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How Do Household Coping Strategies Evolve With Increased Food Insecurity? An Examination of Nigeria's Food Price Shock of 2015–2018

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ABSTRACT

Faced with a significant devaluation of its currency and a surge in food prices, the Nigerian government prohibited the use of foreign currency for food imports. This essentially blocked the importation of numerous food items under the guise of stimulating the domestic output of these staples. Consequently, food prices in Nigeria increased despite a global decline in food prices, and the incidence and severity of food insecurity escalated. This study examines the changes in the types and severity of coping mechanisms for food insecurity resulting from the food price shock caused by the oil price crash, currency devaluation, and restrictions on foreign exchange. Nigeria's General Household Survey Panel data from 2012 and 2015, during periods of high oil prices, is compared with data from 2018 when oil prices had remained low, the currency had been devalued, and the treasury had been depleted. Alongside detailed descriptive statistics, logistic and hurdle regressions are employed for statistical analysis. Findings indicate a rise in the percentage of Nigerian households grappling with food insecurity from 2015 to 2018. During this period, 68.7% of households resorted to at least one coping mechanism, 31.8% adopted six or more coping strategies, and 43.2% resorted to severe coping strategies. The issue stems not primarily from natural disasters or conflicts but from a failure in macroeconomic and agricultural economic policies. Our findings confirm that these policies come at great cost, particularly to female-headed households, single-parent households, households headed by elderly people, and other vulnerable populations, pushing them deeper into food insecurity.

1 | Introduction

Food insecurity remains a key concern in Nigeria. In this study, we investigate the effect of an adverse food price shock on household food insecurity coping behaviors. The mechanism for initiating this food price shock in Nigeria was the collapse in oil prices and the associated currency devaluation, which began in 2014 and continued until mid-2016. During this period, oil prices remained below 60 USD/bbl. Moreover, foreign exchange restrictions imposed on over 40 imported food items further

created a huge food supply gap in the country. The combination of these factors led to high prices for food imports.

From 2000 to 2014, Nigeria's economy enjoyed robust and sustained growth, averaging over 7% annually. This growth was supported by favorable global conditions, increased crude oil price, effective macroeconomic policies, structural reforms, and increased output.¹ However, post-2015, growth rates slowed and GDP per capita stagnated. This slowdown was caused by issues such as distortions in monetary and

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exchange rate policies, increasing fiscal deficits due to reduced oil production and an expensive fuel subsidy program, heightened trade protectionism, and external shocks.² These weakened economic fundamentals led to inflation reaching a 24-year high of 31.7% in February 2024. This, coupled with sluggish economic growth, has pushed millions of Nigerians into poverty.

Despite years of high oil revenues between 2004 and 2012, the Nigerian government failed to adequately stimulate investment in domestic food production and became increasingly reliant on imported food. In 2009, oil prices started a meteoric rise from 45 to the 80 USD/bbl range throughout 2010. By 2012 and 2013, oil prices ranged from 98 to 128 USD/bbl. During those years of high oil prices, Nigeria became heavily reliant on readily available foreign exchange with which imported food was bought cheaply. Indeed, the behavior of the government indicated that oil prices were expected to stay high for years to come. However, by January 2015, oil had fallen back to 49 USD/bbl and did not break the 60 USD/bbl mark again until November 2017.

Globally, the price of oil has been identified as an important factor that affects food prices (Sun et al. 2023). Unsurprisingly, Nigeria experienced a corresponding food price shock when the oil price fell precipitously between 2014 and 2016. Several theoretical channels through which this occurs are already documented in the literature. For one, increases in oil prices often induce currency depreciation, and the associated exchange rate changes are capable of raising the prices of agricultural inputs, which in turn leads to food price increases (Nazlioglu and Soytaş 2011). Rising oil prices also often induce inflationary effects, which in turn cause an upsurge in food prices (Choi et al. 2018; Cologni and Manera 2008). Higher oil prices are also capable of triggering a substitution effect toward crop-based alternatives such as biodiesel and ethanol (Mokni and Ben-Salha 2020).

In addition, the reactive food import policy of restricting the use of foreign exchange for the import of food items and other basic goods introduced by the Nigerian government drove inflation even higher. The policy exacerbated the prevalence and severity of household food insecurity in Nigeria at a time when prices were already rising rapidly due to exchange rate adjustments. Theoretically, it was believed that the policy would conserve foreign exchange by stimulating domestic agricultural output of staples (Alake 2021). However, in the short to medium term, Nigeria has a limited ability to grow and process or refine these goods at the quantities previously imported. Among other factors, the lack of access to efficient irrigation systems, of good transportation systems, and of sufficient credit to modernize production techniques makes it difficult for Nigerian farmers to meet domestic demand (SB Morgen 2021). For instance, in 2019 the Nigerian economy produced just 1.2% and 4.7%, respectively, of the total amounts of wheat and sugar consumed domestically (Alake 2021). These items were added to the foreign exchange restriction list in 2020. Clearly, Nigeria lacks the capacity to produce anywhere near the amount of the staples imported in recent years. Thus, the policy ended up instead effectively banning the import of many staple food items to Nigeria and, significantly,

led to higher food prices. This confirms the claim of Reuters and Ohuocha (2021). Consequently, real food prices rose by 37.0% from 2012 to 2018 in Nigeria, despite real food prices falling globally by 21.9% between 2012 and 2018 (FAO 2021). This effect is in line with what has been documented in the literature, that is, that foreign exchange controls are capable of causing changes in the domestic prices of imports (see Tamirisa 1999).

In response to the idiosyncratic adverse food price shock resulting from the combined effect of the oil price crash, currency devaluation and foreign exchange restrictions, food-insecure households in the country have been forced to adopt various coping techniques. Such coping strategies, broadly categorized as food- and non-food-based techniques adopted to meet basic needs, reflect the degree of vulnerability of the households (Kyaw 2009; Ruel et al. 2010). Some examples of these strategies include purchasing less of the preferred food, reducing meal sizes, and skipping meals when there is a food shortage (Farzana et al. 2017; Gundersen and Ziliak 2014; Gupta et al. 2015). A detailed understanding of the coping strategies adopted by food-insecure households in Nigeria is crucial to the formulation and implementation of food security programs and policies in the country, especially in periods of financial or economic shocks.

The main aim of this article is thus to provide empirical evidence on the nature of coping strategies commonly adopted in Nigeria. To this end, changes in the types and severity of food insecurity coping behaviors are analyzed in 2012, 2015, and 2018. Specifically, we compare Nigeria's General Household Survey Panel data from 2012 and 2015, when oil prices were high (or had only recently fallen), with data from 2018, when oil prices had been persistently low, the currency had been devalued, and the treasury had been depleted. We examine the way households have coped with food insecurity and how the coping behavior has evolved over time with the increased escalation of real food prices. Furthermore, the socioeconomic and demographic characteristics of food-insecure households that influence their adoption of some specific strategies are analyzed. It is noteworthy that this study is the very first to empirically examine the coping strategy responses triggered by the 2015 oil price shock and the foreign exchange restrictions imposed by Nigeria.

The paper proceeds as follows. In Section 2, we present the literature review on the causes and consequences of coping behaviors for food insecurity in general and for Nigeria in particular. In Section 3, we describe the data and methodology. Detailed descriptive statistics and regression results are presented in Section 4, and Section 5 concludes with a discussion of the policy implications of these findings.

2 | Literature Review

Numerous studies have been carried out globally to understand the experiences of households affected by food insecurity. An important fact identified by such research is that systemic and/or idiosyncratic shocks such as those caused by sudden food price increases (see Christian 2010; FAO 2008;

Nakanwagi, Ntuli, and Muchapondwa 2021; Quisumbing, Meinzen-Dick, and Bassett 2008) or global economic crises (see Ivanic and Martin 2008; Ivanic, Martin, and Zaman 2012; Nekmahmud 2024) have adverse effects on the food security of nations. In response to such shocks, households are often forced to adopt certain coping strategies to mitigate the effect of food unavailability (Danso-Abbeam, Asale, and Ogundeji 2023; Devereux 2001). According to Kyaw (2009), households adopt a range of coping strategies in response to food insecurity that reflect their level of vulnerability. These coping strategies, according to Snel and Staring (2001), are defined as the set of choices made by households belonging to poor socioeconomic groups to minimize expenses or improve income so as not to fall too far beneath the society's welfare level. Gupta et al. (2015) and Mabuza, Ortman, and Wale (2016) describe these coping strategies as strategic plans to deal with food unavailability made by households at risk of food insecurity. According to Biadgilign (2023), coping strategies are methods adopted by households or individuals who are unable to access adequate amounts of food.

Coping strategy choices, however, generally vary across households and even within households (Maxwell and Caldwell 2008). Similarly, coping strategy choices often differ based on the degree of poverty severity (Mjonono, Ngidi, and Hendriks 2009). Farzana et al. (2017) claim that the greater the severity of food insecurity, the more inclined households are toward the adoption of a wider range of coping strategies. Coping strategies for food insecurity can be broadly classified into income-soothing strategies and consumption-soothing strategies (see Grobler 2014; Shamsudin 2019). Davies (1993) classifies the former as strategies related to income diversification and alternative food sources. The latter, meanwhile, refers to strategies used to modify consumption, such as food intake reduction or reduction in the number of household members entitled to meals. Farzana et al. (2017), in a similar manner, report that when faced with idiosyncratic shocks such as sudden food price increases, vulnerable households adopt various coping strategies that can be broadly grouped into food- and non-food-based strategies. Either or both food or non-food coping strategies are generally employed in dealing with food insecurity (FAO 2013; Ruel et al. 2010).

Some of the more commonly adopted coping strategies identified in the literature include settling for less preferred food types, reduction in meal quantity, consuming only one type of meal, usually the cheapest available, skipping meals, and selling assets to meet food requirements (Gundersen and Ziliak 2014; Gupta et al. 2015). Studies such as those by Akerele et al. (2013), Biadgilign (2023), Chaudhuri et al. (2021), Dlamini et al. (2023), Orewa and Iyangbe (2010), Sani and Kemaw (2019), and Tsegaye et al. (2018) likewise identify meal skipping and consumption of less expensive food types as some of the commonly used coping strategies. Gupta et al. (2015) report that over 60% of food-insecure households in Delhi, India, rely on the consumption of less preferred and cheaper food types as their coping strategies for food insecurity. The remainder rely instead more on meal size reductions. Studies conducted by authors such as Dore, Adair, and Popkin (2003), Kempson et al. (2003), Mabuza, Ortman, and Wale (2016), and Norhasmah Jr et al. (2010) have also shown that the most

popular kind of coping strategy adopted by food-insecure households is the consumption of less expensive food types. Uddin (2012) identifies additional coping strategies, such as wild food consumption, selling labor cheaply, securing high-interest loans, farming short-duration crops, appealing to social networks and begging. Diversification of income sources, mortgage or sale of landed properties, and seasonal migration are some other types of coping strategies noted in the literature (see Banik 2007; Mishra 2007).

This review of the literature shows that extensive research has been conducted on food insecurity coping strategies around the world. However, it also shows that no study has so far considered the specific coping strategy response of poor Nigerian households to the food price shock induced by the combined effect of the oil price crash, currency devaluation and foreign exchange restrictions. This gap in the literature is the motivation for this study. While food prices have been falling and the prevalence of undernourishment has declined in nearby countries such as Cameroon and Ghana, it has been on the rise in Nigeria (FAO et al. 2019). This was triggered by the exogenous shock to the exchange rate, exacerbated by a failure of agricultural policy, trade policy and food security policy. This study sheds light on the impact of these challenges on households in Nigeria.

3 | Data and Methodology

3.1 | Data

The primary data source for this study is the Nigerian General Household Survey—Panel (GHS-P). This survey is conducted approximately every three years. The GHS-P is a nationally representative sample that is also representative of each of the six geographic zones in Nigeria. This study uses data from three waves of the GHS-P enumerated in 2012, 2015, and 2018. Within each wave, each household is visited twice—once in the pre-harvest period in September to November, and once in the post-harvest period in February to April. In this study, we use food insecurity data from the pre-harvest visit. After data cleaning, the sample for this study consists of 13,923 observations across three waves of the survey: 4518 households in 2012, 4487 households in 2015, and 4918 households in 2018.

The first step in this analysis is to identify all households that are coping with food insecurity (frequency) and to separate them from the households that are not coping. The households we consider to be coping in this study are those that respond to at least one of the nine questions describing households' experience coping with food insecurity (Table 1). A household is classified as non-coping if they did not engage in any food insecurity coping behaviors in the previous 7 days. This coping indicator serves as the first dependent variable for the empirical analysis.

The second dependent variable used for empirical analysis is the severity index (SIN). This indicator establishes the severity of food insecurity by aggregating the number of various coping behaviors in which the sampled households engaged. The index is constructed (Equation 1) as the simple sum of the number of coping behaviors engaged in, which ranges from 1 to 9. For household i in period t we have:

TABLE 1 | Food insecurity coping variables and severity.

Variable	Description of variable	Severity
Less preferred	Unable to eat healthy and nutritious/preferred foods	Mild
Limit type	Ate only a few kinds of foods	Mild
Limit portion	Had to limit portion size	Moderate
Reduce	Had to skip a meal	Moderate
Restrict	Had to restrict adult consumption for children	Moderate
Borrow	Had to borrow food or rely on help	Moderate
None	No food in the household	Intense
Sleep hungry	Had to go to sleep hungry	Intense
Whole day	Had to go a whole day and night without eating	Intense

Source: Nigeria GHS-P 2012, 2015, and 2018.

$$\begin{aligned}
 \text{SIN}_{it} = & \underbrace{\text{less preferred}_{it} + \text{limit type}_{it}}_{\text{Mild}_{it}} + \underbrace{\text{limit portion}_{it} + \text{reduce}_{it} + \text{restrict}_{it} + \text{borrow}_{it}}_{\text{Moderate}_{it}} \\
 & + \underbrace{\text{none}_{it} + \text{sleep hungry}_{it} + \text{whole day}_{it}}_{\text{Intense}_{it}}
 \end{aligned} \quad (1)$$

An alternative severity measure of coping behaviors based on the Household Food Insecurity Prevalence (HFIAP) is also constructed. In this case, we adapt the general principles of the HFIAP approach used by the United States Agency for International Development (Coates and Swindale 2007) to categorize households into four classes of food insecurity based on responses to nine food insecurity coping questions. First, the responses are grouped into four categories—none, mild, moderate, and intense—according to the degree of severity they represent (Table 1). Essentially, a household is classified by the most severe coping behavior in which they engaged. Households that do not engage in any of the food insecurity coping behaviors are considered food-secure (HFIAP=1). Mild food insecurity (HFIAP=2) is defined as eating less preferred/nutritious foods or limiting the types of food (i.e., eating a monotonous diet) with no reported reduction in portion size or skipping meals. A household is moderately food-insecure (HFIAP=3) if its members are reducing caloric intake (e.g., skipping meals or limiting portion size) or borrowing food, but do not engage in any of the three most severe coping behaviors. Finally, a household is severely food-insecure (HFIAP=4) if it engages in any of the three most intense behaviors, which are having no food in the house, going to sleep hungry or going a whole day and night without eating. The construction of the HFIAP index is highlighted in Equation (2).

$$\begin{aligned}
 \text{HFIAP}_{it} = & 1 \text{ if } \text{index}_{it} = 0 \\
 & 2 \text{ if } \text{less preferred}_{it} = 1 \text{ or } \text{limit type}_{it} = 1 \text{ and } \text{index}_{it} \leq 2 \\
 & 3 \text{ if } \text{limit portion}_{it} = 1 \text{ or } \text{reduce}_{it} = 1 \text{ or } \text{restrict}_{it} = 1 \text{ or } \text{borrow}_{it} = 1 \text{ and } \text{severe}_{it} = 0 \\
 & 4 \text{ if } \text{none}_{it} = 1 \text{ or } \text{sleep hungry}_{it} = 1 \text{ or } \text{whole day}_{it} = 1
 \end{aligned} \quad (2)$$

Overall, these variables are used to assess first the existence of coping behaviors, then their severity. They are defined in Table 2, rows 1–3.

Independent household characteristics considered as determinants of coping behaviors are outlined in Table 2, rows 4–19, and include the following: the survey year, log of distance to the agricultural market (km), log of the age of the head of household, if the household is involved in agriculture, if the head of household is a single parent, if the household is polygamous, household expenditure (total and per capita), if the head of the household is employed, if the family owns the home, the educational attainment of the head of household, if the household is urban, the proportion of household members that are children, household size, the number of elderly household members (85 years of age and older), and the geopolitical zone of Nigeria in which the household lives.

3.2 | Methodology

First, detailed statistics are presented on the prevalence of coping behaviors and household characteristics, broken down by survey wave. These statistics include the proportion of households

TABLE 2 | Variables of interest.

Variable	Description of variable	Variable type
Dependent		
Coping	Household engaged in any of the nine coping behaviors = 1 and 0 otherwise	Indicator
FIN	Sum of the number of coping behaviors engaged in, ranging from 1 to 9	Discrete
HFIAP	Food-secure = 1; Mildly food-insecure = 2; Moderately food-insecure = 3; Severely food-insecure = 4	Discrete
Independent		
Year	2012, 2015, 2018	Indicator
log(dist_market)	Log of distance in km from household to agricultural market	Continuous
log(age)	Log of the age of head of household in years	Continuous
Agriculture	Household member(s) involved in agriculture = 1 and 0 otherwise	Indicator
Single_parent	Lone adult as head of household that is divorced, separated or widowed and lives with children = 1, 0 otherwise	Indicator
Polygamous	Head of the household is in a polygamous marriage = 1 and 0 otherwise	Indicator
log(tot_exp_capita)	Real (2012N) annual per-capita household expenditure	Continuous
hh_employed	Head of household is considered employed if they are involved in agriculture, working as an employee or are self-employed = 1 and 0 otherwise	Indicator
Own_home	Home ownership = 1 and 0 otherwise	Indicator
hh_educ	Educational attainment of the household head: No education; Senior Secondary School Certificate (SSSC) or less; Undergraduate, professional or technical degree; Graduate degree	Indicator
Urban	Urban household = 1 and rural household = 0	Indicator
prop_children	Proportion of household members less than 18 years of age	Continuous
hh_size	Number of household members	Discrete
n_elderly	Number of household members over the age of 85	Discrete
Zone	Indicating which of the six geopolitical zones of Nigeria the household lives in North Central, North East, North West, South West, South Central and South South	Indicator

Source: Nigeria GHS-P 2012, 2015, and 2018.

coping with food insecurity, the prevalence of each specific coping behavior, and the proportion of households within each class of severity of food insecurity. We then present descriptive statistics and significance tests on the means of variables of interest (e.g., total expenditure) by classification (e.g., coping vs. non-coping) to illustrate differences between groups.

Next, a hurdle regression is implemented to assess the determinants of households coping with food insecurity in Nigeria in

2012, 2015, and 2018. The first stage of the hurdle regression is a logistic regression showing whether or not the household engages in any of the coping behaviors. The second stage, conditional on a household coping, is a negative binomial on the count of coping behaviors in which a household engages (using the frequency index as the dependent variable). We conduct a statistical test to confirm that a hurdle model is, indeed, necessary due to the excess number of zeros in the number of coping behaviors engaged in. Equations (3) and (4) present the hurdle model.

$$f(\text{Index}_{it} | x_{it}) = \begin{cases} \Pr(\text{coping} = 0 | x_{it}), & \text{if } \text{Index}_{it} = 0 \\ \Pr(\text{coping} = 1 | x_{it}) f(\text{Index}_{it} | \text{coping}_{it} = 1, x_{it}) & \text{if } \text{Index}_{it} \geq 1 \end{cases} \quad (3)$$

where: $\Lambda(\bullet)$ = Logistic distribution, x = Vector of household characteristics, β = Vector of coefficients, λ = Conditional mean of coping behaviors, u_{it} = Error term, and y_{it} = Count of coping behaviors.

$$f(\text{Index}_{it} | x_{it}) = \begin{cases} \Lambda(x'_{it}\beta), & \text{if } \text{Index}_{it} = 0 \\ \frac{[1 - \Lambda(x'_{it}\beta)] e^{-\lambda u_{it}} (\lambda u_{it})^{y_{it}}}{y_{it}!} & \text{if } \text{Index}_{it} \geq 1 \end{cases} \quad (4)$$

Finally, we carry out a logistic regression on households struggling with moderate and intense food insecurity to investigate the factors that tip a household into the most severe coping behaviors, most of which involve the household running out of food entirely at times. In all regressions, time effects are accounted for by using an indicator variable for each wave of the survey, with 2012 as the base year. Regional differences are captured by using an indicator variable for each of the six geopolitical zones of Nigeria, with all differences relative to the North Central zone. To account for repeated observations at the household level, we cluster standard errors by household. To account for unobservable differences at the local level, standard errors are clustered by enumeration zone.

4 | Results and Discussion

4.1 | Prevalence of Coping Behaviors

Table 3 presents the proportion of households coping with food insecurity by severity. In 2012 and 2015, just over half of households coping with food insecurity were moderately food-insecure, with the remainder roughly split between mild and severe—effectively a normal distribution. However, by 2018 the distribution becomes severely skewed, with over 62.9% of food-insecure households severely food-insecure, a 42.9 pp. increase from 2015, 21.0% moderately food-insecure, and just 16.1% mildly food-insecure.

Clearly, the food insecurity situation in Nigeria has both broadened and deepened as more households have been affected and the severity has worsened. Of the 68.7% of coping households, 62.9% are severely food-insecure. This means that 43.0% of all households in Nigeria experienced severe food insecurity in 2018, which very closely matches the 2018 estimate from the Nigerian National Bureau of Statistics (2020a, 2020b) of 40.1% of households in extreme poverty.³ The finding also lends credence to the conclusion reached by Thomas et al. (2023), who through the 2018–2019 household survey of expenditures reveals that about 40% of the Nigerian population is food-insecure. This outcome also supports the finding by Mekonnen et al. (2021), who with

the same survey data show that close to 30% of the population is food-insecure. This result gives further insight into the meaning of extreme poverty—these households are suffering from caloric deficiencies and malnutrition, and are, at times, completely out of food. This increase in the prevalence and severity of food insecurity is due to the rise in real food prices caused by the real currency devaluation triggered by the oil price collapse. This effect is quite similar to what has been documented in studies by Choi et al. (2018), Cologni and Manera (2008), and Nazlioglu and Soytaş (2011). The adverse effect of these economic shocks has been further exacerbated by the ban on the use of foreign exchange to import food. Our finding thus confirms the claim by Reuters and Oluocha (2021) that the policy ended up effectively banning the import of many staple food items to Nigeria, leading to higher food prices. It also corroborates the conclusion of Tamirisa (1999) that foreign exchange controls often cause changes in the domestic prices of imports.

In Table 4, the prevalence of each coping behavior is presented separately. The prevalence of all coping behaviors increased between 2012/2015 and 2018, and most coping behaviors increased by significant amounts. The largest increases occurred for two severe coping behaviors—households having no food in the house (+39.7 pp) and households that went to sleep hungry (+36.2 pp). Considering that in 2012/2015, these proportions averaged 16.1% (no food in the household) and 13.4% (going to sleep hungry), these increases are alarming. In terms of moderate coping behaviors in 2018, nearly three-quarters of all Nigerian households limited portion sizes at meal times (72.7%) and over three-fifths (60.3%) reduced the number of meals per day for all household members. This shows overwhelmingly that the food insecurity crisis has increased in severity in Nigeria.

4.2 | Household Characteristics

In Table 5, we compare the descriptive statistics between 2012/2015 (pooled) and 2018 for coping households to investigate how the characteristics of these households have changed. Considering food insecurity statistics among coping households, the mean number of coping behaviors increased from 3.6 to 5.0, a statistically significant increase of 38.9%. The severity of food insecurity also increased; 62.9% of all coping households were severely food-insecure in 2018, a 42.2 pp. increase from 2012/2015 when just 20.7% of households were severely food-insecure. *F*-tests on the equality of means between the years (column VI, rows 1–5) and chi-squared tests on the equality of proportions are conducted where appropriate (column VI, rows 6–18), Quinton, Jenkins, and Olasehinde-Williams (2023) find that polygamous households, households where the head

TABLE 3 | Prevalence of food insecurity by year.

Year	Food-secure	Food-insecure	Severity of food insecurity		
			Mild	Moderate	Intense
2012	47.6%	52.4%	26.5%	52.2%	21.4%
2015	42.5%	53.5%	24.3%	55.7%	20.0%
2018	31.3%	68.7%	16.1%	21.0%	62.9%

Source: Nigeria GHS-P 2012, 2015, and 2018.

TABLE 4 | Prevalence of coping behaviors by year, coping households.

Coping behavior	Severity	2012/2015	2018	Change
Eating less preferred foods	Mild	85.6%	87.1%	1.5
Limiting types of food	Mild	81.3%	83.8%	2.5
Limiting portion size	Moderate	62.0%	72.7%	10.7
Reducing number of meals	Moderate	53.6%	60.3%	6.7
Restricting adult consumption	Moderate	29.0%	41.8%	12.8
Borrowing food	Moderate	16.3%	26.8%	10.5
No food in the household	Severe	16.1%	55.8%	39.7
Going to sleep hungry	Severe	13.4%	49.6%	36.2
Going a whole day and night without eating	Severe	6.2%	19.4%	13.2

Source: Nigeria GHS-P 2012, 2015, and 2018.

TABLE 5 | Coping household descriptive statistics by year, 2012/2015 and 2018, Nigeria.

Variable	2012 and 2015		2018		Test for equality of means
	Mean	SD	Mean	SD	F-test
Coping behaviors	3.6	2.04	5.0	2.57	$F = 696.833^*$
Real household expenditure (000s)	335.4	265.3	341.4	281.5	$F = 0.952$
Real household expenditure per capita (000s)	78.5	87.3	89.7	95.3	$F = 30.505^*$
Proportion of children	0.42	0.26	0.48	0.36	$F = 79.135^*$
Household size	5.6	3.1	5.1	3.2	$F = 47.4^*$
	N	Percent	N	Percent	Chi-squared test
Severity of coping	4945		3379		$\chi^2 = 1565.97^*$
Mild	1252	25.3%	544	16.1%	
Moderate	2671	54%	709	21%	
Severe	1022	20.7%	2126	62.9%	
Agricultural	3191	64.5%	2559	75.7%	$\chi^2 = 117.41^*$
Polygamous	717	14.5%	571	16.9%	$\chi^2 = 8.65^*$
Employed	4216	87.9%	2987	90%	$\chi^2 = 8.53^*$
Homeowner	3509	71%	2070	61.3%	$\chi^2 = 85.27^*$
Education	4945		3379		$\chi^2 = 69.94^*$
None	2340	47.3%	1293	38.3%	
SSSC or lower	2122	42.9%	1658	49.1%	
Professional degree	269	5.4%	242	7.2%	
University degree	214	4.3%	186	5.5%	

Note: Statistical significance markers: $*p < 0.01$.

Source: Nigeria GHS-P 2012, 2015, and 2018.

is employed, and more highly educated heads of household had lower incidences of food insecurity. However, in 2018, the proportion of polygamous households coping with food insecurity increased by 2.4pp., and the proportion of coping households

with heads of household who are employed and more highly educated also increased. This is indicative of the broadening of the Nigerian food security crisis to include households not typically affected by food insecurity in previous years. Finally, we find

TABLE 6 | Household descriptive statistics by change in food security status, 2018, Nigeria.

Food security status Variable	Transitory insecure			Chronically insecure			Secure			Test F-test	Test F-test
	Mean	SD	Percent	Mean	SD	Percent	Mean	SD	Percent		
Coping behaviors	4.3	2.6		5.0	2.5		0.0	0.0		$F=18.5^{***}$	$F=475.7^{***}$
Total expenditure (000s) 2012N	334.2	263.0		312.6	258.5		391.3	352.4		$F=1.5$	$F=4.2^{**}$
Total expenditure per capita (000s) 2012N	84.0	77.0		76.0	79.9		90.4	99.3		$F=2.2$	$F=0.6$
Age	53.3	14.4		55.0	14.1		55.5	13.7		$F=3.0^*$	$F=2.9^*$
Variable	N	Percent	Percent	N	Percent	Percent	N	Percent	Percent	Chi-squared	Chi-squared
HFIAP	316			634						$\chi^2=18.4^{***}$	—
Secure	0	0%		0	0%					—	—
Mild	76	24.1%		96	15.1%					—	—
Moderate	80	25.3%		129	20.3%					—	—
Severe	160	50.6%		409	64.5%					—	—
Sector										$\chi^2=1.836$	$\chi^2=4.191^{**}$
Rural	211	66.8%		452	71.3%		136	76.0%			
Urban	105	33.2%		182	28.7%		54	24.0%			
Education										$\chi^2=11.9^{***}$	$\chi^2=1.2$
None	136	43%		271	42.7%		81	45.3%			
SSSC or lower	128	40.5%		300	47.3%		64	35.8%			
Professional degree	31	9.8%		29	4.6%		20	11.2%			
University degree	21	6.6%		34	5.4%		14	7.8%			
Zone										$\chi^2=125.9^{***}$	$\chi^2=16.6^{***}$
North Central	83	26.3%		46	7.3%		41	22.9%			
North East	45	14.2%		107	16.9%		31	17.3%			
North West	59	18.7%		71	11.2%		44	24.6%			
South East	15	4.7%		182	28.7%		21	11.7%			
South South	53	16.8%		124	19.6%		19	10.6%			
South West	61	19.3%		104	16.4%		23	12.8%			

Note: Statistical significance markers: * $p<0.1$; ** $p<0.05$; *** $p<0.01$.

that coping households in 2018 tend to have *fewer household members* and a higher proportion of members who are children.

Notably, since real household expenditure does not decline and real expenditure per capita actually increases between 2012/2015 and 2018, we conclude that the increase in food insecurity is almost entirely due to the price shock, rather than an income shock. The income and substitution effects of this food price shock on the consumption of other basic needs, such as health expenditure, warrant further study.

Descriptive statistics by change in food security status are presented in Table 6. We present three groups based on their change in food insecurity status between 2015 and 2018. As the names imply, the transitory insecure group comprises households that were food-secure in 2015 and became food-insecure in 2018, with the transitory secure group being the opposite case, where a household was food-insecure in 2015 and then food-secure in 2018. Finally, the chronically insecure group was food-insecure in both 2015 and 2018. All tests are relative to the transitory insecure food insecurity group.

While the chronically insecure group engaged in an average of 5.0 coping behaviors, the transitory insecure group engaged in an average of 4.3 coping behaviors. The chronically insecure group had a higher proportion of households that were severely food-insecure, at 62.9%; however, 50.6% of the transitory insecure group were also severely food-insecure. The transitory insecure group was more likely to have a younger head of household with a professional or university degree. The North Central zone is very much overrepresented in the transitory insecure group, which indicates that this region had a higher-than-average proportion of households becoming food-insecure in 2018. This region typically has the lowest rate of food insecurity in Nigeria. Relative to the secure group, the transitory insecure group had significantly lower total expenditure and a younger head of household, and were much more likely to be rural. The fact that the transitory insecure group was more like the chronically food-insecure group is supported by findings by Christiaensen and Boisvert (2000).

4.3 | Regression Results

Here, we report the outcomes of the hurdle regression conducted to determine the severity of household coping. As a first step, households are separated into coping and non-coping. Next, a binary logistic regression is performed to establish the factors that determine whether a household falls into the coping or non-coping group. The results are presented in Table 7. Standard errors are clustered by households and enumeration area to account for repeated observations and unobservable differences, respectively.

The year indicator variables show that households were not significantly more or less likely to be coping in 2015 and were 10.6% more likely to be coping in 2018 (not accounting for the year interactions with employment, agriculture, and total expenditure per capita). Single-parent households were 2.7% more likely to be coping,⁴ while homeowners were 7.4% less likely to be coping. The former is supported by the argument

TABLE 7 | Coping=1 versus non-coping=0 logistic regression, marginal effects.

Variables	Coefficients
2015	−0.003
2018	0.106**
Agriculture	−0.072***
2015:Agriculture	0.039
2018:Agriculture	0.071**
Single parent	0.027*
Total expenditure per capita (000s)	−0.0002
2015:Total expenditure per capita (000s)	−0.0004***
2018:Total expenditure per capita (000s)	−0.0004***
Employed	−0.093***
2015:Employed	0.066*
2018:Employed	0.067*
Homeowner	−0.074***
SSSC or lower	−0.002
Professional degree	−0.096***
University degree	−0.222***
Urban	0.026
Proportion of children	0.047**
North East	0.075***
North West	0.051**
South East	0.371***
South South	0.228***
South West	0.109***
Observations	13,582
Log likelihood	−8206.58
Akaike Inf. Crit.	16,461.16

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

put forward by Law, Ward, and Coveney (2011) that single-parent households suffer more from food insecurity, while the latter is in accordance with the claim made by Fafard St-Germain and Tarasuk (2020) that home ownership lowers the degree of vulnerability to food insecurity. Higher levels of education also have a positive effect on food security; high school or less is not statistically different from no education, and we see an increasing effect with higher levels of education—heads of household with a professional degree were 9.6% less likely to be coping and those with a university degree 22.2% less likely to be coping. Overall, we are able to conclude that higher earnings associated with better education provide more resources to buy food, improved access to nutritious foods, and more options to cope with price shocks and food shortages (see Gebre 2021; Mutisya et al. 2016).

Although household expenditure per capita carries a negative sign, suggesting that higher expenditure decreases the likelihood of engaging in coping behavior, the coefficient is statistically insignificant. However, the effect becomes statistically significant in 2015 and 2018 relative to 2012. This is in agreement with past studies suggesting that food expenditure is the main constituent of household expenditure, and that increases in household expenditure lower food insecurity by raising food expenditure (see Kalaba et al. 2022; Rashid et al. 2024). In both 2015 and 2018, we found that a percentage increase in household expenditure lowers the probability of coping by about 0.4%. There is thus no significant difference between the effect of household expenditure in 2015 and 2018. In general, agricultural households were 7.2% less likely to be coping. This finding is just as reported by Abdoellah et al. (2023) that the average calorie adequacy of farmer households is usually higher. By 2015, however, the difference in coping behaviors between agricultural and non-agricultural households had disappeared, as the recorded coefficient had become statistically insignificant. The situation had worsened by 2018, as agricultural households became 7.1% more likely to be coping, which suggests agriculture may be considered to have become another coping behavior. Indeed, we find that the percentage of households involved in agriculture increased from 66.0% in 2015 to 75.1% in 2018. Taken together, this means that cash expenditures became more important for keeping households out of food insecurity in 2015 and 2018 as food prices rose relative to 2012. Households with a higher proportion of children were 4.6% more likely to be coping across all years, ratifying the conclusion by Drammeh, Hamid, and Rohana (2019) that a large family size places an extra burden on food consumption, thereby increasing the chances of food insecurity. Heads of household who are employed were 9.3% less likely to be coping, but just 2.7% less likely in 2015 and 2.6% less likely in 2018. This outcome is broadly in alignment with the conclusion reached by Mabli et al. (2023) that unemployment is associated with food insecurity. Overall, these results are consistent with the pattern observed in the descriptive statistics. Household characteristics that tended to shield households from food insecurity in 2012 became relatively less important in 2015 and 2018, with more households becoming food-insecure due to rising food prices.

Finally, relative to the North Central zone, where Abuja, the capital of Nigeria, is located, households in the North East and North West zones were 7.7% and 4.9% more likely to be coping with food insecurity, respectively, which is to be expected, as these regions are quite similar geographically. Households in the South East zone were 37.1% more likely to be coping, households in the South-South zone 22.5% more likely, and households in the South West zone 11.0% more likely to be coping with food insecurity. This is also consistent with patterns observed in the descriptive statistics, where households in the northern zones tend to be more food-secure, and households in the southern zones tend to be more food-insecure. The north tends to produce an agricultural surplus that is transported (with great difficulty) to the south, where there is typically an agricultural shortage.

Next, we investigate the severity of the food insecurity experienced by households that are, in fact, coping. This is done by

TABLE 8 | Hurdle model, second-stage results, incident rate ratios (dependent variable = count of behaviors).

Variables	Coefficients
2015	1.015
2018	1.299**
Agriculture	1.024
2015:Agriculture	0.958
2018:Agriculture	0.925*
Single parent	1.050*
Polygamous	0.954*
Distance to market	0.998**
2015:Distance to market	1.001*
2018:Distance to market	1.003**
Total expenditure per capita (000s)	0.999**
Employed	0.915**
Homeowner	0.921**
SSSC or lower	0.965*
Professional degree	0.958
University degree	0.916**
Proportion of children	1.095**
North East	0.997
North West	0.987
South East	1.440**
South South	1.343**
South West	1.083**
Constant	3.687**
Observations	13,582
Log likelihood	-25,290.64

Note: * $p < 0.05$; ** $p < 0.01$.

using the number of coping behaviors in which a household engaged as a measure of the severity. We do this with a negative binomial regression to account for over-dispersion and excess zeros in the second stage of the hurdle regression. The results are presented in Table 8. The coefficients are presented as incident rate ratios, which are the multiplicative factor that increases or reduces the expected number of behaviors in which a household engages. For example, households on average in 2018 are expected to engage in 1.299 times the coping behaviors relative to 2012, whereas polygamous households are expected to engage in 0.954 times the coping behaviors on average relative to non-polygamous households.

We find that agricultural households in 2018 are expected to engage in 0.925 times the coping behaviors of non-agricultural households. Indeed, the descriptive data show that in 2018, agricultural households were more likely to be in the mild and

moderate HFIAP categories and less likely to be in the severe category. This makes intuitive sense, as agricultural households would have access to the basic staple foods that they grow. It is thus less likely that an agricultural household would completely run out of food at any given time.

The head of the household being employed significantly reduces the number of coping behaviors engaged in by a factor of 0.915, and owning their home reduces it by a factor of 0.921. These are clear income and wealth effects, respectively. Single parents were more likely to engage in more coping behaviors by a factor of 1.05, as were households with a higher proportion of children by a factor of 1.095. Conversely, polygamous households tended to engage in fewer types of coping behaviors by a factor of 0.954. Thus, just as in Owoo (2018), we are able to infer that at the household level, polygynous households enjoy better food security than monogamous households. These effects reflect the supply of labor relative to the number of dependents. The number of coping behaviors declined with household expenditure per capita by a factor of 0.999 per 1000 naira. Households further from agricultural markets tended to engage in fewer coping behaviors (factor of 0.998 per km). Relative to 2012, however, the trend reverses to become factors of 1.001 and 1.003 per km, respectively, in 2015 and 2018. Finally, there is no statistically significant difference in the coping behaviors of households in the North East, North West and North Central zones. Households in the South East (1.44 times more), South–South (1.34 times more), and South West (1.08 times more) all engaged in significantly more coping behaviors.

Finally, we identify the segments of the population that have engaged in severe coping behaviors by comparing these households with those that have engaged in moderate coping behaviors. Moderate coping behaviors include limiting portion sizes, reducing the number of meals, restricting adult consumption and borrowing food. Severe coping behaviors are no food in the household, going to sleep hungry and going a whole day and night without eating. We assess the determinants that tip a household into severe food insecurity compared with moderate food insecurity (Table 9).

We find that while households were 18.1% less likely to be severely food-insecure in 2015 than in 2012, households were 19.5% more likely to be severely food-insecure in 2018 than in 2012. In general, households further from the market were 7% less likely to be severely food-insecure per 1% increase in the distance to the market. This confirms previous findings that access to market is a key determinant of food insecurity (see Hoang 2018; Munawar et al. 2021). However, as food prices began to increase in 2015, we saw a change in the probability, as households further away from the market became 4.7% more likely to be severely food-insecure per percentage increase in distance. By 2018, the probability of severity increases to 9.5% per percentage increase in distance.

Whereas single parenthood is the key family structure factor determinant of whether or not households engaged in coping behaviors, gender is the key family structure determinant for moderate versus severe coping behaviors. Studies such as Olagunju et al. (2012) and Sekhampu (2017) also report that

TABLE 9 | Logistic regression results: moderate = 0 versus severe = 1, marginal effects (dependent variable = severe).

Variables	Coefficients
2015	−0.181**
2018	0.195**
log_dist_market	−0.070***
time2015:log_dist_market	0.047**
time2018:log_dist_market	0.095***
Gender	−0.507***
gender:log_age	0.140**
log_age	−0.201***
hh_agri	0.061*
gender:hh_agri	−0.085**
single_parent	0.045
Polygamous	−0.054**
tot_exp_capita	−0.0002*
hh_employed	−0.072***
own_home	−0.049**
SSSC or lower	−0.056***
Professional degree	−0.068*
University degree	−0.077*
i_children_less_15	−0.052**
hhszise	−0.022***
gender:hhszise	0.021**
n_elderly	0.258***
gender:n_elderly	−0.221***
North East	0.071
North West	0.02
South East	0.150***
South South	0.146***
South West	−0.057
Observations	6354
Log likelihood	−3514.95

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

household headship is a useful predictor of food security, and that female-headed households tend to be more at risk of food insecurity. There are several important differences by gender of the head of household. Overall, male-headed households were 50.7% less likely to engage in severe coping behaviors (in line with the raw data) than female-headed households, when interactions are not accounted for. Several parameter estimates reveal various gender-related effects when interactions are considered. For instance, compared to their male counterparts, the likelihood of severe coping behaviors in

female-headed households tends to be 14% lower for every additional year. These results indicate that whereas male-headed households start out as being more food-secure, as the ages of the heads of the households increased, food security increased at a greater rate in female-headed than in male-headed households. The likelihood of severe coping behaviors in male-headed agricultural households tended to be 8.5% lower than in female-headed agricultural households. This may be due to females having considerably weaker land rights than males in Nigeria (Ajala 2017), which would make agriculture undertaken by female-headed households less productive on average. Also, for every unit increase in household size, male-headed households tended to be 2.1% more likely to exhibit severe coping behaviors than their female counterparts. This may have to do with the fact that additions to female-headed households are often as a result of widows remarrying, whereas additions to male-headed households are due to additional wives and children. While remarriages by widows mostly introduce additional breadwinners into the family, additional children and wives increase the number of dependents. Finally, households headed by elderly males (85 years of age and older) were 22.1% less likely to exhibit severe coping behaviors than their female counterparts.

Additional revelations are as follows. For every additional year to age, the likelihood that households will engage in severe coping behaviors decreased by 20.1%. Agricultural households were 6.1% more likely to engage in severe coping behaviors. Polygamous households were 5.4% less likely to experience severe coping behaviors. Expenditure per capita decreased the probability of severe coping behaviors, although its effect is almost negligible. The employment status of the head of household is also important, as employed heads of household were 7.2% less likely to experience severe food insecurity. Homeowners were 4.9% less likely to experience severe food insecurity, and households with children under the age of 15 were 5.2% less likely to experience severe food insecurity. Every addition to household membership diminishes the probability of severe food insecurity by about 2.2%. Households headed by people aged 85 years or above were 25.8% more likely to experience food insecurity. We also find that the chances of severe food insecurity were lower in households headed by people with higher education. With regard to the zones, although no significant difference exists in the probability of severe food insecurity among the northern zones, the probability of severe food insecurity was higher in the South East and South West zones than in the benchmark zone (North Central).

5 | Conclusion

In the face of a deep currency devaluation and soaring food prices in a country that had become heavily reliant on readily available foreign exchange and cheap imported food, the Nigerian government chose to forbid the use of foreign exchange for the import of food. This policy effectively banned the import of many staple food items to Nigeria under the guise of stimulating the domestic output of these staples. Unfortunately, Nigeria lacks the capacity to produce anywhere near the amount of the

staples imported in recent years, and once-busy processing facilities sit idle. Consequently, real food prices have risen in Nigeria, despite real food prices falling globally. As food prices rose, the prevalence and severity of household food insecurity in Nigeria have also increased. This paper investigates the changes in the types and severity of food insecurity coping behaviors caused by the food price shock resulting from the combined effect of the oil price crash, currency devaluation and foreign exchange restrictions. Specifically, Nigeria's General Household Survey Panel data from 2012 and 2015, when oil prices were high (or had only recently fallen), was compared with data from 2018, when oil prices had been persistently low, the currency had been devalued and the treasury had been depleted.

Our findings reveal that overall, a large increase in the proportion of Nigerian households coping with food insecurity occurred between 2015 and 2018; 68.7% of all households engaged in at least one coping behavior and nearly one-third (31.8%) of all households engaged in six or more coping behaviors. In terms of the severity of those behaviors, 62.9% of coping households engaged in severe coping behaviors such as running out of food or going a whole day and night without eating. This means that of all households in Nigeria, 43.2% had to engage in severe coping behaviors. This is a famine caused not so much by natural disaster or conflict as by a failure of macroeconomic and agricultural economic policy.

Typical types of households affected by moderate or severe food insecurity in 2018 are identified. One group is predominantly female-headed single-parent households, the majority located in the rural areas south of Nigeria. These households are less likely to be involved in agriculture, probably due to an inability to own land. This means that they must face the higher cost of food in rural Nigeria without the support of subsistence agriculture. Furthermore, these heads of household are much less likely to be employed outside the home, yet many are mothers to at least one child under the age of 15.

The second typical group to be discussed is rural households, mostly from the north. Most of these are male-headed households and are much more likely to be polygamous. These households have more members than average, and more children than average. They are almost all involved in subsistence agriculture and have very low total expenditures per capita. This suggests that they rely on agriculture for most of their basic needs and supplement this with some food purchased in the market. These families have shown significant resilience against the massive increase in the price of food and have remained relatively more food-secure.

The final typical household to be discussed is predominantly rural but tends to live further away from the agricultural markets and in the south of Nigeria. The heads of household tend to be older than average and are likely to be engaged in agriculture and/or labor outside the household. These households tend to have more members and have more than two children on average. This group also has low expenditure per capita, which suggests that the small amount of cash they have to spend on food to supplement their diet buys much less than it once did, pushing them and their children into food insecurity.

While this effective import ban policy has indeed achieved the stated goal of increasing the profitability of domestic agriculture, by 2020 Nigeria was still importing more than 95% of its wheat and sugar. This policy has effectively created an import quota for anyone who receives an official exemption. Given that real food prices fell globally from 2012 to 2018 and rose in Nigeria, massive rents must certainly be accruing to anyone able to import the import-controlled goods. One notable example of such an occurrence is when, in August 2019, the Central Bank told lenders to stop offering credit to importers of milk after saying it would ban access to foreign exchange for dairy purchases to spur local production. It later lifted forex restrictions for milk imports for six firms following an outcry from businesses (Reuters and Oluocha 2021).

Overall, our findings confirm that these policies of the Nigerian government come at a great cost to current generations, particularly female-headed households, single-parent households, households headed by elderly people, and other vulnerable populations, pushing them deeper into food insecurity. The decision taken in October 2023 by the Nigerian government, through the Central Bank, to lift the foreign exchange restriction placed on essential agricultural and food items is therefore a good decision that perhaps came a little too late. Another important discovery is that the government's policy of providing financial support for small-scale farming that dominates the agricultural landscape in Nigeria cannot achieve anywhere near the productivity of large-scale agriculture. In spite of all the major investments made in the agricultural sector in Nigeria, there has been very limited improvement in the volume of output. This may be tied to the fact that most of these investments, rather than being channeled into large-scale, mechanized agriculture, are being used to support small-scale agri-businesses. This study also highlights the extent to which the Nigerian government was unprepared for food price shocks. While the government had every opportunity to prepare for a potential food shortage when oil prices were high and government coffers were full, it abjectly failed to do so. Indeed, strategic grain reserves, a tool successfully used by the Indonesian government since the 1970s, have been built in Nigeria but have been woefully underfunded and lie idle. This vast network of silos is to be sold off to private investors—no doubt at a loss to the government—in another obvious instance of mismanagement at best, or outright corruption at worst.

This food security crisis, while certainly not created by the Nigerian government, has been mismanaged and exacerbated by misguided policy. This is a multi-faceted failure of policy. First, the agricultural sector and infrastructure required to support it is far behind where it could have otherwise been due to years of neglect toward developing that sector. When the Nigerian government finally decided to stimulate domestic agricultural output, they chose to do so by increasing food prices after they had already risen sharply due to the collapse of the currency. This is a failure of trade policy, as Nigeria is not allowing free and open trade for a wide range of basic goods. Finally, this is the result of a failure of macroeconomic policy, as the Central Bank policy of maintaining a fixed exchange rate has proved unsustainable. Taken together, these policies have had negative impacts on a great number of Nigerians and will have long-lasting consequences for children who grow up in these times of heightened food insecurity.

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Ethics Statement

The authors have nothing to report.

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

¹<https://www.cbn.gov.ng/OUT/PUBLICATIONS/REPORTS/RD/2000/HALF-YR2000.PDF>.

²<https://www.worldbank.org/en/country/nigeria/overview#1>.

³Extreme poverty is defined as living on less than 137,430 naira per day—equivalent to approximately \$1 USD per day.

⁴Note that the indicator variable for polygamous households is not significant in the first stage regression; however, it is significant in the second stage on the number of behaviours.

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