Rethinking Poverty in Nigeria: The Demographics of Households with Threatened Livelihoods

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ABSTRACT

While access to adequate food and freedom from hunger is a basic human right, millions of Nigerians experience food insecurity and are malnourished. Using nationally representative and panel data from the Nigeria General Household Survey (NGHS), this study analyzes the socioeconomic and demographic correlates (including wealth index, a widely used measure of household socioeconomic condition) of household livelihoods in Nigeria. The study expands the existing measures of household livelihood to include persistent and transitory food insecurity and water access. A series of multinomial logistic regression models showed very weak associations between the predictors of household socioeconomic status in previous studies (e.g. education, employment, and household wealth) and experiences of household food insecurity and limited water access. The study seeks to advance our knowledge about household food insecurity in Nigeria by providing new insights into processes underlying household food insecurity and their implications for wellbeing.

The literature on household welfare is permeated with definitions and measurements of household economic status and poverty (Bollen et al. 2002). Although there is no ubiquitous conceptualization of poverty, the Committee on Economic, Social and Cultural Rights at the United Nations, in 2001, broadly defined poverty as including any "human condition characterized by sustained or chronic deprivation of the resources, capabilities, choices, security and power necessary for the enjoyment of an adequate standard of living and other civil, cultural, economic, political and social rights" (5). People can be poor in absolute terms, when judged against a minimum standard of living, or poor, when their living conditions are lower, relative to the living standards of another segment of the society (Falkingham and Namazie 2002; Foster 1998). In poor countries like Nigeria, where the majority of the population struggles with basic subsistence, absolute poverty better portrays household living conditions (Falkingham and Namazie 2002).

Understanding people's living conditions is essential in every human society because poverty influences nearly all demographic and health outcomes, including life expectancy, maternal and child mortality and morbidity, human capital development, fertility, contraceptive use, use of healthcare facilities, among others (Adeyemi et al. 2009; Bollen et al. 2002; Filmer and Pritchett 2001; Gonzales et al. 2010; Gwatkin et al. 2007; Houweling et al. 2003; Montgomery et al. 2000). Poverty estimates are particularly crucial to policies and programs aimed at alleviating poverty in the poor regions of the world (Hanmer et al. 1999). But the determination of who is poor and who is not largely depends on operationalization of poverty in surveys and is very sensitive to measurement error (Falkingham and Namazie 2002; Hanmer et al. 1999). Empirically, the choice of indicators of living standards not only influences the relationship between economic status and health-related outcomes (Lindelow 2006), but it also

shapes the associations between many sociodemographic variables and health outcomes (Bollen et al. 2002; Houweling et al. 2003).

In view of the salience of the definition and measurement of poverty, actual measures of household consumption of food and other goods and services are the most preferred indicators of household welfare. However, more often than not, income and expenditure serve as proxies for household consumption patterns (Falkingham and Namazie 2002). Also, the dearth of panel data in many developing countries precludes the analysis of transitory and persistence household poverty experiences (Carter and May 1999). This study takes advantage of a recent longitudinal data collection in Nigeria to examine the patterns of household food poverty and limited water access over a two year period (2010-2012). Food and water are two basic needs for survival, inadequacy of which suggests serious deprivation or extreme poverty (Hanmer et al. 1999). They are also, arguably, better indicators of livelihood than the money-metric measures employed in previous studies (Carter and May 1999). Also, the analysis seeks to investigate the extent to which one of the most widely used measure of household socioeconomic condition – wealth index – captures the experiences of extreme poverty in Nigerian households. Lastly, the paper examines the correlates of food poverty and water access in the giant of Africa. This research utilizes more recent survey data - the 2010 and 2012 Nigeria General Household Survey (NGHS) - thereby allowing analysis of poverty experiences in more recent socio-historical time in the country.

The Study Context

Nigeria is the most populous African country. With its nearly 179 million people, the nation accounts for one-sixth of the entire Africa's population (United Nations 2014). Nigeria's population is estimated to emerge the third largest in the world, surpassing the US population, by

2050 (United Nations Press Release 2013). Based on its over 3000 dollars GDP per capita (The World Bank 2014), Nigeria ranks high on national income, relative to other developing countries. In addition, Nigeria's GDP per capita has risen substantially since the 1970s oil boom. However, majority of the population of the self-acclaimed largest economy in Africa, worth $510 billion which is far more than South Africa's $352 billion (African Development Bank Group 2014), live in abject poverty. Using the World Bank's poverty headcount ratio of one dollar twenty five cents a day, 68 percent of Nigerians lived in poverty in 2010, up from 63 percent in 2004. The vast majority of the population (85%) survived on less than two dollars a day in 2010 (The World Bank 2014).

The manifestations of poverty cut across nearly all sectors of Nigeria's economy. But the health impacts of poor living conditions in the country have received the most attention. At least one out of every four children under the age of five in Nigeria was underweight in 2012 (The World Bank 2014). Also, even though Nigeria ranks seventh in population size around the world, more mothers and children die in Nigeria than in any other country, except India (UNICEF 2011). Given Nigeria's rich resource endowment, the level of poverty in the country is concerning. But a large body of literature has emphasized how unlike many other resource-rich nations like Saudi Arabia, Nigeria's rich natural resource endowment has been a curse rather than a blessing to the majority of its populace (Hodler 2006).

Understanding poverty experiences in poor countries like Nigeria is expedient but onerous because "as a rule, the poorer a country, the more difficult it is to know just how poor its people are and whether their living standards are improving over time" (Ravallion and Chen 1997: 357). Poverty is multidimensional (Bollen et al. 2002; Carter and May 1999; Howe et al. 2008) and in order to improve the health and wellbeing of poor people in Nigeria and elsewhere,

it is important to study poverty in its different forms (Falkingham and Namazie 2002). Evaluating the achievement of the Millennium Development Goal of eradicating extreme poverty and hunger by 2015 requires an assessment of access to food and water. Food insecurity, particularly in urban parts of the globe, though of lower political priority, influences nearly all aspects of life and other social problems that top government agenda (Maxwell 1999).

Measuring household welfare

Due to its clearer policy implications and the complexity involved in other conceptualizations of household welfare, income is the most preferred measure of living standard (Montgomery et al. 2000; Howe et al. 2008). But the variability in sources of income, its seasonal nature in agrarian societies, and the paucity of income data resulting from difficulty involved in collecting accurate information about earnings, make income a less preferred measure in resource-poor countries like Nigeria (Howe et al. 2008; Sahn and Stifel 2003). Income-poverty also provides weak assessment of the causes of poverty, thereby making interventions less feasible (Carter and May 1999; Hanmer et al. 1999). There is therefore, growing demands for alternative measures of household welfare and poverty in the poor countries like Nigeria (Falkingham and Namazie 2002; Sahn and Stifel 2003).

Economists have widely employed consumption expenditure, a money-metric alternative measurement of standard of living in many developing countries (Boosyen et al. 2008; Falkingham and Namazie 2002; Sahn and Stifel 2003). Adjusting consumption expenditure for variations in household sizes produces household per capita expenditure on consumption, which is a more preferred measure of household welfare than consumption expenditure (e.g. Chen and Ravallion 2004; 2007; Montgomery et al. 2000; Ravallion and Chen 1997). However, collection of consumption expenditure data is plagued with reliability issues and the data gathering is

cumbersome (Sumarto et al. 2007). More so, the widely available Demographic and Health Survey (DHS) and other social survey data, from many sub-Saharan African countries, lack information on consumption and expenditure (McKenzie 2005). Thus, researchers have adopted alternative measures of socioeconomic wellbeing in the region, notably the wealth or asset index. Asset index and consumption expenditure are both imperfect proxies for household welfare and so they somewhat differ in their rankings of households and in their estimates of household poverty (Lindelow 2006; Sahn and Stifel 2003). Both the wealth index and consumption expenditure measure long-term socioeconomic status of households (Howe et al. 2008) but information about household assets is easier to collect, more cost-efficient, and produces more reliable data (Bollen et al. 2002; Lindelow 2006).

The asset index method provides a relative assessment of living conditions which involves ranking households (e.g. in quintiles) based on their ownership of an array of assets (Boosyen et al. 2008). Asset poverty or the wealth index has been widely used in the study of HIV prevalence, gender issues, fertility, child mortality, contraceptive use, women's reproductive health, and so on (Afifi 2009; Falkingham and Namazie 2002; Mishra et al. 2007). The adoption of the asset-based measure is premised on the idea that a goal of most poverty alleviation programs is to increase ability of individuals and households to acquire income generating assets (Sahn and Stifel 2003). Yet, assets are not only discrete in nature, but they are also durable (Boosyen et al. 2008). This means that asset index provides an ambiguous long term household economic status that is less responsive to short-term economic shocks (Boosyen et al. 2008; Falkingham and Namazie 2002; Gonzales et al. 2010; Howe et al. 2008). In times of economic difficulty, individuals may prefer to lessen their food and other household expenditure while preserving their household assets. At the same time, changes in assets may not necessarily

mean changes in household welfare (Falkingham and Namazie 2002). Wealth index is, therefore, limited in monitoring people's experiences of poverty over time.

Unlike per capita consumption expenditure that adjusts for variability in price (but often due to problems involved in valuing assets), researchers usually assume comparable prices and/or values of assets across space (Bollen et al. 2002; Lindelow 2006). Many studies also fail to adjust for variations in household sizes and compositions when constructing the wealth index (Howe et al. 2008). Therefore, relatively large and poor households may be ranked high on the wealth quintiles when they report more assets, simply due to their sizes. Clumping ensues when there are inadequate number of assets to distinguish the poor from the very poor households at the lower end of the asset scale (Boosyen et al. 2008; McKenzie 2005) and very low access to public facilities or many durable goods among the poorest households can result in the problem of truncation when using wealth indices (Howe et al. 2008; McKenzie 2005).

More so, asset index is derived from aggregate country-level data which raises the issue of validity of the measurement, particularly in the rural areas (Boosyen et al. 2008; Falkingham and Namazie 2002). Asset measures sometimes reflect mere geographic proximity to public infrastructure (Boosyen et al. 2008; Falkingham and Namazie 2002) and many assets used to estimate asset poverty, such as electricity, pipe borne water, flush toilets, and cement floor, are more urban than rural in nature (Boosyen et al. 2008; Filmer and Pritchett 2001; Lindelow 2006). It is therefore not surprising that assets predict poverty better in rural areas than in the urban centers (Somarto et al. 2007). Previous studies have also reported cross-country, regional, and state variations in the relative importance of assets (e.g. Filmer and Pritchett 2001). Whereas household goods like television, radio, and fridge better distinguish wealth classes in Jamaica, access to pipe-borne water assesses wealth better in Madagascar (Sahn and Stifel 2003).

The choice of asset indicators is limited to those available in surveys, particularly the Demographic and Health Survey (DHS) (Falkingham and Namazie 2002). The DHS not only has limited number of durable goods with no information about their quantity or quality, but it also fails to include many assets commonly owned by the poor and rural dwellers (Houweling et al. 2003). This may be because the assets in DHS were not originally intended to measure household socioeconomic status (Falkingham and Namazie 2002; Howe et al. 2008). Although the World Bank developed a measure of relative economic status based on housing characteristics, durable consumer goods, water and sanitary facilities, among other amenities (Gwatkin et al. 2007), different studies construct wealth indices using different sets of wealth indicators despite variations in household ranking based on the choice of assets (Houweling et al. 2003; Montgomery et al. 2000) and how the scale is constructed (Boosyen et al. 2008).

Moreover, the wealth index is constructed from several variables, many of which may confound the associations between sociodemographic characteristics and health outcomes (Howe et al. 2008; Montgomery et al. 2000). The components of the wealth index affect and are affected, by different socioeconomic and health factors (Houweling et al. 2003). There is, therefore, no theoretical underpinning as to what specific aspect(s) of household socioeconomic status the wealth index assesses (Filmer and Pritchett 2001; Howe et al. 2008). In fact, the asset index is not based on actual experiences of poverty. Rather, it assumes close relation between material possessions and other aspects of wellbeing (Hanmer et al. 1999). However, socioeconomic wellbeing is multidimensional (Falkingham and Namazie 2002) and highly complex (Howe et al. 2008). It requires approaches beyond material consumption or resources (Falkingham and Namazie 2002). The relative strength of each dimension of household welfare and the interactions of the different measures of socioeconomic status are important to

intervention programs and policies (Gonzales et al. 2010). Food and water are two basic needs for survival, inadequacy of which suggests extreme or hardcore poverty (Hanmer et al. 1999). Questions about food security and water access are relatively simple to ask, and food insufficiency has been found to be a powerful correlate of money-metric poverty (Falkingham, 2000; McKenzie 2005).

Household Livelihoods based on food and water access

A society is food insecure when some or all of its people, at some point in time, do not have access (physical, social, and economic) to sufficient, safe, and nutritious food that they need or that they prefer to have in order to lead active and healthy lives (Ivers and Cullen 2011). Food insecurity at the household level involves unreliable and or insufficient quality and quantity of nutritionally adequate food (Hadley 2014; Sirotin et al. 2014). The theoretical understanding of the problem of food insecurity has evolved over time, from simply a failure of agricultural production, to "a failure of livelihoods to guarantee access to sufficient food at the household level" (Devereux and Maxwell 2001: 1). But except in rare instances of sudden surge in food prices or problems with food supply, household food insecurity is highly invisible to the public gaze; it is a problem often relegated to the household level (Maxwell 1999). Nevertheless, household food security, being an aspect of poverty (Hoddinott and Yohannes 2002; Kalichman et al. 2012), is associated with maternal and child wellbeing, human capital development, contraceptive use, risky sexual behavior, risks of contracting STIs including HIV, suicidality, chronic diseases, among other outcomes (Cook et al. 2006; Dewing et al. 2013; Diamond-Smith et al. 2015; Ivers and Cullen 2011; Kalichman et al. 2012; Oyefara 2007; Ramsey et al. 2011; Sirotin et al. 2014; Tsai and Weiser 2014; Vozoris and Tarasuk 2003). Globally, simulation

studies show that as many as five million to 170 million additional people are at risk of hunger by 2080 (Schmidhuber and Tubiello 2007)

Sub-Saharan Africa has the highest incidence and depth of poverty and remains the only region of the world being threatened by widespread persistent food insecurity and famine (Devereux and Maxwell 2001). It replaced East Asia as the region with the highest incidence of extreme poverty in the world between 1981 and 2001 (Chen and Ravallion 2004). The high fertility countries in the region are particularly prone to the problem of food insufficiency because, rapid population growth is closely related to the problem of household livelihood; it elevates levels of food demands, increases competition for land and water resources, as well as poses environmental challenges (Godfray et al. 2010). Unsurprisingly, over 40 percent of the residents of the most populous country in Sub-Saharan Africa – Nigeria- are food insecure (Amaza et al. 2006). Some estimates are larger than 60 percent (Ajani et al. 2006; Babatunde et al. 2007).

Although problems with household livelihoods are more pronounced in the developing world, there are limited studies of household welfare, based on food access, in resource-poor settings (Joshi et al. 2010; Nord 2014). Also, due to the reciprocal relationship between HIV/AIDS and food insecurity (Anema et al. 2009), the existing analyses of food insufficiency in developing countries have been predominantly conducted in relation to HIV/AIDS. However, in South Africa, and perhaps elsewhere, HIV, unlike other diseases, is more prevalent in the wealthier segment of the population (Mishra et al. 2007). In Nigeria, the few studies of food insecurity are based on limited geographic coverage – mostly one city. Oyefara (2007) studied food insecurity among the female commercial sex workers in Lagos metropolis; Amaza et al. (2006) examined food insecurity in Borno state; Titus and Adetokunbo (2007) in urban part of

Lagos; and Ajani and his colleagues (2006) analyzed food insecurity among households headed by primary and secondary school teachers in Lagos and Ibadan cities. Building on the existing understanding of poverty in Nigeria, the present study utilizes a recent, nationally representative, and panel survey data to examine the experiences of household food insecurity and limited water access in contemporary Nigeria. As suggested by Pinstrup-Andersen (2009), the study examines food insufficiency in conjunction with access to water. Given the large share of Nigeria's population living in abject poverty, food insufficiency and water access are indicators of welfare most appropriate for the context of this study.

Food poverty and water access measures are less susceptible to many of the issues arising from studies of household socioeconomic status using other measures, especially validity and reliability issues, problems with underreporting, and difficulty deriving monetary or use values of consumption. Like consumption and expenditure measures, food poverty estimates are derived from retrospective recollection of food consumption in the past seven days. However, unlike consumption expenditure, eating patterns are less sporadic and experiences of hunger should loom longer in people's minds, especially in households that are affected over a relatively long period of time. Food insufficiency and limited water access are also limitless by space and time. Whereas previous studies have mostly lumped water access with other components of the index of living standards (Montgomery et al. 2000), access to water is particularly advantageous over money-metric measures of poverty because it captures an aspect of poverty that cannot be easily monetized in surveys. Nonetheless, poverty assessment using measures of household food insufficiency and water access are intended to complement, rather than replace, the conventional money-metric measures. They are not superior measures of poverty, but ones that allow direct examination of two crucial manifestations of hardship.

The Present Study

The aims of this paper are threefold. First, it examines patterns of household food insecurity and water access over a two year period in Nigeria. The two aspects of household living conditions examined in this study – food poverty and water access – reflect the most basic needs for survival among poor people (Hanmer et al. 1999), and are therefore, arguably better indicators of livelihood than the money-metric measures (Carter and May 1999) in the context of this study. Whereas previous studies relied on static measures of poverty (e.g. Ajani et al. 2006; Amaza et al. 2006; Oyefara 2007; Titus and Adetokunbo 2007), panel nature of the NGHS makes it possible to monitor improvements (or deteriorations) in household living conditions in Nigeria over time.

Once I establish the level of food insecurity and pattern of water access in Nigeria, I will examine the relationships between insufficient food and water access and the established sociodemographic characteristics associated with poverty and food insecurity in previous research (e.g. Belachew et al. 2012; Bigsten et al. 2003; Garrett and Ruel 1999; Hanmer et al. 1999; National Population Commission 2014; Sumarto et al. 2007). These sociodemographic indicators include the following: education of household head, employment status of household head, household size, household dependency ratio, age of household head, gender of household head, urban residence, and region of residence. Prior studies have not established this profile of food insecurity and water access in Nigeria.

I will explore in multivariate models, the associations between two sets of outcomes - food insecurity and water access - and the above sociodemographic indicators. I expect that education of the household head and employment will be strongly associated with food insecurity and water access. Based on prior studies (Ajani et al. 2006; Amaza et al. 2006;

Belachew et al. 2011; 2012; Hanmer et al. 1999; Sumarto et al. 2007), I expect that households headed by less educated persons will be more likely to be food insecure and less likely to report limited water access. But the living standard-enhancing power of education is subject to availability of employment opportunities for maximal productivity among educated individuals (Hanmer et al. 1999). Given the high rate of unemployment in Nigeria and continued population growth that further depresses wages (Hanmer et al. 1999; Omonona and Adetokunbo 2007), it is important to also consider the role of employment of household head in the experiences of household food insecurity and water access. Labor force participation by the household head is associated with lower risks of poverty, particularly in the rural areas (Sumarto et al. 2007). More so, the type occupation that the household head engages in is a strong predictor of per capita expenditure (Bigsten et al. 2003). Therefore, I examine not just the effect of being economically engaged versus being out of the labor market, but also differentiate households headed by unemployed adults from those headed by individuals engaged in agriculture, sales and services, professional jobs, and other activities.

I include a series of demographic indicators of the households in the analyses. Household size is related to poverty with larger households experiencing higher levels of poverty (Ajani et al. 2006; Amaza et al. 2006; Bigsten et al. 2003). The dependency ratio is important as the number of producers versus consumers is related to poverty (Belachew et al. 2012; Bigsten et al. 2003). Age of the household head is negatively related to poverty (Bigsten et al. 2003; Hanmer et al. 1999). Gender of the household head is critical indicator of poverty as households headed by women are more likely to be poor than those headed by men, though this effect varies across countries (Amaza et al. 2006; Belachew et al. 2011; 2012; Hanmer et al. 1999; Joshi et al. 2010).

Scholars have highlighted the importance of incorporating urban–rural distinctions into poverty estimates (Boosyen et al. 2008; Chen and Ravallion 2007; Montgomery et al. 2000; Sumarto et al. 2007). Livelihoods and lifestyles vary across urban and rural households (Garrett and Ruel 1999). Urban poverty is easily linked to food insecurity (Maxwell 1999) because food prices are higher in the urban than in the rural areas and as such, city residents spend more on food, consume less, and purchase most of their food (Garrett and Ruel 1999). Nonetheless, poverty is mostly concentrated in the rural areas (Boosyen et al. 2008; Gonzales et al. 2010; Hanmer et al. 1999). Lastly, there is a huge spatial variation in poverty levels across the geopolitical regions in Nigeria (National Population Commission 2014; Ogwumike 2001). The poverty rate in the south-west for instance, is more than thrice the rate in the north-east region (The World Bank 2014).

A unique feature of this study is the ability to determine the extent to which wealth (or asset) index correlates with food poverty and insecure water access. The NGHS has an added advantage in this regard because respondents reported not just possession of each of the asset, but also the number of each assets present in their households. Therefore, I am able to test the relevance of asset quantities to measures of socioeconomic status. It is plausible that accumulation of consumer assets is a better measure of relative poverty in affluent, rather than poor social contexts (Zeller et al. 2001). Previous studies have shown very weak (Montgomery et al. 2000; Sahn and Stifel 2003) to modest (Howe et al. 2008) agreement between wealth index and consumption expenditure. The correlation coefficient between asset indices and household expenditure mostly ranges from 0.20 to 0.42 (World Bank 2003; Boosyen et al. 2008; Falkingham and Namazie 2002; Lindelow 2006), with high correlation of 0.71 reported only in Peru and South Africa (Sahn and Stifel 2003). Wealth index may even be less correlated with

extreme poverty than consumption expenditure. In a study, fewer than one-third (32%) of hard core poor Indonesians living in the rural areas were predicted to be hard core poor using the wealth index and even much fewer (18%) hard core poor urban residents of the country were identified correctly on the wealth terciles (Sumarto et al. 2007). In view of the weak association between wealth index and consumption expenditure in other settings, and given the fact that food is a component of household expenditure, I hypothesize a weak relationship between household wealth and food poverty in Nigeria. I also expect that change in household wealth will be weakly associated with change in household food insecurity. Given the limited conceptual and empirical work on water access as a measure of household welfare, I treat water access similar to food access. I expect a weak association between wealth index and limited water access in the country.

METHODS

Data

I utilized panel data from the Nigeria General Household Survey (NGHS). The NGHS is a nationally representative annual survey of 22,000 households conducted as part of the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA). In 2010, the survey was expanded to include a panel component that sampled 5,000 households out of the 22,000 core sample of the NGHS. Unlike its cross-sectional counterpart, the panel survey is biennial by design but the panel households are visited twice per wave of data collection; the two visits correspond to the post-planting and the post-harvest periods in each year. Although the NGHS primarily aims to collect household-level agricultural-related statistics, the survey also collects extensive information about household welfare and social behavior which could aid in the analysis of household socio-demographic characteristics in relation to health and wellbeing.

The panel NGHS is the first panel survey implemented by the Nigeria National Bureau of Statistics and one of the first few panel surveys in Nigeria. The LSMS-ISA team in the World Bank's Development Research Group provides technical guidance in the design and implementation of the NGHS survey as well as assist with the analysis of the data. The survey was supported by various organizations including the Nigeria Federal Ministry of Agriculture and Rural Development, the National Food Reserve Agency, the Bill and Melinda Gates Foundation, and the World Bank. The first round of the panel survey was carried out between August and October 2010 (post-planting) and between February and April 2011 (post-harvest). The 2012 survey was administered between September and November 2012 (post-planting) and between February and April 2013 (post-harvest). Thus, in reality, the NGHS spans about three years. In the present study, I used data from the two post-planting visits (August-October 2010 and September-November 2012). The design, implementation, and coverage of the NGHS have been detailed elsewhere (National Bureau of Statistics 2015[1]).

Unlike the Nigeria Demographic and Health Survey data which have been previously utilized in the analyses of household socioeconomic and nutritional status, the NGHS not only collects information about household durable assets, but it also recorded the occurrences of household food insecurity within the week preceding the survey. Thus, in addition to being one of the first few panel data in Nigeria, the NGHS presents a unique opportunity to analyze the relationship between two measures of household socioeconomic status – household food insecurity and household wealth. More so, the reports of time spent fetching or collecting water by the NGHS respondents expands the existing measures of household livelihood to include water access. Lastly, the NGHS allows researchers to account for the effects of a wide range of

[1] The data are also available for download through the World Bank's Living Standard Measurement Study website (http://go.worldbank.org/BY4SLL0380).

household sociodemographic characteristics such as education, employment, size, age, gender, place of residence, among others, in their analyses of health and wellbeing.

Sample

Although the NGHS originally sampled 5,000 households, 4,988 households completed the questionnaire at wave one. At the initial wave (2010), only 134 households had missing information on one or two out of the seven items used to measure household food insecurity. The majority (70%) of these households lacked data on the measures of less severe household food insecurity and only fifteen of them failed to supply information on more than one occurrence of household food insecurity. Therefore, I retained them in my analysis. I replaced the missing data on each household food insecurity question with the mean score on the item by the rest of the sample. The remaining 221 households with missing information on four or more food insecurity items were excluded from my analysis. Thus, there were 4,767 households in my 2010 analytic sample.

At wave 2 (2012), 245 households of the 2010 analytic sample did not participate in the survey. An additional 146 households did not answer any questions on household food insecurity and were excluded from my sample. Therefore, the sample for the analysis of change is based on 4,376 households (food insecurity measured at both waves 1 and 2).

There were some further sample restrictions based on missing data for the sociodemographic indicators. Nine household heads did not report their educational attainment at wave one but they did provide the information at wave 2. I substituted their missing education at wave1 for their reported educational attainment at wave 2. A comparison of the educational status of household heads at waves one and two suggests some reporting errors. In these cases I used the lower level of reported education. I excluded four heads of households who did not

report their educational attainment at both waves from the sample. Further, I eliminated three household with missing information on the age of household head at both waves while I substituted the missing age at baseline with the reported age at wave 2 (minus two) for 12 others. Based on these limitations the cross-sectional analyses are based on 4,760 households while the final sample for my analyses of stability and change in household food insecurity is 4,371 households.

As many as 760 households (15%) out of the original 4,988 households interviewed at the NGHS wave one had missing information on the time spent collecting or fetching water at wave two (251 did not participate in the survey at all). However, only 258 households did not report water collection time at wave one. In view of this data limitation, my analysis of limited water access is restricted to 2010 and is cross-sectional in nature. I excluded from my sample, four households with missing educational attainment of household head and two others with no valid age of household head. Therefore, my cross-sectional analysis of water access is limited to 4,724 households.

Measures

All the variables in my cross sectional analyses were assessed at the wave one post-planting interview. I also used lagged predictors of household food insecurity, measured at wave one (first visit) to predict stability and change in household food insecurity status in the panel component of my analysis.

Outcome variables

The two main dependent variables in this study are *household food insecurity* and *water access*. I utilized seven out of the nine items in the refined Household Food Insecurity Access Scale (HFIAS) which assesses the access component of household food security (Coates et al.

2007). Although Coates et al. (2007) recommended using the HFIAS questionnaire in its entirety, the HFIAS questionnaire was adapted by the NGHS in such a way that rendered two of its items less generalizable to all households in the sample. The first of these two items asked about a coping strategy used by households with children (restriction of adults' meals to accommodate children's nutritional demands) and the other one inquired about help-seeking behavior among households experiencing food insecurity (reliance on friends and relatives for food). Also, rather than asking about the frequency-of-occurrence of food insecurity separately from incidence, as in the HFIAS questionnaire, the NGHS combines both incidence and frequency of household food insecurity in a series of questions about the number of days during which households recorded certain occurrences of food insecurity. Nevertheless, the food insecurity questions in the NGHS were very similar to the ones in the HFIAS questionnaire, especially when use to categorize households along a continuum of severity of food insecurity.

I examine household food insecurity in cross-sectional and longitudinal analysis. First, I capture the incidence of household food insecurity a given point in time (2010). In the cross-sectional component, I compare the socioeconomic and demographic characteristics of three major categories of households based on their food insecurity status reported at wave one. These are: food secure households, moderately food insecure households, and severely food insecure households. The details of the reports of food insecurity among households in each of the three categories are presented in Table 1. My classification of Nigerian households into the above three categories closely mirrors the official and well tested classification adopted by the Food and Nutrition Technical Assistance III Project (FANTA) team in the US (see Coates et al. 2007).

Second, the longitudinal measure established stability and change in the experiences of household food insecurity over two year period (2010-2012). In the second part of my analysis

which is based on two waves of data from the panel NGHS, I examine factors predicting both transient and chronic household food insecurity in Nigeria. Along this line, my combination of measures of frequency of occurrence and severity of household food insecurity experience yielded four mutually exclusive categories of households in the country. The four categories comprise of: persistently food secure, persistently food insecure, newly food secure, and newly food insecure households. Persistent food insecurity status is based on reports of similar levels of household food insecurity at both waves of data collection (2010 and 2012). Newly food secure households were food insecure at wave one but reported food security at wave 2 while newly food insecure households transitioned into food insecurity over the study period.

The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) designates any household whose members spend more than 30 minutes on a water collection round trip as experiencing limited water access (WHO and UNICEF 2011). Because multiple trips to water sources are not uncommon in my study area, I crudely define limited *household water access* as more than two hours of household water collection per day. In the NGHS, all members of the household who were five years or older reported time spent on various domestic activities, including hours and minutes spent collecting or fetching water the day preceding the interview. In the present analysis, households whose members jointly spent more than two hours fetching or collecting water the day before they were surveyed had limited water access.

Household sociodemographic variables

Education is based on a categorical measure that is coded as a series of dummy variables: no education, primary school education, secondary school education, and higher levels of education. I included a fifth category comprising of households headed by persons with quranic or adult education. *Employment status* of the household head is based on reports of employment

activities within seven days preceding the survey. The questions asked whether or not the head of households: 1) worked for someone who was not a member of their households, 2) worked on a farm owned or rented by a member of their households, and 3) worked on their own account or in a business enterprise belonging to them or someone in their households. Household heads who reported engaging in any of the three work categories were considered employed and were compared to their unemployed counterparts in their experiences of household food insecurity. In a follow up question, respondents were asked to report the sector of their primary occupations. I combined the reports of employment status and the specific occupations to create the following employment categories: unemployed (reference category), agriculture, sales and services, professional jobs, and others.

Household size is a measure of the total number of individuals residing in each household. The respondents, including household heads, reported their *ages* in years. *Household dependency ratio* is the ratio of the total number of dependents (children under the age of 15 and adults sixty five years and above) to the total number of working age adults (age 15-64) in each household. *Gender* of the household head is coded as one for males and zero females. *Urban status* is based on location of a household in an urban enumeration area (EA) as defined by the Nigeria Census. I coded one for urban zero for rural. There are six geopolitical *regions* in the analyses and they are coded as a series of dummy variables: north-central, north-east, north-west, south-south, south-east and south-west, with south-west as the reference category.

Household wealth

In the NGHS, the household head provided information about ownership of a series of assets such as radio, television set, generating set, fridge, etc., by his/her household. Similar to previous studies (e.g. Bollen et al. 2002; Booysen et al. 2008; Filmer and Pritchett 2001; Howe et

al. 2008), I constructed a wealth index, one for each wave of data, from the dichotomized asset indicators. Each component of the wealth index was assigned weights generated from the first component of the principal components analysis (PCA). The PCA is a data-reduction statistical procedure that allows large numbers of correlated variables to be represented by few uncorrelated components. The procedures for using the PCA to construct asset indices have been widely documented in previous analyses (e.g. Bollen et al. 2002; Booysen et al. 2008; Howe et al. 2008). The asset indicators used in this study and their weights are presented in Table 3. In both 2010 and 2012, I used weights from the PCA and sampling weight from the NGHS to generate wealth deciles and quintiles which are used as continuous and categorical variables respectively in my analyses.

Analytic Strategy

The main aims of this study are three-fold: 1) to document the patterns and correlates associated with household food insecurity and limited water access in Nigeria between 2010 and 2012; 2) to examine the association, if any, between a widely-used measure of household socioeconomic status - wealth index - and household food insecurity and water access; and 3) to analyze how household wealth relates to change in household food insecurity status. I constructed a wealth index that categorizes Nigerian households into wealth quintiles based on their asset ownerships in 2010. In subsequent analyses, I will be exploring the importance of quantities and change in household assets to food insecurity experiences.

I first estimate the share of households in Nigeria that reported experiences of food insecurity and limited water access in 2010 and 2012. Then, I present the descriptive statistics of variables in the analyses. In order to answer my first and second questions in multivariate analyses, I use education of household head, employment of household head, household size, age

of household head, household dependency ratio, gender of household head, urban residence, region of residence, and household wealth to predict household food insecurity and limited water access. I estimate the odds of being moderately food insecure and severely food insecure, relative to being food secure using multinomial logistic regression (Table 3). My second set of models, logistic regression models, predict the odds of reporting limited water access, relative to having "unlimited" access to water (Table 4). I estimate zero-order models and then a series of models to evaluate how household sociodemographic factors are associated with food insecurity and limited water access. As shown on Table 3, the first model includes education, employment, household size, age, dependency ratio, gender, urban, and region of residence while the final model includes all the variables in the analyses. A similar modeling strategy is followed for analysis of limited water access (Table 4) except logistic regression is employed.

My third question focuses on change in household food insecurity. At the bivariate level, I examine the share of households that transitioned out of food insecurity and the share of households that slid into poorer conditions over the two year period. In order to answer my third question in multivariate analyses, I used multinomial logistic regression to analyze changes in household food insecurity. This set of models predicts the odds of upward transitory food insecure and downward transitory food insecure statuses, compared to having a persistent food insecurity status (Table 5). As in my previous analyses, I estimate zero-order models and then a final model with all the predictors in my analysis.

PRELIMINARY RESULTS

Table 2 presents the descriptive statistics of the variables included in the analyses. Two in five households reported a level of food insecurity in 2010. More than half (57%) of those households experiencing food insecurity were severely food insecure. The analysis of persistent

and transient food insecurity further revealed that only 40% of Nigerian households were food secure at both NGHS visits (2010 and 2012). More than one-fifth (22%) of all households were food insecure at both time points. Sixteen percent of the households had limited access to water in 2010.

Close to one-third of Nigerian households were headed by individuals with no education. Household heads reported higher level of education in only 15% of the households. Agriculture is the primary mode of subsistence in Nigeria; nearly half of all household heads were farmers. Close to one in ten Nigerian households were headed by unemployed adults. On average, each household had about three people and was headed by someone around 50 years of age. The average household dependency ratio was one. A relatively small segment of Nigerian households (5%) had no working age adults in them. Although Nigerian households were predominantly patriarchal, 16% were headed by women. More rural than urban households were included in the sample. The NGHS sampled fair share of households from all the six geopolitical zones in the country. Wealth was unevenly spread out among the sampled households.

[Table 2 about here]

Table 3 presents the results of multinomial logistic regression models predicting the odds of experiencing moderate or severe food insecurity, relative to being food secure, among households in Nigeria. According to the results of the zero order models, education, employment status, age of household head, household dependency ratio, gender of household head, urban residence, region of residence, and household wealth, were all significantly related to the experiences of food insecurity among Nigerian households. Contrary to my expectation, food insecurity was significantly more pronounced among households headed by individuals with primary and secondary education, than among those with uneducated household heads. Also,

higher levels of education were not significantly associated with the risks of food insecurity. Farming seems to be protective of Nigerian households against the risks of moderate and severe food insecurity. Households headed by older individuals had significantly higher odds of moderate but not severe food insecurity. Female-headed households were more represented among food insecure (moderate and severe) households. Similarly, urban residence predicts significantly higher odds of both moderate and severe household food insecurity. As in previous reports of poverty in Nigeria (e.g. National Population Commission 2014), I found a huge regional divide in the experiences of household food insecurity in Nigeria. However, contrary to other measures of household socioeconomic status, food insecurity seems less prevalent, or less often reported, in the northern regions where poverty is more concentrated, than in the southern regions.

[Table 3 about here]

The results in Model 1 show the relationships between food insecurity and the different household sociodemographic characteristics while controlling for the effects of other variables in the model. Education, employment, urban residence, and region of residence remained significantly associated with food insecurity net of other sociodemographic characteristics. Compared to those headed by uneducated persons, households headed by individuals with only primary education were at significantly greater risk of moderate food insecurity. Higher education and professional jobs on the other hand, had significant protective effects on severe but not moderate food insecurity. The odds of moderate food insecurity significantly increased with age of household head. Certain households with no working age adults, a relatively small segment of my total sample, were at significantly lower risks of moderate food insecurity. Urban households were significantly more prone to food insecurity than their rural counterparts. All

three northern regions – north-central, north-east, and north-west – had significantly lower odds of moderate household food insecurity than the south-western region but households in the south-west region compare to those in the north-central and the north-east in their experiences of severe food insecurity. Northwestern households were significantly less likely than households in the south-west to report severe food insecurity. Among the three southern regions – south-south, south-east, and south-west, households in the southwestern region stood out for their significantly lower odds of moderate and severe food insecurity. The final model (Model 2) includes all the variables in Model 1 and measures of household wealth. With few exceptions, the results in Model 2 were similar to those reported in Model 1. After accounting for wealth variations, higher education was no longer significantly related to household food insecurity. Also, control for household wealth in Model 2 revealed significant difference in the odds of severe household food insecurity between the south-west and the north-east. Finally, as hypothesized, my analyses showed weak association between household wealth and experiences of food insecurity in Nigeria. Though wealthy households were less likely to report severe food insecurity, experiences of moderate household food insecurity were similar across wealth spectrum.

Next, I examined the predictors of limited water access among Nigerian households. The results, presented in Table 4, showed important differences in the sociodemographic characteristics associated with water access, relative to food insecurity in Nigeria. As in my previous analyses, I first present the results of the zero-order models. Model 1 includes all the variables in the analysis, except household wealth which is included in the final model (Model 2). At the zero order level, primary, secondary, and tertiary education, relative to no education, predicted significantly lower odds of limited water access. Farming households were more likely

to report having limited water access. The odds of limited water access increases with increasing household size and number of dependents in the household. Female-headed households and households in the urban areas were, however, significantly less likely to report limited access to water than male-headed and rural households respectively. Limited water access was significantly less prevalent in the south-west than in all other geopolitical zone in Nigeria. I found the hypothesized positive relationship between water access and household wealth. The poorest households were significantly more vulnerable to limited water access than households higher up on the wealth quintile. The significant effects of education of head of household, employment of household head, household dependency ratio, and gender of household heads on the experiences of limited water access were all accounted for by other covariates of household livelihood included in Model 1. Further, after controlling for other predictors of limited water access, a significant association between age of household head and water access emerged. Households headed by older persons were found to be more likely to report limited access to water. The inclusion of measures of household wealth in Model 2 did not significantly change the results reported in Model 1. However, net of other covariates of water access, I found a seemingly curvilinear relationship between household wealth and limited water access. Only the richest and the poorer households had significantly greater advantage over the poorest households in terms of access to water.

[Table 4 about here]

My last set of analyses investigated the factors predicting changes in the experiences of household food insecurity in Nigeria over a two-year period – 2010-2012. In each of my multinomial logistic regression model, I predicted: 1) the odds of reporting food insecurity in 2012 (newly food insecure) given that a household was food secure in 2010; 2) the odds of a

previously food insecure household becoming food secure in 2010 (newly food secure); and 3) the odds of persistent food security versus persistent food insecurity across the study period. The results presented in Table 5 reveal significant relationships between most of the predictors of household livelihood in this study and household food insecurity. Food secure households headed by individuals with primary and secondary education were significantly more likely than those headed by uneducated persons, to become food insecure. Higher level of education was not significantly related to food insecurity. Compared to unemployment, agriculture enhanced the chance of escaping food insecurity among food insecure households. Farming households were also significantly more likely to be persistently food secure than being persistently food insecure. More so, over the two year period, households headed by individuals holding professional jobs were significantly more likely to be persistently food secure than to be persistently food insecure. However, employment of household head was not a significant predictor of transitioning into food insecurity.

Larger household size protected food secure households against the risks of food insecurity. Larger households were also more likely to be persistently food secure than persistently food insecure. Although households headed by older persons were at significantly greater risks of persistent food insecurity, age of household head was not significantly related to the odds of experiencing transitory food insecurity. The greater the number of dependents in food secure households, the higher the likelihood of sliding into food insecurity. Yet, households with more dependents had higher odds of persistent food security, relative to being persistently food insecure, than those with fewer dependents. Female-headed and urban households appeared significantly more vulnerable to food insecurity. Compared to their male-headed and rural counterparts, households headed by women and those in the rural areas were significantly more

likely to report food insecurity in 2012 if they were food secure in 2010; less likely to transition out of food insecurity, and had significantly lower odds of being persistently food secure relative to being persistently food insecure.

Food secure households in all the three northern regions were significantly less likely to become food insecure than those in the south-west; those that were food insecure had greater chances of moving out of food insecurity; and significantly more households in the north, than in the south-west, reported persistent food security. Households in the south-south region seemed to be more prone to food insecurity than those in the south-west. I found similar experiences of food insecurity among southeastern households and those in the south-west, except for the significantly lower odds of persistent food security versus persistent food insecurity among the former than among the latter households. Poor households (poorer and poorest) reported similarly on their experiences of transitory and persistent food insecurity. Surprisingly, I found significantly higher risks of sliding into food insecurity, lower chances of upward mobility, and lower odds of persistently food security versus persistent food insecurity among wealthy Nigerian households than among the poorest households.

While controlling for the effects of other covariates of household livelihood, I analyzed the association between each of the predictors and transitory and persistent household food insecurity in Model 1. As in the previous analyses, I ran Model 1 without the measures of household wealth but the results were mostly the same as those presented on the Table. The results on Table 5 show that net of other controls, higher education predicts significantly lower odds of food insecurity among food secure households. Households headed by highly educated persons were also significantly more likely to be persistently food secure than persistently food insecure. Compared to households with unemployed heads, farming households were not only

more likely to escape food insecurity but they were also significantly more represented among persistently food secure than persistently food insecure households. Urban residence remained associated with significantly higher chances of food secure households becoming food insecure. Urban households were also more likely than rural households to be persistently food secure versus persistently food insecure. The inclusion of other covariates in Model 1 changed the regional variations in household food insecurity very little. However, the significant relationship between household wealth and food insecurity reported in the zero order models were mostly accounted for by other predictors. Controlling for variations in sociodemographic characteristics across households, rich Nigerian households only differed from their poorest counterparts in their significantly higher odds of persistent food security relative to persistent food insecurity.

Discussion and Next Steps

The present study expands the existing measures of household livelihood in Nigeria to include persistent and transitory food insecurity and water access. I found very weak associations between the predictors of household socioeconomic status in previous studies (e.g. education, employment, and household wealth) and experiences of household food insecurity and limited water access. The many unexpected findings emerging from my preliminary analyses such as the lower prevalence of food insecurity in the poorer northern regions of Nigeria relative to the southern regions, and the significantly higher risks of food insecurity among wealthy households than poorer ones, call for better understanding of household food insecurity experiences in the giant of Africa.

I will continue to explore different conceptualizations of food insecurity and alternative measures of household wealth that take into account the number of each asset that households reported as well as changes in wealth ownership over the study period. In order to further our

existing knowledge of poverty in Nigeria, I will also conduct further analyses to determine the levels of household asset ownership among the really poor Nigerians, relative to the rest of the population. More importantly, I will be jointly estimating the risks of food insecurity and water access in my next set of analyses.

While this study moves the field forward there are a few limitations. Like most longitudinal data, the NGHS is affected by the problem of attrition. Also, the wealth index used in this study excludes measures of access to public facilities (e.g. type of water and use of electricity), housing conditions (e.g. floor and roofing materials), and certain types of cooking fuel (e.g. dung, straw, shrubs, and grass). In spite of the above limitations, this study will contribute immensely to food insecurity research. Adequate knowledge of household food security which is an aspect of poverty (Hoddinott and Yohannes 2002; Kalichman et al. 2012), is essential because poverty influences nearly all demographic and health outcomes, including life expectancy, maternal and child mortality and morbidity, human capital development, fertility, contraceptive use, use of healthcare facilities, among others (Adeyemi et al. 2009; Bollen et al. 2002; Filmer and Pritchett 2001; Gonzales et al. 2010; Gwatkin et al. 2007; Houweling et al. 2003; Montgomery et al. 2000).

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Table 1. Measures of Food Insecurity

Occurrence of food insecurity	Frequency of occurrence (past seven days)			
	Never (0 day)	Rarely (1-2 days)	Sometimes (3-4 days)	Often (5-7days)
Relied on less preferred foods				
Limited the variety of food eaten				
Limited portion size at meal times				
Reduced number of meals eaten in a day				
Had no food of any kind in the household				
Went to sleep at night hungry because there was not enough food				
Went a whole day and night without eating anything				

Data: Nigeria General Household Survey

Food secure Moderately food insecure Severely food insecure

Table 2. Descriptive Statistics for Study Variables

Variables	Percentage and Mean
Household food insecurity	
2010	
Food secure	59.49
Moderately food insecure	25.74
Severely food insecure	14.76
2012	
Persistently food secure	40.74
Persistently food insecure	22.21
Newly food secure	18.76
Newly food insecure	18.29
Limited water access (2010)	15.72
Sociodemographic characteristics	
Education of household head	
No education	30.26
Primary school education	27.09
Secondary school education	21.39
Higher education	15.29
Quranic/adult education	5.97
Employment status of household head	
Unemployed	9.35
Agriculture	44.57
Sales and services	24.38
Professional jobs	13.44
Others	8.25
Household size	3.24 (2.31)
Age of household head	50.23 (15.38)
Household dependency ratio	0.97 (0.90)
Households with no working age adults	4.51
Female-headed households	15.78
Urban residence	40.21
Region of residence	
North-central	12.51
North-east	10.46
North-west	20.55
South-south	14.96
South-east	14.73
South-west	26.79
Household wealth	
Poorest	20.40

Poorer	19.98
Medium	20.02
Richer	20.09
Richest	19.51

Source: Nigeria General Household Survey, 2010 and 2012; Standard deviation in parentheses where appropriate

Table 3. Relative Risk Ratios from Multinomial Logistic Regression of Household Food Insecurity in Nigeria, 2010 (n = 4,760 households)

Predictors	Zero order Models		Model 1		Model 2	
	Moderately FI vs. FS	Severely FI vs. FS	Moderately FI vs. FS	Severely FI vs. FS	Moderately FI vs. FS	Severely FI vs. FS
Intercept			0.30***	0.30**	0.31***	0.36**
Household sociodemographic characteristics						
Education of household head (0=no education)						
Primary school education	1.77***	1.37*	1.27*	0.91	1.30*	0.98
Secondary school education	1.57***	1.25	1.19	0.80	1.25	0.97
Higher education	1.09	0.80	0.80	0.53**	0.86	0.73
Quranic/adult education	0.59**	0.29***	0.97	0.56	0.97	0.58
Employment status of household head (0=unemployed)						
Agriculture	0.70*	0.50***	1.04	0.76	1.03	0.72
Sales and services	1.03	0.77	1.01	0.75	1.03	0.78
Professional jobs	0.76	0.46***	0.91	0.55*	0.93	0.58*
Others	1.06	0.82	1.04	0.80	1.05	0.86
Household size	0.98	0.96	1.02	1.01	1.02	1.02
Age of household head	1.01**	1.01	1.01*	1.00	1.01*	1.00
Household dependency ratio	0.90*	0.94	1.00	1.05	1.00	1.05
Households with no working age adults	0.73	1.09	0.56*	0.79	0.54*	0.70
Gender of household head (0=male)						
Female-headed households	1.38**	1.63***	1.00	1.02	0.98	0.94
Urban residence(0=rural)						
Urban residence	1.42***	1.76***	1.25*	1.86***	1.31*	2.14***
Region of residence (0=south-west)						
North-central	0.51***	0.68*	0.55***	0.85	0.54***	0.75
North-east	0.38***	0.61**	0.42***	0.77	0.40***	0.66*
North-west	0.38***	0.31***	0.42***	0.40***	0.40***	0.34***
South-south	1.34*	1.50*	1.35*	1.83***	1.36*	1.84***
South-east	1.51**	1.85***	1.62***	2.38***	1.65***	2.44***
Household wealth (0=poorest)						
Poorer	1.28*	1.08			1.06	0.88
Medium	1.55***	1.66***			0.95	0.90
Richer	1.73***	1.63**			0.87	0.65*
Richest	1.80***	1.00			0.83	0.36***

Source: Nigeria General Household Survey, 2010; FI = food insecure; FS = food secure

Table 4. Odds Ratios, Logistic Regression Models of Limited Water Access in Nigeria, 2010 (n = 4,724 households)

Predictors	Zero order Models	Model 1	Model 3
Intercept		0.02***	0.03***
Household sociodemographic characteristics			
Education of household head (0=no education)			
Primary school education	0.61***	0.81	0.84
Secondary school education	0.51***	0.83	0.89
Higher education	0.56***	0.87	1.00
Quranic/adult education	1.43*	1.03	1.06
Employment status of household head (0=unemployed)			
Agriculture	2.55***	1.33	1.32
Sales and services	1.42	1.57	1.61
Professional jobs	1.58	1.41	1.44
Others	1.69*	1.71	1.74
Household size	1.22***	1.13***	1.14***
Age of household head	1.00	1.01***	1.01***
Household dependency ratio	1.28***	1.07	1.06
Households with no working age adults	0.17**	0.20**	0.19**
Gender of household head (0=male)			
Female-headed households	0.43***	0.76	0.72
Urban residence(0=rural)			
Urban residence	0.41***	0.65***	0.69**
Region of residence (0=south-west)			
North-central	4.67***	3.37***	3.18***
North-east	8.68***	5.19***	4.75***
North-west	5.20***	3.22***	2.93***
South-south	2.18***	1.73*	1.72*
South-east	2.09***	1.72*	1.74*
Household wealth (0=poorest)			
Poorer	0.68**		0.78*
Medium	0.63***		0.96
Richer	0.42***		0.77
Richest	0.29***		0.60*

Source: Nigeria General Household Survey, 2010

Table 5. Relative Risk Ratios from Multinomial Logistic Regression of Transient and Persistent Household Food Insecurity in Nigeria, 2010-2012 (n = 4,371 households)

Predictors	Zero order Models			Model 1		
	Newly FI vs. Persistently FS	Newly FS vs. Persistently FI	Persistently FS vs. Persistently FI	Newly FI vs. Persistently FS	Newly FS vs. Persistently FI	Persistently FS vs. Persistently FI
Intercept				0.39*	0.76	1.79
Household sociodemographic characteristics						
Education of household head (0=no education)						
Primary school education	1.72***	0.57***	0.43***	1.14	0.79	0.76
Secondary school education	1.70***	0.60**	0.49***	1.29	0.74	0.70
Higher education	0.93	0.96	1.05	0.63*	1.34	1.65*
Quranic/adult education	1.21	1.83	3.03***	1.67*	0.70	0.83
Employment status of household head (0=unemployed)						
Agriculture	0.79	2.36***	2.95***	1.09	1.85**	1.66*
Sales and services	1.14	1.05	1.22	1.03	1.14	1.34
Professional jobs	0.82	1.50	2.20***	1.08	1.17	1.45
Others	1.61	1.88*	1.17	1.55	1.88*	1.17
Household size	0.95*	1.03	1.06**	1.01	0.97	0.97
Age of household head	1.00	0.99	0.99***	1.00	1.00	0.99
Household dependency ratio	0.83***	1.05	1.17**	0.91	0.94	0.97
Households with no working age adults	0.79	0.89	1.17	0.63	1.25	2.43**
Gender of household head (0=male)						
Female-headed households	1.44*	0.56***	0.44***	0.91	0.86	0.95
Urban residence(0=rural)						
Urban residence	1.65***	0.67**	0.45***	1.86***	0.80	0.44***
Region of residence (0=south-west)						
North-central	0.40***	1.97**	3.20***	0.48***	1.69*	2.64***
North-east	0.36***	4.14***	6.45***	0.43***	3.43***	5.19***
North-west	0.61**	3.44***	7.02***	0.67*	2.91***	5.79***
South-south	4.48***	0.48***	0.26***	5.98***	0.42***	0.20***

South-east	0.82	0.96	0.65*	1.03	0.87	0.49***
Household wealth (0=poorest)						
Poorer	1.24	0.94	0.79	1.05	1.16	1.11
Medium	1.65***	0.51***	0.39***	1.11	0.90	1.00
Richer	1.46*	0.52***	0.39***	0.76	1.11	1.50*
Richest	1.79***	0.63*	0.48***	0.85	1.38	2.21***

Source: Nigeria General Household Survey (Panel), 2010-2012; FI = Food insecure, FS = Food secure, PFS = Persistently food secure, PFI = Persistently food insecure