (73%)	<0.001
2.01–5 ha	25 (13%)	165 (24%)	190 (21%)	
5.01–10 ha	2 (1.0%)	42 (6.0%)	44 (4.9%)	
> 10 ha	3 (1.5%)	8 (1.1%)	11 (1.2%)	

Note: counts with percentages in parentheses; water-fetching time in minutes per week, median (interquartile range). p-values from chi-square or Fisher's exact tests (categorical variables) and Wilcoxon rank-sum tests (continuous variables).

Source: author's computation from GHS-Panel Wave 5 (2023/2024).

3.2 Poverty and vulnerability by zone.

Poverty is widespread in the sample (Table 3). The headcount is 79.7%, with the North-

East (88.6%) well above the South-West (49.8%); the poverty gap and severity indices show the same contrast. Vulnerability to

poverty is 77.7% overall, but 95.4% in the North-East and 18.0% in the South-West (Figure 1). The mean vulnerability index is 0.747 and the median 0.833. In the North-East, 659 of the 691 households exceed the 0.5 threshold, and state rates range from 92.0% in Adamawa to 98.6% in Bauchi. In the South-West they range from 14.3% in Ogun to 25.0% in Ekiti, with no vulnerable household among the five in Lagos; state samples of fewer than 20 households (Borno, Ekiti, Lagos and Osun) are too small for reliable state-level inference. The ordering agrees with Agbaje *et al.* (2014), who also found the highest vulnerability in the North-East (71.0%) and the lowest in the South-

West (28.8%). The North-East rate here is higher and the South-West rate lower, which suggests that the contrast has widened. Unlike the Ethiopian studies cited above, in which vulnerability exceeded observed poverty, pooled vulnerability here (77.7%) is slightly below the poverty headcount (79.7%), although it exceeds the headcount in the North-East; this may partly reflect the relative poverty line, which places most households below it. The South-West rate is also well below the 55.7% that Adepoju and Yusuf (2012) reported from primary data for rural South-West households. The surveys, poverty lines and years differ, so these comparisons are only indicative.

Table 3. Poverty and vulnerability to poverty by zone

Zone	P0 headcount (%)	P1 gap (%)	P2 severity (%)	Vulnerable, n (%)
North-East (N = 691)	88.57	59.75	45.90	659 (95.4)
South-West (N = 205)	49.76	23.15	13.98	37 (18.0)
Pooled (N = 896)	79.69	51.38	38.60	696 (77.7)

Note: poverty line ₦125,217.10 per person per year (two-thirds of mean per capita consumption); vulnerability threshold 0.5.

Source: author's computation from GHS-Panel Wave 5 (2023/2024).

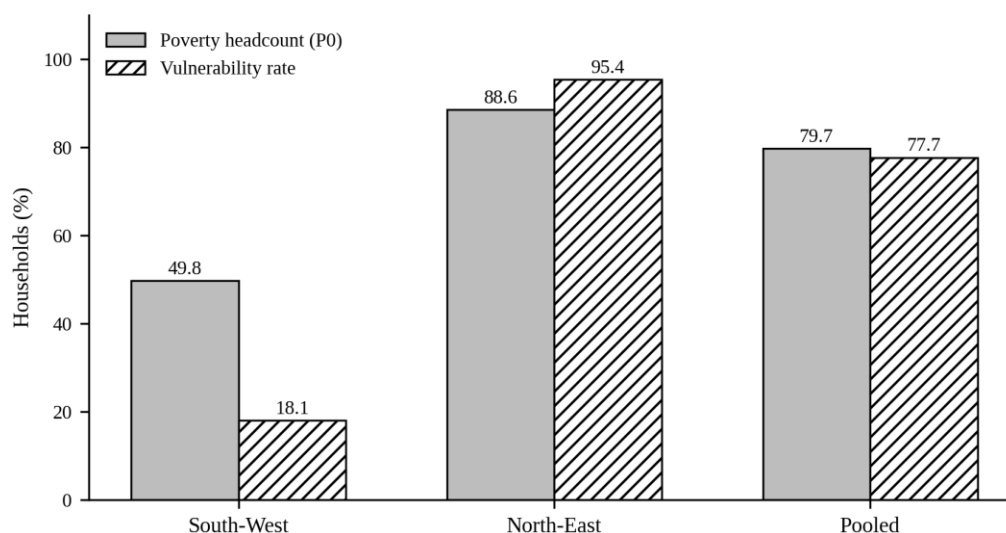


Figure 1. Poverty headcount and vulnerability rate by zone (%)

Combining poverty and vulnerability status shows that the two zones face different problems (Table 4). In the North-East, 599 of the 612 poor households (97.9%) are also vulnerable, so almost all current poverty is expected to persist, and 60 of the 79 non-poor households (75.9%) are themselves vulnerable. In the South-West, 81 of the 102 poor households (79.4%) are not vulnerable, which indicates that most poverty there is expected to be transient, and 87 of the 103 non-poor households (84.5%) are not

vulnerable. Pooled, 69.2% of households are poor and vulnerable, 10.5% are poor but not vulnerable, 8.5% are non-poor but vulnerable and 11.8% are neither. The 76 non-poor but vulnerable households are the group that targeting based on the poverty headcount alone would miss. Poor households in the North-East need sustained support, whereas in the South-West measures that help households stay above the line during shocks are more relevant.

Table 4. Joint poverty and vulnerability status by zone, % (number of households)

Group	North-East	South-West	Pooled
Poor and vulnerable	86.7 (599)	10.2 (21)	69.2 (620)
Poor but not vulnerable	1.9 (13)	39.5 (81)	10.5 (94)
Non-poor but vulnerable	8.7 (60)	7.8 (16)	8.5 (76)
Non-poor and not vulnerable	2.7 (19)	42.4 (87)	11.8 (106)
Total	100 (691)	100 (205)	100 (896)

Source: author's computation from GHS-Panel Wave 5 (2023/2024).

3.3 Consumption and variance equations.

Table 5 reports the equations that underlie the vulnerability index. Expected log consumption is lower in larger households (−0.168 per member), in male-headed households (−0.351) and in households whose heads are in polygamous marriages (−0.270), informal unions (−0.411) or separated (−0.514), and higher in the South-West (0.853), among households that applied for credit (0.292) and among those whose

heads have primary, secondary or tertiary education (0.202, 0.281 and 0.174). Age, farm size, water-fetching time and shock experience do not significantly affect expected consumption. In the variance equation, the South-West (1.177), polygamous marriage (−0.386), Qur'anic/Islamic education (−0.546) and water-fetching time (−0.0002 per minute) are significant at the 5% level, and the equation has limited explanatory power ($R^2 = 0.10$).

Table 5. Consumption (weighted least squares) and variance equations

Variable	Consumption: coefficient	SE	Variance: coefficient	SE
Intercept	11.9900***	0.3506	0.4538	0.8990
Zone: South-West	0.8525***	0.1174	1.1770***	0.1954
Sex of head: male	-0.3512*	0.1471	-0.1513	0.3355
Age of head	0.0001	0.0107	0.0282	0.0304
Age squared	0.00003	0.0001	-0.00028	0.00028
Household size	-0.1679***	0.0071	0.0154	0.0222
Marital status (ref: married, monogamous)				
Married, polygamous	-0.2699***	0.0572	-0.3860*	0.1884
Informal union	-0.4105**	0.1271	-0.8125	0.6510
Divorced	0.4729	0.3454	0.3683	0.6281
Separated	-0.5138*	0.2555	-0.0596	0.4294
Widowed	-0.1694	0.1753	0.3313	0.3584
Never married	0.2473	0.2651	0.4149	0.4911
Education (ref: no formal education)				
Primary	0.2020**	0.0724	-0.3624	0.2028
Qur'anic/Islamic	0.1292	0.0696	-0.5460*	0.2338
Secondary	0.2807***	0.0682	-0.3461	0.1972
Tertiary	0.1740*	0.0847	-0.3192	0.2419
Water time (min per week)	-0.00002	0.00001	-0.00019*	0.00008
Farm size (ha)	0.0171	0.0151	0.0593	0.0321
Applied for credit (yes)	0.2923***	0.0658	0.0013	0.2114
Shocks (yes)	0.0468	0.0716	-0.0632	0.1927
Observations; R ²	896; (weighted)	0.643	896; 0.0995	

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Dependent variable: natural log of per capita consumption (consumption equation) and squared OLS residual (variance equation). The consumption equation is weighted by the inverse of the estimated variance.

Source: author's computation from GHS-Panel Wave 5 (2023/2024).

3.4 Determinants of vulnerability.

Table 6 reports the AMEs from the fractional logit and the coefficients from the Tobit model. Most effects have the same direction and significance in the two models. Household size has the strongest association: each additional member raises the predicted vulnerability index by 3.65 percentage points (AME = 0.0365, $p < 0.001$), consistent with Mba *et al.* (2018), Abebe and Minch (2016), Adepoju *et al.* (2011), Deressa (2013), Tesfaye (2018), Sanusi and Fanifosi (2019) and Ogebe *et al.* (2020), who also found

larger households to be more vulnerable. Male-headed households have an index 8.24 points higher than female-headed households (AME = 0.0824). This agrees with Agbaje *et al.* (2014), Oni and Yusuf (2008) and Baffoe and Matsuda (2018) but differs from Mba *et al.* (2018), Ogebe *et al.* (2020), Adepoju *et al.* (2011), Abebe and Minch (2016) and the de jure group in Zhang *et al.* (2025), and from Addai *et al.* (2022), who found no significant difference. Klasen *et al.* (2015) also found that the relationship varies across settings, so the effect of headship appears to depend on

context. Marital status is also significant. Relative to monogamous marriage, the index is higher by 9.58 points for polygamous marriage, 8.42 for informal unions, 10.11 for separated heads and 2.67 for widowed heads, and lower by 15.48 for divorced and 8.81 for never-married heads. The divorced, informal-union, never-married and separated groups contain only 11, 10, 19 and 26 households, so these estimates are imprecise.

The widowed result agrees with Adepoju *et al.* (2011), who found widowed heads among the characteristics of vulnerable households. The effect of age is small (AME = -0.0006 per year), with a direction that agrees with Mba *et al.* (2018), who found vulnerability to fall with the age of the head; age and age squared are significant in the fractional logit but not in the Tobit, so the age pattern is sensitive to the specification.

Table 6. Determinants of vulnerability to poverty: fractional logit (AME) and Tobit

Variable	Fractional logit AME	SE	Tobit coefficient	SE
Sex of head (ref: female)				
Male	0.0824***	0.0074	0.098***	0.0111
Age of head	-0.0006 ***	0.0001	-0.0017	0.0010
Age squared	—	—	0.000006	0.000009
Household size	0.0365***	0.0007	0.024***	0.0007
Marital status (ref: married, monogamous)				
Married, polygamous	0.0958***	0.0046	0.050***	0.0063
Informal union	0.0842***	0.0105	0.151***	0.0220
Divorced	-0.1548 ***	0.0143	-0.304 ***	0.0208
Separated	0.1011***	0.0064	0.067***	0.0142
Widowed	0.0267***	0.0070	-0.005	0.0119
Never married	-0.0881 ***	0.0112	-0.212 ***	0.0163
Education (ref: no formal education)				
Primary	-0.0305 ***	0.0046	-0.019 **	0.0068
Qur'anic/Islamic	0.0381***	0.0060	0.033***	0.0078
Secondary	-0.0387 ***	0.0046	-0.031 ***	0.0066
Tertiary	-0.0198 ***	0.0055	-0.011	0.0081
Water time (per 100 min per week)	0.0034***	0.0003	0.0031***	0.0003
Applied for credit (yes)	-0.0793 ***	0.0048	-0.078 ***	0.0070
Farm size (ha)	-0.0073 ***	0.0007	-0.008 ***	0.0011
Shocks (yes)	-0.0074	0.0043	-0.007	0.0064
Zone (ref: North-East)				
South-West	-0.2231 ***	0.0052	-0.323 ***	0.0065
Constant	—	—	0.654***	0.0299
Log(scale)	—	—	-2.714 ***	0.0239
Observations	896		896 (20 right-censored)	

Note: *** $p < 0.001$, ** $p < 0.01$. Fractional logit: quasi-binomial family with logit link; AMEs from the delta method (the AME of age combines the linear and squared terms). Tobit: left-censored at 0 and right-censored at 1; log-likelihood = 1128; Wald $\chi^2(19) = 10,840$.

Source: author's computation from GHS-Panel Wave 5 (2023/2024).

Primary, secondary and tertiary education reduce the index by 3.05, 3.87 and 1.98 points relative to no formal education, in line with Ngepah *et al.* (2023), who found vulnerability to fall across education levels in South Africa, and with Deressa (2013) and Adepoju and Yusuf (2012). Qur'anic/Islamic schooling, however, is associated with an index 3.81 points higher. This category appears only in the North-East sample (114 households, none in the South-West), so its coefficient may reflect other characteristics of this group and not the schooling itself. Farm size lowers the index by 0.73 points per hectare, which agrees with Abebe and Minch (2016) and Tesfaye (2018), who found land size and asset ownership to reduce vulnerability. Households that applied for credit have an index 7.93 points lower. The variable records applications and not loans received, so the coefficient indicates participation in the credit market and not the effect of credit; it may also reflect that better-off households find it easier to apply and to be accepted. Abebe and Minch (2016) and Tesfaye (2018) found credit use or access to reduce vulnerability, and Sanusi and Fanifosi (2019) identified access to credit as a significant determinant, but using or having access to credit is not the same as applying for it. Each additional 100 minutes of water-fetching time per week raises the index by 0.34 points ($AME = 0.0034$, $p < 0.001$); this may reflect the time cost of obtaining water, and it may also proxy for remoteness.

Experience of a shock is not significantly associated with vulnerability ($AME = -0.0074$, $p = 0.084$). A likely reason is that 85.0% of the households reported at least one shock, so the binary indicator has little variation, and it does not capture the type or severity of shocks. This differs from Eze and

Iheonu (2025), who found that health shocks significantly increased the likelihood of poverty in Nigeria using the same survey, which suggests that the type of shock matters. The South-West coefficient is large and negative ($AME = -0.2231$): comparable South-West households have an index 22.3 points lower than North-East households, in line with the spatial pattern reported by Agbaje *et al.* (2014), Mba *et al.* (2018) and Ogebe *et al.* (2020), who found the North-East to be the most vulnerable. That the gap remains large after controlling for household characteristics suggests that zone-level conditions not captured by the model, such as livelihood opportunities, infrastructure, security and access to services, remain important. Since the index is constructed from household characteristics that also appear in Table 6, strong associations such as that for household size partly reflect this construction.

3.5 Coping strategies.

Of the 896 households, 762 (85.0%) experienced at least one shock (604 in the North-East and 158 in the South-West). Among them, erosive strategies were the most common response (58.7%), followed by non-erosive strategies (20.3%), reduced consumption (12.2%) and no action (8.8%) (Table 7). The zones differ: erosive strategies account for 66.9% of responses in the North-East and 27.2% in the South-West, while non-erosive strategies account for 50.6% in the South-West and 12.4% in the North-East. Reliance on erosive coping in the North-East is consistent with the persistent poverty found above, since selling assets and borrowing can reduce future consumption capacity, whereas the South-West pattern fits its lower vulnerability.

Table 7. Coping strategies of households that experienced shocks by zone, n (%)

Coping strategy	North-East	South-West	Overall
Erosive strategies	404 (66.9)	43 (27.2)	447 (58.7)
Non-erosive strategies	75 (12.4)	80 (50.6)	155 (20.3)
Reduced consumption	78 (12.9)	15 (9.5)	93 (12.2)
No action taken	47 (7.8)	20 (12.7)	67 (8.8)
Households with a shock	604 (100)	158 (100)	762 (100)

Note: percentages are among households that reported a shock.

Source: author's computation from GHS-Panel Wave 5 (2023/2024).

4.0 Conclusions and Policy Recommendations

This study shows that vulnerability to poverty among rural households in the North-East and South-West zones of Nigeria is unevenly distributed, with vulnerability substantially higher in the North-East than in the South-West. Using GHS-Panel Wave 5, the study found that 95.4% of households in the North-East were vulnerable, compared with 18.0% in the South-West. Almost all poor households in the North-East were expected to remain poor, whereas most poor households in the South-West were not vulnerable. Vulnerability was higher among larger households, male-headed households, households with longer water-fetching time and households with certain marital statuses, while formal education, larger farm size and having applied for credit were associated with lower vulnerability. Experience of a shock was not a significant determinant of vulnerability. Erosive coping strategies were more prominent in the North-East, suggesting that vulnerable households may be relying on measures that can weaken their future livelihood capacity. These findings indicate that current poverty status alone is insufficient for identifying households at risk of future poverty and that vulnerability requires attention to the conditions that shape households' ability to withstand and recover from economic and environmental pressures. Reducing vulnerability therefore requires sustained and spatially targeted interventions, particularly in the North-East, including

expanded social protection for larger households, improved water infrastructure, greater access to credit and savings, support for farm productivity and expanded access to formal education. In the South-West, greater emphasis should be placed on measures that strengthen household capacity to withstand shocks. The potential role of credit in reducing vulnerability should also be examined further using information on the actual loans received by households.

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