MEASURING HOUSEHOLD FOOD SECURITY STATUS IN TARABA STATE, NIGERIA: COMPARING KEY INDICATORS

By

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: March 2015

ABSTRACT

Achieving food security and reducing hunger requires comprehensive measurement for proper identification of the food insecure, the severity of food insecurity, its causes, and progress in reducing food insecurity. Measuring food security is challenging due to its multidimensional nature as all four dimensions (availability, access, utilisation, and stability) need to be achieved simultaneously. Comprehensive measurement has not been achieved as most existing indicators have a uni-dimensional focus and efforts to find a 'composite indicator' (a catch all measurement tool) have thus far been unsuccessful. This study therefore identified how the three most widely used indicators of food security, the Household Food Insecurity Access Scale (HFIAS), Dietary Diversity Score (DDS) and the Coping Strategies Index (CSI), can complement one other in capturing the multiple dimensions of food security. The study brought them together in one cross-sectional household survey of 409 randomly selected households in Taraba State, Nigeria. The results show that 69 percent of households in Taraba had a very low food security status, 23 percent had low food security, and 8 percent had high or marginal food security. About 34 percent of the households used very erosive coping strategies. Very low food security status was found to be associated with: a household head who is a farmer, less educated, or divorced; low household income and expenditure; large household size; and not owning large plots of land. The survey revealed that most households that obtain the greater proportion of their food from own production, and spend most of their income on the purchase of starchy staples were in the very low food security category. Those that sourced their food mainly through purchase, and spent more on fresh fruit and vegetables, meat, fish, eggs, and processed foods were in the high or marginal food security category. The study showed that the key indicators followed a clear complementary pattern. The bivariate analysis showed a significant difference ($P<0.01$) in DDS and CSI across HFIAS categories. The HFIAS very low food security category is characterised by the lowest food diversity and highest CSI, revealing that the depth of food insecurity is intense among the extreme group. The study demonstrated that these three indicators can be used together for a fuller understanding of the relationships between the different dimensions of food security, and recommended more studies in using complementary indicators to measure food security. This thesis is presented as the two academic articles option: the first article reviews the measurement of food security and complementarity of the three measures, while the second article discusses the findings of the survey.

OPSOMMING

Die bereiking van voedselsekerheid en die bekamping van hongersnood vereis omvattende meting vir die korrekte identifikasie van voedselonsekerheid, die erns daarvan, die oorsake daarvan, en die proses van voedselonsekerheidvermindering. Die meting van voedselsekerheid is 'n uitdaging as gevolg van die multidimensionele aard daarvan, aangesien die onderskeie dimensies (beskikbaarheid, toegang, benutting, en stabiliteit) tegelyktydig bereik moet word. Omvattende meting is nog nie bereik nie, aangesien bestaande aanwysers 'n eendimensionele fokus het, en aangesien pogings om 'n 'saamgestelde aanwyser' ('n allesomvattende metingsinstrument) te vind, tot dusver onsuksesvol was. Hierdie studie het dus geïdentifiseer hoe die drie mees algemene aanwysers vir voedselsekerheid, naamlik die Huishoudelike Voedselonsekerheid Toegangskaal *(HFIAS)*, die Dieetkundige Diversiteitstelling *(DDS)* en die Hanteringstrategieë Indeks *(CSI)*, mekaar kan aanvul om die verskeie dimensies van voedselsekuriteit vas te vang. Die studie het die bogenoemde instrumente saam geïmplementeer in 'n deursnee-huishoudelike opname van 409 ewekansig-geselekteerde huishoudings in Taraba Staat, Nigerië. Die resultate het 69 persent van huishoudings in Taraba met 'n baie lae voedselsekerheid-status getoon, 23 persent met 'n lae voedselsekerheid-status, en 8 persent met 'n hoë of geringe voedselsekerheid-status. Ongeveer 34 persent van die huishoudings het baie verwerende hanteringsstrategieë gebruik. Baie lae voedselsekerheid-status is bevind om meer geassosieer te word met: 'n huishoudelike hoof wat 'n boer is, minder opgevoed is, of geskei is; waar daar lae huishoudelike inkomste en uitgawes teenwoordig is; 'n groot huishoudelike grootte; en die nie-besitting van eiendom. Die opname het geopenbaar dat die meeste huishoudings wat die grootter proporsie van hulle voedsel vanaf eie produksie verkry, en die meeste van hulle inkomste op die aankoop van styselagtige stapelvoedsel spandeer, in die baie lae voedselsekerheid-kategorie geval het. Diegene wat hulle voedsel hoofsaaklik deur aankope verkry het, en meer spandeer het op vars vrugte, groente, vleis, vis, eiers en geprosesseerde kosse, was in die hoë/ geringe voedselsekerheid kategorie. Die studie het bevind dat die sleutelaanwysers 'n duidelike aanvullende patroon gevolg het. Die tweeveranderlike ontleding het 'n beduidende verskil ($P<0.01$) in *DDS* en *CSI* oor *HFIAS*-kategorieë getoon. Die *HIFIAS* baie lae voedselsekerheidkategorie word gekenmerk deur die laagste voedseldiversiteit en hoogste *CSI*, wat openbaar dat die diepte van voedselonsekerheid intensief is onder die uiterste groep. Die studie het

gedemonstreer dat hierdie drie aanwysers saam gebruik kan word om ’n beter begrip van die verhoudings tussen die verskillende dimensies van voedselsekuriteit te verkry, en daar is aanbeveel dat meer navorsing onderneem word aangaande die gebruik van aanvullende aanwysers om voedselsekuriteit te meet. Hierdie tesis word aangebied as die twee-akademiese-artikels opsie: die eerste artikel bied ’n oorsig van die meting van voedselsekerheid en die aanvullendheid van die drie instrumente, terwyl die tweede artikel die bevindinge van die studie bespreek.

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LIST OF ACRONYMS AND ABBREVIATIONS

CSI	Coping Strategies Index
DDS	Dietary Diversity Score
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agricultural Organisation
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HND	Higher National Diploma
HSRC	Human Sciences Research Council
LGA	Local Government Area
NCE	Nigeria Certificate in Education
NPC	National Population Commission
O Level	Ordinary Level
OND	Ordinary National Diploma
Std	Standard Deviation
UN	United Nations
USDA	United States Department of Agriculture

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CHAPTER 1 – INTRODUCTION

1.1 INTRODUCTION[1]

In this opening chapter, the background of the research focus is described through reference to the literature. This provides insight into the problem statement which is then used to identify the research questions that the study sought to answer. Next, an introduction is provided to the research design and methodology, as well as the limitations of the study. The chapter concludes with an overview of the remainder of the thesis.

1.2 BACKGROUND

Humanity today faces many obstacles to the achievement of sustainable development; a term which has been widely adopted since it was originally defined by the 1987 Brundtland Commission as 'development that meets the needs of the present, without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development 1987). Swilling & Annecke (2012) have referred to these obstacles to sustainable development as a 'polycrisis' and identified seven key issues that need to be addressed in order to resolve the polycrisis: ecosystem degradation, climate change, oil peak, poverty and inequality, material flows, urbanisation and food security.

Globally, about 805 million people are estimated to be seriously undernourished (FAO et al. 2014); despite the massive improvements in food production over the past six decades since the Green Revolution, and the fact that enough food is produced to feed over ten billion people (Holt-Giménez et al. 2012). The food insecure lack access to sufficient quantity and quality of food for a healthy and active life, which can compromise their health, wellbeing and productivity. A country with many food insecure citizens can even lead to a lower Gross Domestic Product for a country, making food insecurity an economic challenge, as well as a human rights problem (FAO 2012b; White & Masset 2007; Jones et al. 2013). To achieve the goal of hunger eradication in a sustainable manner, as proposed in the Sustainable Development Goals (United Nations Department of Economic and Social Affairs 2014), there is a need for indicators that will

[1] As per the requirements of the Sustainable Development postgraduate programme, this thesis is presented via the two academic articles format for submission to a conference and an accredited journal.

help in identifying the food insecure and provide adequate contextual information for measuring, monitoring and evaluating progress (De Haen et al. 2011).

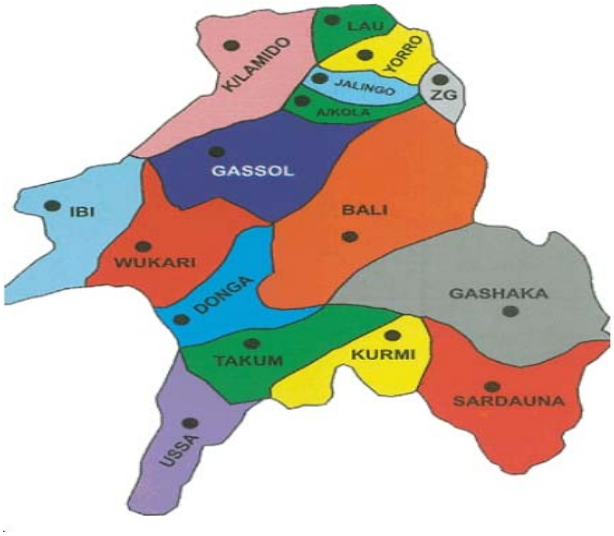
The most widely accepted definition of food security is from the Food and Agriculture Organisation of the United Nations (FAO): “A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO et al. 2014: 50). A careful look at this definition reveals the multidimensionality of the concept. Headey and Ecker (2012) and Nathalie (2012) reported that there are about 250 definitions and 450 indicators of food security, which has brought much knowledge as well as much difficulty in the measurement of the concept. The lack of a comprehensive and standardised measure that can be used as a yardstick for satisfactory monitoring of food security conditions is still a challenge (Jones et al. 2013; De Haen et al. 2011), although suggestions abound on the use of two or more complementary indicators that measure different dimensions of food security to achieve a more comprehensive measurement (FAO 2013a; Nathalie 2012; Maxwell et al. 2013; Coates et al. 2007).

Taking into consideration the key dimensions of food security (availability, access, utilisation and stability), some researchers have combined two or more food security indicators in a study to achieve more comprehensive information on food security (Nathalie 2012; Maxwell et al. 2013). The focus of these works was to find out how the different indicators grouped the households into food security categories and to develop a multidimensional measure. Their works brought greater understanding of food insecurity at a household level, and tried to compare the grouping of the instruments to find out how they compare. They concluded that relying on one indicator will lead to misclassification of the households.

Very important to this study is the suggestion by Maxwell & Coates (2012) that the focus of improving food security measurement should be on understanding how the indicators, especially the 4th generation indicators (HFIAS, DDS, and CSI), complement each other, and their adaptation to the local context. These 4th generation indicators are the longest standing and most widely validated indicators of food security that currently dominate the food security measurement debate (Maxwell & Coates 2012; Maxwell et al. 2013).

Despite being Africa's largest economy and most populous nation, Nigeria has extremely high poverty and food insecurity levels (Central Intelligence Agency 2014). Taraba is one of the northeast states of Nigeria. It has a population of about 2.3 million people and occupies a land area of 54,473sq.km and has an international boundary in the east with the Republic of Cameroon (Online Nigeria 2003). Taraba is a highly heterogeneous, multi-ethnic state, with over 80 indigenous ethnic groups and languages and 16 Local Government Areas (LGAs), which are divided into four (4) agricultural zones. The multi-ethnicity of Taraba, has being a source of constant conflict that has affected the welfare of the people (Aluaigba 2008). The zones and their constituent local government areas are: (1) Wukari zone: Gassol, Ibi, Wukari. (2) Zing zone: Jalingo, Ardo Kola, Yorro, Lau, and Zing, Karim Lamido. (3) Bali zone: Takum, Kurmi, Ussa, Bali, Donga, Gashaka. (4) Gembu zone: Sardauna (tarabastate.gov, 2011).

Figure 1: Map of Taraba State, Nigeria



Source: Nigerian Muse (2010)

The people of Taraba are predominately engaged in subsistence crop and pastoral farming. They cultivate yams, cowpeas, sugar cane, rice, vegetables, cassava, millet, sorghum, beniseed, etc., and they rear animals including cattle, goats, sheep, and donkeys (Online Nigeria 2003; Kuku-shittu et al. 2013).

It is well documented that, even with the aggressive support of the agricultural sector by the government of Nigeria to achieve food security, the northeast region of Nigeria is the most food

insecure part of the country (Ajayeoba 2010; Liverpool-Tasie et al. 2011; Akinyele 2009). Liverpool-Tasie et al. (2011) and Akinyele (2009), in reviewing food security studies in Nigeria, identified that most studies generating food security information about Nigeria depend heavily on national data of food production, income, and calorie intake, which do not give a clear picture of household food access. This confirms that little has been done in measuring household levels of food security in Nigeria, yet the household is still the most important social unit for food preparation and consumption (Maxwell & Caldwell 2008).

1.3 PROBLEM STATEMENT

Food insecurity is a challenge to human society, affecting physiological, environmental and economic development. To address this challenge, there is a need for comprehensive information on the nature and prevalence of food security, and also a proper identification of the people affected. This will allow for more effective policies, programmes and food aid design and monitoring. But the multidimensional nature of food security has been a challenge as most indicators only measure one dimension, and attempts to create a composite indicator have thus far not been successful. In trying to address the problem of multidimensionality of food security, scholars and food security agencies have suggested the use of more than one valid indicator together that can complement each other in food security measurement (Headey & Ecker 2012; Maxwell & Coates 2012; Webb et al. 2006; FAO 2013a).

1.4 RESEARCH QUESTIONS

The main aim of the study is to investigate how the three key indicators of food security (HFIAS, CSI and DDS) complement each other in measuring food security by using them together in a cross sectional survey of households in Taraba State, Nigeria.

The research questions that will be addressed in the study in order to achieve this aim are as follows:

1. How well do the three key indicators (HFIAS, CSI, and DDS) capture the four main dimensions of food security?
2. What is the breadth and depth of food insecurity in Taraba State?
3. How do households compare across the HFIAS food security categories in terms of socio-economic variables?
4. Is there a difference in the consumption patterns of the HFIAS food security categories?

5. What percentage of the households is considered vulnerable based on the coping strategies used?
6. Is there difference in the consumption of iron and Vitamin A rich foods across food security categories, and
7. How do the three key indicators complement each other?

1.5 INTRODUCTION TO RESEARCH DESIGN AND METHODOLOGY

In order to answer the research questions posed above, the research design selected was a mixed or hybrid approach that combined both qualitative and quantitative methods in a cross-sectional survey. A brief overview of the design and methodology is provided here, with more detail being contained in Chapter 2 and within each of the articles in Chapter 3 and 4.

A literature review was conducted initially to provide an overview of the state of food security measurement and to answer research question one on how well the HFIAS, DDS and CSI capture the different dimensions of food security (presented in Chapter Three, the conference paper). This literature review was conducted through an organised search of various academic databases (e.g. JSTOR and EBSCOHost) using a variety of search terms, as well as sourcing grey literature from the websites of respected food security agencies like the FAO.

To answer research questions two to seven, a cross sectional survey was designed which combined the three key indicators and also included questions on household socio-economic characteristics and whether households experienced extreme weather events. The optimum recall periods for each indicator were used thereby capturing long-term, medium-term and short-term time ranges (HFIAS: one month (Coates et al. 2007); CSI: seven days (Maxwell & Caldwell 2008); and DDS: 24 hours (Kennedy et al. 2011). The questionnaire was sent to food security experts for their review before being translated into the local languages in Taraba with the assistance of the tertiary students and Agricultural Development Programme staff who were hired as fieldworkers. The questionnaires were also adapted to the local conditions through seven focus group discussions with local people before being piloted. After adjustments were made, the questionnaires were then administered to over 400 households across Taraba that were selected through multistage sampling to provide a representative picture of the food security status of the state. Although the aim was to obtain 450 responses, the violent conflict in the state at the time of the survey (May 2014) meant 409 responses were gathered.

Results from the survey were then analysed using descriptive and inferential statistics. Rasch model scoring (Coates et al. 2007), CSI calculation (Maxwell & Caldwell, 2008), and the FAO HDDS calculation method found in Kennedy et al. (2011), were used in analysing the data collected using the three food security core questions. RASCH model used in analysis the data collected using the HFIAS, has two components that can be used to derive attributes or characteristics of food insecure households. Respondents can therefore be objectively categorised through this strategy.

For the comparative part of the study (research question six), the Spearman correlation and ANOVA statistics were used. The Kruskal-Wallis test was used to verify the ANOVA estimates, and the Bonferroni test was used for the post hoc analysis. For categorical relations, Chi-Square was used to test for differences across the three HFIAS groups. Information gathered through observation and informal discussions, which could not be analysed using statistical tools, were discussed using simple narrative.

1.6 LIMITATIONS OF THE STUDY

The major factors that limited this study include working in a conflict region, multiple languages, funding and, of course, time.

- The active conflict in the area constituted a hindrance to the fieldwork, but this was mitigated by seeking the assistance of the community leaders and the security personnel assigned to these areas, as well as employing more field workers and providing a means of transportation for the field workers between their areas of assignment and the regional centre of Jalingo. By adapting the data collection in this way information on food security in a conflict area was successfully collected.
- The multiple languages in Taraba State were also a challenge, as I have very little understanding of them. In order to overcome this limitation, field workers who understand most of the languages of the State were employed for the data collection and for the translation and adaptation of the survey questions.
- Funding was probably the greatest limitation of this study, but more students from tertiary institutions were employed as field workers (rather than the agricultural development programme staff earlier proposed). This made it a little cheaper, but did not reduce the quality.

- This thesis is limited to food security measurement, with focus on the three key indicators; it did not cover all existing food security indicators. Also, it did not cover the health aspect of nutritional security, as human nutrition goes beyond food to include health and care, but the Dietary Diversity Score was used to capture the nutritional aspect of food security.
- The work is also limited to a household level study. This was chosen because the household still remains the most important space through which humans obtain their food. The sample included only 'regular' households and so excluded the homeless and people in transit.
- The work is also limited to a cross-sectional data collection. Given the limited time for this study the work could only collect data on food security at one point in time.

1.7 SIGNIFICANCE OF THE STUDY

Measurement of food security is essential for proper understanding, monitoring and achievement of the proposed Sustainable Development Goal of hunger eradication. Knowing what each indicator measures, as discussed in the study, is a prerequisite for understanding the results from each indicator and for defining appropriate societal responses. This study shed lights on the conceptualisation, dimensions, and principles underlying the different indicators of food security and explores the strength of using the three key indicators of food security together in measuring the various dimensions of food security. By exploring the complementarity of the HFIAS, DDS and CSI, this study makes an important contribution to the current focus in the food security measurement field on finding more comprehensive measurement approaches.

At the same time, this study deepens our understanding of the Nigerian food security situation by measuring the food security status of households in Taraba State for the first time. The supply side approach of measuring food security (e.g. measurement of total food production and availability and food balance sheet) commonly used in Nigeria (Oruche et al. 2012; Liverpool-Tasie et al. 2011; Adebayo 2010; Akinyele 2009) only focuses on food availability at the macro or national level, and does not satisfactorily capture what happens in terms of food availability, access, and utilisation at the household and individual levels (Akinyele 2009; Liverpool-tasie 2011; Adebayo 2010; Oruche et al. 2012).

The results of this study will help the food security agencies in monitoring progress achieved so far in Taraba State and can be used for evidence-based advocacy. The findings of this study

can also assist the government agencies responsible for protecting the environment and ensuring food security in the country to make informed policies and efforts. The starting point for addressing the issue of food security using policy depends on the clear conceptualisation and measurement of food security.

1.8 THESIS OUTLINE

The rest of the thesis is organised as follows. Due to the word limitations inherent in the two article option for this thesis, Chapter 2 presents a more detailed description of the methodology used in the study. The first article, which is a conference paper intended for submission to the second **International Congress Hidden Hunger** that will be held in March 2015, is contained in Chapter 3. This article presents an analysis of the literature that was used to inform the empirical research and covers the issues around food security measurement and the need for exploring the use of complementary indicators. Chapter 4 contains the second article, which presents the empirical research on the measurement of food security of households in Taraba State, Nigeria. This paper is intended for submission to the ***Ecology of Food and Nutrition*** Journal**.** Chapter 5 is the concluding chapter and contains the highlights of the study, recommendations and areas for further studies. The study concluded that using a simplified combination of complementary indicators may enable a big leap forward in terms of household food security measurement approaches, food security policies and feasible interventions in practice.

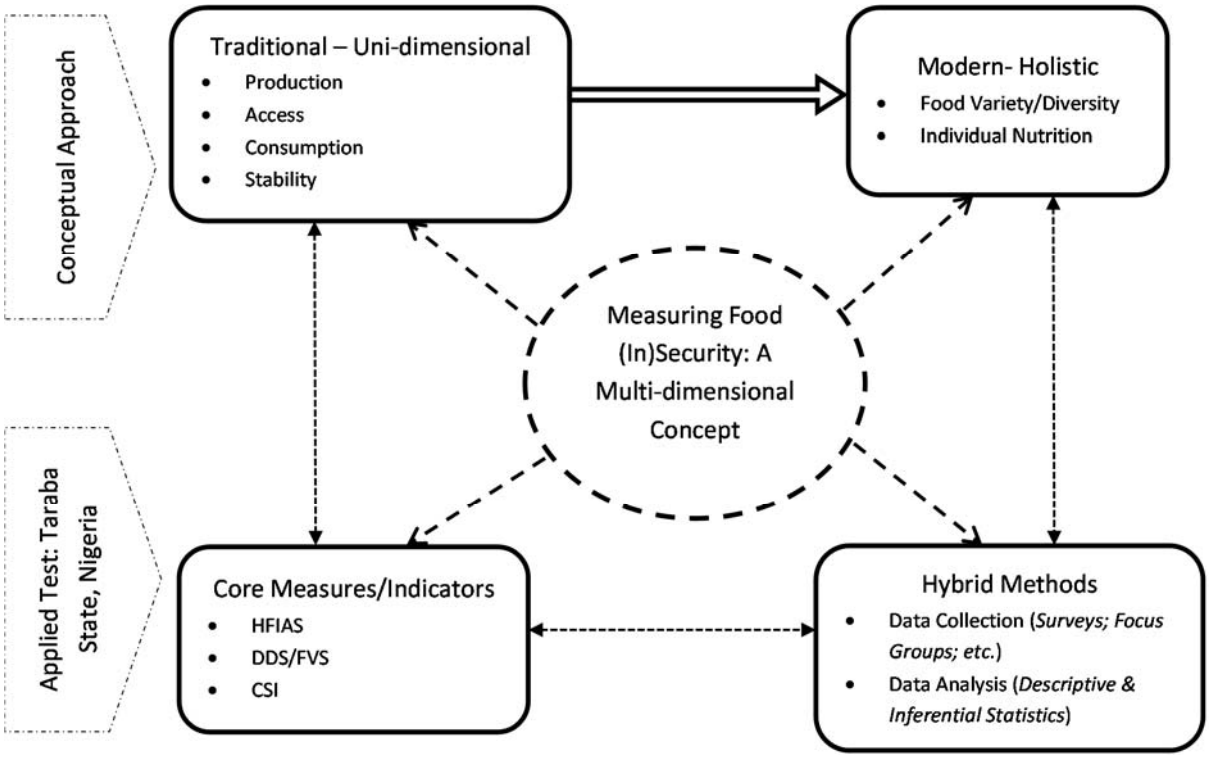
CHAPTER 2: RESEARCH METHODOLOGY

2.1 INTRODUCTION

Due to the format chosen for the thesis being a conference paper (conceptual overview) and a journal article (reporting empirical research), this chapter aims to provide an overview of the research methodology. It also includes more detail on the methods and analysis used for the empirical research that could only be provided in a summarised format in the journal article. Figure 2.1 below summarises the design and the flow of the research from the first to the second article. The study used a mixed/hybrid design that involves the combination of both quantitative and qualitative methods in food security measurement.

The following figure schematically depicts how elements in this study are connected and fit together. Conceptually, this study builds on and extends the emerging multi-dimensional perspectives on food security measurement and is therefore firmly rooted in the modern holistic practice of food security thinking, research, measurement, and policy action. The top part of the diagram shows this fundamental reorientation in how scholars and decision makers look at food and nutrition security today. To illustrate what this shift away from the older uni-dimensional viewpoint on food security means for its better measurement, this exploratory study demonstrates how three longstanding and validated indicators could be adapted and combined in a single research instrument, administered among households in Taraba State, North East Nigeria. The findings and contributions are derived from the systematic use of multiple techniques of data collection and analysis as shown at the bottom right-hand side of this diagram.

Figure 2.2 Food security measurement: a schematic overview



Source: Authors

The study began with a literature review of food security measurement. The initial literature used for this analysis was obtained utilising existing academic databases including Google Scholar, ScienceDirect, EBSCOhost, and JSTOR, with the keywords relating to food (in)security; dietary diversity, food insecurity coping strategies, household food insecurity access scale, food security measurement, measurement, food security indicators, food availability, food access, food stability, food utilisation, multidimensionality. Grey literature on the current state of food security from the FAO and other influential food security agencies was sourced from their websites using Google Search, Yahoo and Bing. The body of knowledge gained from these investigations of food security measurement was used in conceptualising the study, and in the discussion of the findings in the second article.

Harnessing the advantages of each of the core food security indicators; HFIAS, DDS, and CSI, the study carried out a survey to measure the food security situation of households in Taraba State. A well-structured questionnaire comprising four (4) modules; household socio-economic characteristics and HFIAS, DDS and CSI module questions, was used as an interview guide to elicit the primary data used for the study. Apart from the interview schedule, the survey also involved the use of focus group discussions to adapt the questions to the local context, and expert opinion to refine the instrument and observation. Just as with any interview method, the survey medium has a limitation in the area of recall error, and a tendency to deflate or inflate the food insecurity experience by the respondents, due to shame or an expectation of aid. With this in mind, care was exercised in designing the survey, sample selection, and in data gathering to ensure a good representation of the population was studied, thus obtaining a reliable result. The precautions taken include: adaptation of the CSI and HFIAS to the local context through focus group discussions; the use of optimum recall periods for each of the food security modules (one month for HFAIS, seven days for CSI, and 24 hours for DDS); assuring the respondents of their anonymity; the selection of representative samples using a well-defined sampling strategy; the use of well-trained field workers for data collection; carrying out a pilot test of the survey instrument; and constant monitoring of quality control during data collection to ensure consistency.

2.2 SURVEY DESIGN AND DATA COLLECTION

This section first lays out the sampling strategy used to determine which households to include in the survey. After that, a detailed account is given of how the survey questionnaire was constructed, adapted and piloted. Finally, an account is given of the process of data collection and the challenges faced.

Sampling strategies: The survey questions were designed for a household level study. The unit of analysis for this study is the household, and households in Taraba State constituted the sampling frame. Household, for this study, is defined as 'all the people living together and sharing a common source of food, eating together and having a sense of belonging together as a social unit' (National Population Commission (NPC) 2006). Hence, this study did not include homeless persons such as the mentally ill, lunatics, vagabonds (in the Nigerian context), and transient people who are visitors or have lived in Taraba for less than six (6) months. Fishing households, institutional households (e.g. orphanage), nomadic households, regular households and homeless households (i.e. regular households whose homes were destroyed by crisis or

natural disaster, as defined in NPC (2006)) were included. A household with children is considered one with member(s) who are below 18 years of age.

Bali and Wurkari LGAs were experiencing violent conflict at the time of this survey. The conflict is alleged to have been caused by the *Boko Haram* insurgence, and the Fulani, Jukun and Tiv ethnic conflict that often erupts in Taraba State (The Eagle Online 2014; Eagle Newspaper 2014; Moti n.d.). Although the current crisis in Taraba indirectly affected all parts of the state, those recorded in the survey as households that experienced the crisis, were households directly involved, and can be defined as households whose house or means of livelihood is located within the crisis area and who are affected directly by the crisis. These were people whose houses, properties, farms, stores, shops, and other means of livelihood were destroyed. It includes those whose household member(s) were killed, burnt or seriously injured during the crisis. The study considered respondents to be from Wurkari or Bali (the major areas experiencing the violent conflict), if they were found within the community, whether still in their houses or on the road, as a household, waiting for rescue, and if they have lived in this conflict area for more than six months; and are counted to have experienced a crisis if they had a direct conflict experience.

A multistage sampling technique was used in selecting the respondents for the study. The choice of using a multistage sampling technique was informed by the need to get a representative sample of the population to be able to draw inferences from the sample about the state of food security in Taraba State. The sampling followed a purposive selection procedure at a higher level and a simple random selection at the household level. Simple random sampling was applied only at the household level, due to financial and time constraints. Setting the error margin at 4%, at a significance level of 0.05, Population= 438883 households (although there is massive outmigration in this area due to the crises that have persisted over the years (The Eagle Online 2014; SaharaReporters 2014; Moti n.d)); excluding people in transit and homeless persons, a sample size of 450 households was targeted.

Five stages were followed in selecting the 450 households for the study. Only 409 questionnaires were recalled with valid observations.

Stage 1 - three out of the four (4) agro-ecological zones of the state were purposively selected based on the number of Local Government Areas contained in each. The zones with more LGAs

were chosen over the zone with one LGA. The three selected zones - Wurkari, Zing, and Bali consist of three, six and six LGAs respectively, while Saduana, which was not chosen, has only one LGA in it, and is sometimes counted as part of the Bali zone.

Stage 2 - five LGAs; Wurkari, Jalingo, Yorro, Bali, and Takum were proportionally selected from the three zones, i.e. one LGA from Wurkari and two LGAs from each of the other zones.

Stage 3 **-** four communities were selected from each of the selected LGAs, making a total of 20 communities;

Stage 4 - two villages were selected from the 20 communities, making a total of 40 villages; and

Stage 5 - twelve households were randomly targeted from each of the villages using the list of households provided by the *Mee Angwa* (village head). For a detailed illustration of the selection see the sample selection chart in Appendix A. Table 2.1 shows the sample sites, their agro-ecological characteristics, and the targeted and realised sample sizes.

Table 2.1: Summary of targeted and realised samples per Local Government Area

LGA	Agro-ecological zone characteristics		Targeted sample	Realised sample	
		Average values		**N**	**%**
Jalingo	Rainfall	1058mm/annum	90	84	93.34
	Terrain	Western river Benue, widely swamp uncultivated land			
	Soil type	Soil fertility below critical level. Organic carbon: 0.4- 1.0cm deep Total nitrogen: 0.08- 0.1 cm deep Potassium cmolkg^{-1}: 0.21 - 0.3cm deep Phosphorus: 3 - 7cm deep			
	Temperature	28^{0}C			
Bali	Rainfall	1300mm/annum	90	81	90
	Terrain	Minor plain with high rising land developed on sandstones. Extensive flood plain. Evergreen low growing grass vegetation, which provides grazing reserve.			
	Soil type	Moderate soil fertility. Organic carbon: 1.0 -1.4cm deep Total nitrogen: 0.1 - 0.15cm deep Potassium- cmolkg^{-1}: 0.31 - 0.6cm deep			

		Phosphorus: 7 – 20cm deep			
	Temperature	27^{0}C			
Takum	Rainfall	1508mm/annum	90	83	92.23
	Terrain	High rising terrain that is moving towards the basement of the Mabila plateau, with average elevation of 256 metres			
	Soil type	High soil fertility. Organic carbon: 1.4 -2.0cm deep Total nitrogen: 0.16 -0.2cm deep Potassium cmolkg^{-1}: 0.31 - 0.6cm deep Phosphorus: 7 – 20cm deep			
	Temperature	26.5 °C			
Wukari	Rainfall	1200mm/annum	90	80	88.89
	Terrain	Western river Benue			
	Soil type	Soil fertility below critical level. Organic carbon: 0.4- 1.0cm deep Total nitrogen: 0.08- 0.1 cm deep Potassium-cmolkg^{-1}: 0.21 - 0.3cm deep Phosphorus: 3 - 7cm deep			
	Temperature	25°C			
Yorro	Rainfall	1058mm/annum	90	80	88.89
	Terrain	Western river Benue. widely swampy uncultivated land			
	Soil type	Soil fertility below critical level Organic carbon: 0.4- 1.0cm deep Total nitrogen: 0.08- 0.1 cm deep Potassium cmolkg^{-1} :0.21 - 0.3cm deep Phosphorus: 3 - 7cm deep			
	Temperature	28°C			
Total		29°C (average)	450	409	

Source: Online Nigeria (2003) and Ministry of Agriculture and Development Taraba State Office

Questionnaire structure and refinement: The questionnaire consists of four modules: household socio-economic characteristics and whether extreme weather events or conflict were experienced; adapted HFIAS module; adapted food insecurity CSI module; and adapted DDS module.

The section of the questionnaire on household socio-economic characteristics included questions on household demographic data: household size; income, expenditure; food expenditure; presence of children below 18 years of age; age of the household head; number of years the household head spent in formal education; household access to physical resources such as land, farm/productive technology, drinkable water, input and output market, free borehole water, electricity, paved roads, and information technology; extreme weather events experienced: heavy and long periods of rain, massive floods, heatwaves, unusual drying up of rivers/streams, outbreak of human/animal/plant pests and diseases, erratic rainfall patterns, long periods of dry season/The Harmattan; and household experience of conflict.

The principal investigator led the data collection process, with the assistance of 12 carefully trained enumerators proficient in the languages spoken in Taraba. The primary motivation for this large number of field workers was the need to collect enough data within a month amidst the conflict in the area whilst also catering to the multilingual nature of the state. The field workers were trained for a week on the use of the survey questions, using the field manuals for the food security modules. Afterwards, they actively participated in the adaptation and translation of the survey questions, especially for the three major food security modules; HFIAS, DDS and CSI. Adaptation of the questions to the local context lasted for one week, thus the training and adaptation were completed in two weeks.

Seven focus groups to discuss the adaptation of the food security questions, and ranking of the CSI questions, were held in seven LGAs in the state- Jalingo, Gassol, Ibi, Yorro, Ado Kola, Donga, and Gashaka. The focus groups were made up of five to seven adults (Groups 1 – 7 were made up of six, five, five, six, seven, six, and seven individuals respectively), mostly women, because the requirement was for group discussants who are responsible for the household's food provision (cooking, buying food, and sharing of food among members).

The seven focus group discussions were used in identifying the coping strategies used in Taraba State, and also the severity ranking of the strategies. The CSI severity ranks range from 1 - 4, with the least severe coping strategies being designated as 1 and the most severe strategies as 4. It is important to note that the survey questionnaire did not include all the identified coping strategies. This is because some of them were identified by the discussants as being shameful and demeaning, and might most likely; offend the respondents; receive false responses, or be met with resistance from the respondents. For these reasons, coping strategies

such as prostitution for food, and stealing of food, were removed from the list. Following Maxwell & Caldwell (2008), other coping strategies that are not directly connected to food were also removed. For the DDS adaptation, the seven focus groups, and two food markets were used for the identification of the different foods consumed in Taraba. One urban food market (Jalingo Main Market) and one rural food market (Dananicha Market) were visited, to ask food sellers the names of foods sold in these areas. The focus groups also identified foods that are peculiar to their community. It was easier getting the common names of the popular foods from the sellers, but the focus groups were important in identifying the local, uncommon and wild foods not easily found in the markets, which form part of their meals. The HFIAS was adapted using a small group of the intended respondents (one of the seven focus groups; Jalingo) and key reviewers (the trained field workers). The adaptation of HFIAS basically involved the translation and interpretation of some of the words and phrases to make the survey questions as locally relevant as possible. The adapted questions can be viewed in the questionnaire in Appendix A.

The discussions were conducted in English, Pidgin English, Hausa and other local languages. The major language used for these group discussions, apart from English, was Hausa, as this seems to be more common than the others (there are about 80 languages and tribes in Taraba State (Online Nigeria 2003)). With the consent of the group members, the discussions were recorded using notes and audiotape, and afterwards analysed and used in developing the survey questionnaire, and in calculating the CSI. The questionnaire was written in English, and every other language used in the discussions was translated to English.

The adapted questionnaire was sent to food security experts at the Human Sciences Research Council (HSRC) and the University of Stellenbosch, South Africa, soliciting expert inputs on content and design. The adapted questions were then used in a pilot test to ascertain their quality. Thirty five (35) households in Jalingo and Bali were used for the pilot test. The pilot test result was used in testing the appropriateness of the questionnaire in capturing the data needed for this study. The only adjustment made to the questionnaire after the pilot test was to discard the idea of using an adapted version of the reduced CSI, so the adapted full version was used instead. The adjustment was based on the outcome of the test that showed that the reduced CSI could not capture the severe coping strategies used by the sampled households.

Data collection cost, and response rate. Data collection for this study lasted for a period of one month from 1st - 31st of May 2014. The survey questions were administered to households after

receiving verbal consent. The household respondents were adult(s) involved with the household food provisioning, i.e. buying, harvesting, cooking, serving etc. as stipulated in Bickel et al. (2000). This is because a person, physically and directly involved with providing food for the members of the household will be more knowledgeable in explaining what, when, how, and where the household eats, and how food is managed within the household.

Data collection in the crisis area in Wurkari and Bali was very hazardous, and so was costlier than that collected from the more stable areas. It took four field assistants to collect data in Wurkari and three to collect in Bali. But only five field assistants with the principal investigator collected data from the remaining three LGAs, i.e. two (2) field workers for each of the stable LGAs. In the first week of data collection, two field workers were sent to each of the selected LGAs. As the crisis progressed, and with the 24 hour curfew imposed on Wurkari on 5th May, after a fight that took more than fifty lives in a night (Sahara Reporters 2014; The Eagle Online 2014), the data collection was seriously hindered and the field workers were trapped within the communities in Wurkari. After approximately nine days of 24 hour curfews, the curfew was relaxed for six hours a day during the hours of 8am – 2pm, and it was then possible to send three more field workers to join the ones already there, two to Wurkari and one to Bali. The field workers sent to the crisis area returned to Jalingo every night for safety. Paying them daily, unlike the others in the stable LGAs, who were paid at the end of the job, and providing them with the means to come back every night (car or bike), really encouraged them to do the job, and is believed to have positively impacted on the number of households covered. With the help of the field workers, community chiefs and the army deployed to the crisis areas, the data collection in these areas was successful.

The response rate (the percentage of successfully completed questionnaires out of the total number of administered questionnaires) for this data collection ranged from 54% - 97%. Due to the violent crisis in Taraba during the questionnaire administration, some of the questionnaires were not successful, especially in two LGAs. So the number of questionnaires administered was increased to 150 for the crisis areas (Wurkari and Bali), but only 80 of the questionnaires in Wurkari, and 81 in Bali were successfully completed. The response rate was much higher in the more stable areas than it was in the crisis areas. A total of 85 questionnaires were administered

to each of the other three stable LGAs[2], and 84, 80 and 83 were successfully completed in Jalingo, Yorro and Takum respectively.

Though it was not the initial purpose of this study to collect data on the food security of a crisis area, it was anticipated that such could happen, given the volatile nature of the state. Earlier in the proposal, it was stated that the site for the data collection could be changed if there was violent conflict at the time of data collection. The site could not be changed as proposed, due to the time and cost involved in doing so. Collecting data in a crisis area is hazardous, traumatic, time consuming, and of course, very costly, and so should be weighed carefully before embarking on.

2.3 DATA ANALYSIS

The data obtained from the field was cleaned up before carrying out the statistical analysis, to ensure the high quality and reliability of the results. The questionnaires were checked for incomplete and invalid information. After the initial sorting and removing of invalid questionnaires, the data was coded in a spreadsheet. Using the spreadsheet cleaning systems such as auto filter and data validation, invalid entries were barred in the coding sheet.

The process of data cleaning started with univariate descriptive analysis of all variables needed for measuring the food security indicators. This helped with outlier identification, detection and non-distortionary adjustments. Significant outliers often affect the interpretability of the model (Hodge & Austin 2004). Identifying outliers in a data set involved separating and sorting the variables to identify extreme values. In the survey, outliers were sorted by calculating the mean and the standard deviation of the variables, and were identified as those values that are larger than the mean plus three times the standard deviation. This approach is robust in identifying outliers (Osborne & Overbay 2004). The calculation showed that there were outliers in the household income, expenditure, number of plots of land, and the head female[3] of the household's income data. To correct the data, the next step was to find out if they were invalid

[2] Targeted sample was 90, but the field workers were able to administer 85 questionnaires in three LGAs and 150 in two LGAs. This discrepancy was caused by the crisis in the state and also the unequal number of field workers in the stable and unstable area.

[3] 3 Head of the females is not necessarily the household head, but she is the head of the other females in the household. They are usually the mother, first wife, adult daughter or female in the household who has the responsibility of managing the affairs of the women in the household.

entries, errors in the data, or if they were legitimate sample values from the same population, which may have resulted from change in the behaviour of the population (Osborne & Overbay 2004). This identification informs the decision on how to deal with the outlier; whether to remove it completely or accommodate it. For the outliers in the survey, they were legitimate values, and so did not need to be completely removed. Hence, the outliers were reasonably accommodated. These few outliers were basically from the data collected from some government officials (politicians) whose income was much more than the sample average.

Adjusting variables showing evidence of outlier distortion started with basic tests for skewed distributions. Winsorising was used to adjust the values of variables with significant outliers. This manual procedure entails replacing extreme values causing distortion with another value derived from the mean plus three times the standard deviation of the variable formula. In this way, the values will still remain a large value located within the 99th percentile of the population. Winsorising thus reduces skewness and the distortionary effects of significant outliers.

Both descriptive and inferential statistics were used in analysing the data from the survey. Rasch model scoring used in grouping the households into food security categories, (Coates et al. 2007), CSI calculation (Maxwell & Caldwell, 2008), and FAO HDDS calculation method found in Kennedy et al. (2011), were used in analysing the data collected using the three food security core questions. Rasch has two components that can be used to derive attributes or characteristics of food insecure households. Respondents can therefore be objectively categorised through this strategy.

HFIAS items are analysed using a one-parameter logistic item-response-model approach also referred to as a Rasch model. The fundamental idea of a Rasch model is that individual abilities and experience in doing a specific duty, and the difficulty level of the duty, can be measured (Newton et al. 2007). The nine HFIAS questions analysed using the Rasch, are dichotomous and have two categorical answers (“yes/no” or “true/false”). Administering these dichotomous questions, a Rasch model assumes that each of the households will answer each question based on their hidden experience (ability) of food insecurity: the more severe the food insecurity experience, the greater the chance of an affirmative response to any given food security question. Each of the items/questions in the HFIAS has an implicit level of difficulty (food insecurity), with the more difficult questions having a greater chance of receiving negative

answers than the less difficult ones, regardless of the level of food insecurity experienced by the household. Mathematically the Rasch Model for HFIAS dichotomous variables is expressed as:

$$\text{In}\left(\frac{P_{in}}{(1-P_{in})}\right) \equiv B_i - D_n \quad \text{..... Equation 1}$$ or

$$P_{in} = \frac{\exp(B_i - D_n)}{[1 + \exp(B_i - D_n)]} \quad \text{..... Equation 2}$$

(Wright & Mok 2004)

P_{in} represents the probability of household *i* with experience or ability B_i, giving an affirmative answer to question *n* that has a food insecurity level D_n. The indicator variables B_n are assumed to be independent of each other (Opsomer et al. 2003; Wright & Mok 2004). The rationale behind the Rasch model is that the chance that a household will give an affirmative answer, relative to giving a negative answer, depends on the extent of the food insecurity of the household and the level of food insecurity captured by the question. For easy interpretation, you should note that if $B_i = D_n$, then *i* household is 50% likely to answer "yes" to question *n*. If $B_i > D_n$, the *i* household is more than 50% likely to answer "yes" to the *nth* question, and correspondingly, if $B_i < D_n$ the household is less than 50% apt to answer "yes" (Opsomer et al. 2003; Wright & Mok 2004).

Using the respondent's latent food insecurity ability (experience) and the question's hidden difficulty (food insecurity level), the Rasch will classify the households into consistent groups of food security (Ecosse 2004; Illian et al. 2010). Rasch scoring assumes that a household's positive or negative response follows a logical distribution. This technique converts the positive and negative answers to the nine HFIAS questions into a single indicator. Two indicators are derived from the HFIAS analysis: HFIAS scale and HFIAS categories.

The HFIAS scale is estimated for each household by a simple summation of all codes for each item occurrence. The occurrence items are coded as follows: 0 = no occurrence, 1 = rare occurrence, 2 = sometimes and 3 = often. So, if question one did not occur, then question 1 = 0 and, the next question, which is more difficult, is more likely to be zero, according to the arrangement of the question. The HFIAS scale gives a picture of households in different food security levels based on their position on the scale of 0 - 27. Food insecurity increases as the number of positive responses increases; zero (0) being most food secure and 27 being most

food insecure. The HFIAS prevalence indicator, which is also derived from the same nine questions, divides the households into four categories of food insecurity using the Rasch model.

The HFIAS categories according to the United States Department of Agriculture (2014) are: Category 1 (High food security) - this group is made up of households with very little or no problem/anxiety about food. They had steady access to adequate food; Category 2 (Marginal food insecurity) - are households that had anxiety and problems at times/rarely in accessing adequate food, but their food intake quantity, quality, and variety were not significantly reduced; Category 3 (Low food security) – the quality, variety and desirability of the food taken by these households was significantly disrupted, but the quantity and eating pattern of their meals were not significantly disrupted and; Category 4 (very low food security) – the eating pattern of one or more household members were disrupted at times during the survey period and the quantity of their food was reduced due to lack of resources or money for food. Following Agresti (2007) this study derived three instead of four HFIAS categories, as the first two categories were merged due to the small sample size contained in them.

The DDS was developed to meet the need for a cost effective, easy to use, simple to understand and also comprehensive measure of the quality aspect of food security. This indicator enquires about food eaten by household members in the last 24 hours. All foods eaten are recorded and grouped into twelve food groups (Kennedy et al. 2011; Kennedy et al. 2010). The minimum score for this indicator is 0 for households that ate nothing, and the maximum score is 12 for households that ate all the food groups. Diets of special interest that were investigated in the study using this indicator are; iron rich foods and vitamin A rich foods from both plant and animal sources. These food groups of special interest are good sources of individual micronutrient (Kennedy et al. 2011).

The CSI asks questions about what the households did when they did not have enough food or resources for food. This index places the households on a continuous scale based on the weighted frequency and severity rank of the strategies used. To calculate the household CSI, the frequency of using each strategy is multiplied by its severity rank score obtained through focus group discussions, prior to the survey.

For the comparative part of the study, the Spearman correlation and ANOVA statistics were used. The Kruskal-Wallis test was used to verify the ANOVA estimates, and the Bonferroni test

was used for the post hoc analysis. For categorical relations, Chi-Square was used to test for differences across the three HFIAS groups. Information gathered through observation and informal discussions, which could not be analysed using statistical tools, was discussed using simple narrative.

2.4 DELIMITATION OF THE STUDY

The study is centred on food security indicators and measurement. Although there are other indicators of food security, the study focused on the three core food security indicators: HFIAS, DDS, and CSI. The study is limited to households in Taraba State, Nigeria. The homeless persons and visitors were excluded.

CHAPTER 3 - FIRST ARTICLE - CONCEPTUAL FRAMEWORK OF FOOD SECURITY MEASUREMENT: COMPARING KEY INDICATORS

ABSTRACT

Achieving food security, and reducing hunger as stated in the Sustainable Development Goal (SDGs), requires a comprehensive measurement for a proper identification of; the food insecure, the severity of food insecurity, the causes, and progress in reducing food insecurity. Food security is a multidimensional issue that has been difficult to measure comprehensively, given the one-dimensional focus of existing indicators. Three indicators: Household Food Insecurity Access Scale (HFIAS), Dietary Diversity Score (DDS) and Coping Strategies Index (CSI), dominate the food security measurement debate, and each of these 3 has been widely used as a sole food security indicator. In light of the absence of a specific '*composite indicator' [a catch all measurement tool]* this article tries to illustrate the strength of these key indicators in an effort to use them in a complementary manner. Identifying how the key indicators complement each other, in capturing multiple dimensions: availability, access, utilisation, stability and complex societal undertone, of food security, the study recommended bringing them together in one survey instrument to improve the comprehensiveness of food security studies.

3. 1 INTRODUCTION[4]

The volume and quality of food that people eat impacts their wellbeing. Globally about 805 million people are estimated to be seriously undernourished (FAO et al. 2014). The food insecure lack access to sufficient quantity and quality of food for a healthy and active life, which can compromise their health, wellbeing and productivity. A population with many undernourished citizens can even result in a lower Gross Domestic Product for a country, making food insecurity an economic issue, in addition to a human rights issue (FAO 2012b; White & Masset 2007; Jones et al. 2013). To achieve the goal of hunger eradication in a sustainable manner, as proposed in the Sustainable Development Goals (United Nations Department of Economic and Social Affairs 2014), there is a need for indicators that will help in identifying the food insecure and provide adequate contextual information for measuring, monitoring and evaluating progress (De Haen et al. 2011).

The most widely accepted definition of food security is from the Food and Agriculture Organisation of the United Nations (FAO): “A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”(FAO et al. 2014: 50). Unpacking this definition reveals the multidimensionality of the concept. Sufficiency of food is focused on the *availability* of adequate quantity and quality food; physical and economic access looks at households and individuals having *access* to enough food; the security dimension is about food *utilisation* by the body, food safety, risks, shocks, vulnerability and trade-offs; while the time dimension looks at the *stability* of food availability, access and utilisation. These factors have been widely agreed upon as the four major dimensions of food security: availability, access, utilisation and stability (Headey & Ecker 2012; FAO 2012a; FAO 2013a; De Haen et al. 2011).

A food security indicator can be said to be a pointer, yardstick or instrument used in identifying and monitoring food security. Headey and Ecker (2012) and Nathalie (2012) reported that there are about 250 definitions and 450 indicators of food security, which has brought much knowledge as well as difficulty in the measurement of the concept. These indicators offer very little consensus on what food security policy targets should be. The relevance, validity, and

[4] To be submitted to the second International Hidden Hunger Conference to be held in Hohenheim in March 2015

comparability of the existing measures of food security across regions and time is still unsatisfactory (Barrett et al. n.d.; Nathalie 2012; Headey & Ecker 2012; FAO 2013a; Jones et al. 2013). The lack of a comprehensive and standardised measure that can be used as a yardstick for satisfactory monitoring of food security conditions is still a challenge (Jones et al. 2013; De Haen et al. 2011).

This article focuses on the three major food security indicators, HFIAS, CSI and DDS, that dominate the food security measurement debate. These indicators are the most widely used and validated of all food security indicators (Maxwell & Coates 2012; Maxwell et al. 2013). The article explores how the strengths of each can be exploited for a more comprehensive view of this multifaceted concept. The discussion starts with a brief overview of the literature review strategy employed, then moves on to a discussion of the multidimensionality of food security, before looking more closely at the four key dimensions of food security and their indicators. Next, the persistent problems with food security measurement are reviewed with some evidence from previous empirical studies on food security measurement. This leads us to a focus on the three major indicators of food security in line with growing scholarship investigating the need for more comprehensive measures of household food security. The paper concludes that using a simplified combination of complementary measures may enable a big leap forward in terms of household food security measurement approaches, food security policies and feasible interventions in practice.

3.2 LITERATURE REVIEW STRATEGY

This paper is based on a literature review of food security measurement. The initial literature used for this review was obtained utilising scholarly databases like Google Scholar, ScienceDirect, EBSCOhost and JSTOR, with combinations of keywords: food security, DDS, CSI, HFIAS, measurement, food security/insecurity measurement and indicators, food availability, food access, food stability, food utilisation, and multidimensionality. The seminal papers in the field were identified and an ancestry approach was used to track the development of arguments and thinking. The literature gathered from these databases was reviewed with a focus on food security measurement improvement. Grey literature, including reports of influential bodies like the FAO, was sourced using Google, Yahoo and Bing and used to conceptualise the study.

3.3 FOOD SECURITY: A COMPLEX AND EVOLVING CONCEPT

Food security is a complex phenomenon with multiple environmental, social, political and economic determinants. The agri-food system - with its many processes from input manufacture, agricultural production, processing, distribution, retail and consumption - directly affects food security. In addition, systems outside of the agri-food system also impact food security, for example water, health and energy, and these interactions happen at a number of different scales (Dube 2913; Ericksen 2007; Hammond & Dubé 2012). This kind of "dynamic complexity", where counterintuitive outcomes can result from interactions due to feedback loops and nonlinearity, means that food security policy and decision-making is particularly challenging (Hammond & Dube 2012:12356).

The definition of food security has evolved over time, reflecting an increasing appreciation of the complexity inherent in the concept. In the 1970s, the focus was on global and national food supplies as food availability was thought to be synonymous with food security (Maxwell & Smith 1992). This notion was challenged in the 1980s by the work of Amartya Sen, when it became obvious that food availability does not guarantee access to food by all (FAO 2006; FAO 2010; FAO 2013). The focus thus shifted to food access at household and individual levels (Nathalie 2012; Webb et al. 2006). This focus on food access and household level study has continued to grow, mostly due to the importance of the household as the major social unit through which most people access their food. In the 1990s, micronutrient undernutrition was in the spotlight, "thereby shifting attention from mere caloric sufficiency to overall diet quality" (Jones et al 2013:483). This utilisation component has remained at the forefront with household and individual food access. The history of the concept shows the evolution of the definition of food security to the currently most widely accepted FAO version, which reflects the four key dimensions of food security, to be discussed next.

3.4 THE FOUR MAJOR DIMENSIONS OF FOOD SECURITY AND THEIR INDICATORS

An overview of the four dimensions of food security provides insight into the multidimensionality of food security. These four dimensions are also key to understanding different indicators and which dimensions of food security they measure.

Food availability is the condition of having enough food of appropriate quality and quantity (Nathalie 2012). This dimension reflects the supply side of the food security concept. It looks at

how much food is available, regardless of the source (local production, import or food aid), with the presumption that all food produced is consumed. Indicators of food availability as measured by the FAO include average dietary energy supply adequacy; average value of food production; share of dietary energy supply derived from tuber, cereal and root crops; and average protein supply from animal origin. Jacobs (2010), Nathalie (2012), Headey and Ecker (2012) and the FAO (2013) noted that the measurement of food availability usually occurs at the national or macro level, where food security data is sourced from food balance sheets, which relate total food output to total national food consumption.

Food access relates to how people acquire the food they consume and is determined by two factors: economic and physical access (FAO 2013). Economic access is determined by disposable income, food prices and accessibility of social support, while physical access depends on the physical infrastructure that aids access (Headey & Ecker 2012; Barrett et al. 2009). This dimension reflects the demand side of food security and highlights uneven inter- and intra-household food distribution and socio-cultural limits on food choices. (Bickel, Price, et al. 2000) include other elements in their definition of food access like: social access (adequate access in a socially acceptable way i.e. not stealing or prostituting for food); food quality and safety (ensuring sufficient diversity and safety to promote good health) and low risk of losing assets. The indicators of physical access include levels of physical infrastructure development, like paved roads, railways, electricity, irrigation facilities etc., while those for economic access include domestic food price index, disposable income, expenditure survey (FAO 2013a). Other widely used access indicators are the HFIAS, DDS and CSI (Webb et al. 2006), which will be discussed in detail in section 3.7.

Food utilisation involves food culture, food preparation and the actual consumption of accessed food. This dimension is related to food being nutritious, safe to eat and properly prepared. Food utilisation is thus related to the nutritional health outcomes which are determined by numerous other factors like water systems, sanitation and health (Barrett et al. 2012; Agwu et al. 2011; Nathalie & Nathalie 2012; Liverpool-Tasie et al. 2011). Utilisation or consumption of food is also related to the allocation of food within a household, which is not always equal across household members either due to being a lower quantity and quality or because household members' health status differs affecting their ability to use nutrients (Jones et al. 2013). Common measures for this dimension include the DDS, food consumption surveys and anthropometric measures.

The anthropometric measures capture stunting (low height for age), wasting (low weight for height) and underweight (low weight for age) in the population, although the use of anthropometric measures have been complicated by the existence of severe hunger, undernutrition, overweight and obesity in the same population (Townsend et al. 2001; White & Masset 2007).

Food stability considers the stability of the other three dimensions over time (reflected in the definition of food security as 'at all times' (Maxwell et al. 2013)). It is related to people's vulnerability to and ability to cope with stresses and shocks. Factors that increase vulnerability and reduce coping ability include extreme weather events, conflict, and political and economic factors (United Nations 2014; Webb et al. 2006). Stability is not a standalone dimension, and is usually incorporated into other dimension indicators (Maxwell et al., 2013). Indicators like the HFIAS, CSI and DDS look at the frequency of change or fluctuation in food availability, access and utilisation during a given time frame.

Table 3.1 below provides more examples of indicators used for the different dimensions, as well as the main advantages and disadvantages of these.

Table 3.1 Food security dimensions and their indicators

Dimensions	Indicators	Nature	Level or unit of analysis	Instrument	Advantages	Disadvantages
Availability	Average dietary energy supply adequacy; Average value of food production; Share of dietary energy supply derived from cereals, roots and tubers; Average protein supply; Average supply of protein of animal origin	Determinant	Macro level, used mainly by the FAO for global and national food measurement	Food balance sheet	Readily available. Applied globally. Can be used for annual progress monitoring at the global scale	High measurement error, data collection across country is less standardised, the cut-off point (point of reference) is questionable due to its evidence base, since it is a macro level analysis it doesn't identify the food insecure
Access **- Physical access**	Percentage of paved roads over total roads; Rail lines density; Road density;	Determinant	Macro level, used mainly by the FAO for global and national food measurement Can be applied to the household or individual level	National records, and food price data	Applicable to a wide range of developing countries	Rely on national level information and so do very little in measuring the problem of entitlement Data intensive, so require high data processing and skill. Does not take account of waste and loss of food. Most simple access measures do not report food quality. Most of them are costly to apply in terms of time and resources
- Economic access	Domestic food price index. Food expenditure ratio; Undernourishment prevalence; Depth of the food deficit; Prevalence of food inadequacy; Household expenditure models; Caloric intake per capita per household; Dietary variety score; Food composition tables to convert food expenditures and consumption into energy intake; Household caloric acquisition; Dietary diversity; Low energy availability; Home food production; Food composition database; Rural food prices and energy requirements of persons in the	Outcome and determinant		Household expenditure survey; Food expenditure survey; Income elasticity; Caloric intake per capita per household; Dietary consumption into energy intake	Provide information on the type of households that are food insecure. Provide cut-off that can aid decision-making and inform policy. Household food access measures give information on the nature and characteristics of food insecurity. They can be apply to all levels of analysis from global to individual, so can be used in assessing the differences in the distribution of food at all level including intra-household	

	household (age, sex); Food poverty; Coping strategies					
Utilisation	Access to improved water sources; Access to improved sanitation facilities	Determinant	Macro	Density of bore holes; Health records of an area	These indicators can be used to measure actual food consumption. Can assess short, medium and long-term food intake. Can be used to assess both dietary quality and quantity. Helpful in identifying households and individuals that are at-risk	Memory "recall" bias, high intra-subject variability in food and nutrient intakes, difficult to assess portion sizes, food composition tables need to be of high quality and culturally appropriate, uncertainty about human requirements for most nutrients High cost especially for inclusion of 24-hour recalls in national surveys
	Individual's food group intake counts; Nutrient intake; Percentage of children under 5 years of age affected by wasting/ stunting/ underweight; Percentage of underweight; Prevalence of anaemia among pregnant women; Prevalence of anaemia among children under five; Prevalence of vitamin A and iodine deficiency	Determinant Outcome	Micro Micro	Dietary diversity; Anthropometric data of stunting, wasting and underweight		
Stability **- Vulnerability**	Cereal import dependency ratio; Percentage of arable land equipped for irrigation; Value of food imports over total merchandise exports	Determinant	Macro		Readily available data. Can be applied globally. Can be used annually for progress monitoring at the global scale	Measurement error is high. Data collection across countries is less standardised. The cut-off point is questionable, due to its questionable evidence base. Doesn't identify food insecure individuals
- Shocks	Political stability and absence of violence/terrorism, Domestic food price volatility, Per capita food production variability Per capita food supply variability Food coping and adaptation mechanism	Outcome	Micro		Easy to implement, takes about three minutes for each household. Clearly captures the concept of adequacy, vulnerability and behaviour of the food insecure	Can produce a biased result as it depends on the response of the recall. It can be difficult to get accurate answers as people may not want to expose their socially unaccepted or degrading behaviour

(Adapted from Maxwell et al. 2013; Coates et al. 2007; FAO 2010; Nathalie & Nathalie 2012; Maxwell & Frankenberger 1992).

3.5 FOOD SECURITY MEASUREMENT

This section looks at the importance of food security measurement, gives some insight into different approaches to measurement, then at the challenges of measurement before exploring suggestions for more comprehensive measures.

Food security measurement is first and foremost a policy and practical imperative; policies and interventions to reduce food insecurity must be based on good quality evidence on food security prevalence, severity, vulnerability and nutritional status (Webb et al. 2006; Barrett 2010). Measurement is an interactive three-step process: it requires data inputs (collected, for example, through various survey methods), processing based on a particular model or framework, and produces outputs (in the form of indicators). Producing good quality evidence for decision-making requires the use of scientifically sound and tested data collection, analysis techniques and indicators (Maxwell & Smith 1992; Jacobs 2010; De Haen et al. 2011; Headey & Ecker 2012; Jones et al. 2013).

Each of the vast arrays of existing food security measures has been developed based on a particular understanding of the concept of food security and with a specific aim in mind. Each measures a different dimension of food security, while some measure a combination of dimensions. It is vital that indicators are used with awareness of the underlying conceptualisation and the intended purpose of the indicator (De Haen et al. 2011). Without this understanding, the indicator may not produce the information that was hoped for; the needs of the end user of the information are vital to this process. As has already been seen in the previous section, there is a wide range of different measures available. Each has its own strengths and limitations and there are trade-offs involved when choosing between them – a common trade-off involves “comprehensibility and contextual details exchanged for simplicity and comparability” (Jones et al. 2013:501).

In the past, the focus of food security measurement was on macro level indicators of food availability (Webb et al. 2006). For example, food balance sheets were once the main focus of food security measurement, but Headey and Ecker (2013) observed that most indicators used in the measurement of national or regional food security are based on notoriously unreliable national data sources, which equally do not account for food waste or unequal access to food

within nations or regions. However, like most indicators, these measures have a specific function and are still used by the FAO to report on national trends over time.

Since Sen's work refocused the food security agenda from food supply to household food access, there has been a search for appropriate measures of access. Attempts to measure the access dimension of food security have moved away from 'indirect' indicators (which measure proxies for food security like household income and expenditures) to those that measure household's experiences of food security (the 'direct' or 'experienced-based' measures) (Opsomer et al. 2003; Jones et al. 2013; Webb et al. 2006). This does not mean that more objective indicators have been rejected entirely; there has been a move towards survey-based collection of "objective dietary, economic, and health indicators as well as subjective measures of adequacy, risk exposure, and socio-cultural acceptability" (Barrett 2010:826). These survey-based measures have been shown to be reasonably good at predicting who is most likely to suffer food insecurity as a result of shocks, whereas the national food availability indicators are not good predictors; they showed a 12 percent increase in global food availability between 1990 and 2010, while the undernourished population has increased by nine percent (Barrett 2010).

3.6 ATTEMPTS AT MORE COMPREHENSIVE MEASUREMENT

It is well documented that it is almost impossible to capture all dimensions of food security using one indicator and the use of more than one indicator is strongly recommended (Maxwell & Coates 2012; FAO 2013b; Headey & Ecker 2012; Nathalie 2012). In line with this growing concern, some researchers have worked on improving food security measures by developing composite indicators or by using two or more indicators.

Composite food security measures attempt to combine indicators that capture different dimensions of food security into a single measure or indicator. Some composite measures developed include the Food Insecurity Multidimensional Index (Napoli et al. 2011), the Rose-Charlton composite measure developed in South Africa (Rose & Charlton 2002) and the Global Hunger Index (International Food Policy Research Institute (IFPRI) 2013). The components of these composite indicators are mainly national level indicators like income, poverty, undernourishment, food production, and micro or macro nutrient data. IFRPRI's Poverty Hunger

Index, for example, uses three equally weighted indicators at the national level: undernourishment, child underweight and child mortality.

While the use of composite measures can enable a broader understanding of food security, they are limited due to their reliance on indirect food security measures and macro level data and they still neglect the problem of reflecting differences in access across a population (De Haen et al. 2011). Composite measures will always be limited by the choice of and weight given to component indicators, and lacking in fine inter- and intra-household food security detail (Jacobs 2010). Composite indicators developed with a focus on food nutrition like the Global Hunger Index are limited by the fact that nutritional outcomes are not solely determined by food access, but also factors like healthcare and sanitation (Jones et al 2013). Due to the ongoing difficulties in developing composite indicators, researchers have tried to combine well-validated food security indicators that measure different dimensions of food security.

Nathalie (2012) and D'Haese et al. (2011), combining six indicators, measured the food security situation of Limpopo province in South Africa. Combining these measures led to an improved knowledge of how each measure classifies households into different food security levels. Though these six indicators were used together in one survey, they were still treated as standalone indicators. Maxwell et al. (2013) combined three household level indicators (the HFIAS, Food Consumption Survey and CSI) and went a step further by drawing conclusions from information derived by cross tabulating the three indicators. Investigating how the combined indicators classify the households, they were able to identify misclassified households. Maxwell et al. (2013) concluded that the combination yielded more detailed food security information. And combining the three indicators, they developed a multidimensional composite indicator for classifying households into levels of food security (Maxwell et al. 2013). Though these efforts to use more than one indicator have provided greater understanding of food security, the need for comprehensive measures goes beyond: combining utilization dimension indicators of food consumption and anthropometric variables - which cannot be totally attributed to food, as suggested in De Haen et al. (2011); and comparing existing indicators to see if they produce the same result, to identifying complementary strength of the indicators in capturing simultaneously the major dimensions of food security.

It is well documented that a comprehensive measurement of food security can be achieved by using more than one indicator (FAO 2013b; Maxwell & Coates 2012; Headey & Ecker 2012; Napoli et al. 2011). Maxwell and Coates (2012) presenting the key indicators, which they called the 4th generation indicators[5] of food security- HFIAS, DDS, and CSI, and confirming their validity, concluded that the effort to develop a comprehensive measure should be focused on identifying how they (4th generation indicators) complement each other and on their adaptation.

3.7. THREE MAJOR INDICATORS USED FOR HOUSEHOLD FOOD SECURITY MEASUREMENT

Before moving on to look at the complementarity of the three most widely used household food security indicators - HFIAS, DDS and CSI – each measure is introduced. These indicators have been found to be cost effective, time sensitive and effective in identifying those that lack access to adequate food (Jones et al. 2013; Webb et al. 2006; Headey & Ecker 2012). They have been used across different geographical locations and cultures, and their robustness and validity proven (Coates et al. 2007; Opsomer et al. 2003; Maxwell et al. 2003; Maxwell & Caldwell 2008). Each of these three measures has been validated by different authors: HFIAS by Coates et al. (2007) and Opsomer et al. (2003); CSI by Maxwell et al. (2003) and Maxwell and Caldwell (2008); and DDS by the FAO (2010) and Maxwell, Coates and Vaitla (2013).

Coping Strategies Index (CSI)

The CSI was developed to capture the vulnerability, resilience and sustainability behaviours of the food insecure household. The rationale behind the CSI is that food insecure households adjust their behaviour in the face of lack or perceived lack of food to ensure food security now and in the perceivable future, based on their best judgement of the situation (Maxwell et al. 2003; Maxwell & Frankenberger 1992; Maxwell 1996).

Households are known to cope with food insecurity using four different kinds of consumption strategies namely: changing their diet from expensive or more preferred foods to less preferred ones; using strategies that are not sustainable over a long period to increase short-term food supply; reducing the number of people they have to feed; and (the most common strategy) managing the shortfall by limiting the quantity of food and the number of times foods are eaten

[5] All three were referred to as 4th generation indictors, because they met most of the validity and equivalence test criteria of universal food security measures and are the most widely used and validated indicators of food security (Maxwell & Coates 2012).

(Maxwell et al. 2003; Maxwell & Caldwell 2008). The severity of the lack determines the nature of coping strategies employed. The most severe ones, like begging and skipping an entire day without eating, are less often employed and may expose the individuals to health or societal problems (Maxwell et al. 2003). They are used when food insecurity is high and thus indicate high vulnerability (Mjonono et al. 2009).

The CSI module is designed to elicit information on the trade-offs between food quality and quantity, and between food and other livelihood assets (Jones et al. 2013). Adaptation of the CSI module questions and the severity ranking thereof using focus group discussions within the area to be studied is strongly advised, because coping strategies and their severity are often context specific (Maxwell & Caldwell 2008). Maxwell et al. (2003) describe the CSI as straightforward and quick to use, and well correlated with other, more complex food security measures. This indicator is used for food security early warning, monitoring and assessment (Maxwell & Caldwell 2008)

Household Food Insecurity Access Scale (HFIAS)

Adapted from the United States Department of Agriculture's (USDA) food security assessment module (the Household Food Security Survey Module), the HFIAS is made up of nine questions used in assessing household food security experiences and perceptions. The HFIAS captures feelings of uncertainty and anxiety over food, perceptions of insufficient quality and quantity of food, reductions of food intake and its consequences in the household and also feelings of shame (Bickel, Price, et al. 2000; Coates et al. 2007). The rationale behind the development of this measure is that, when food insecurity is experienced, it causes predictable reactions that can be captured, quantified and presented on a severity scale (Coates et al. 2007).

The result from this measure is presented in two forms: food insecurity scale and categories. The categories of food insecurity in the HFIAS are:

- Category One - High food security: households had no problems or anxiety about accessing food. They have steady access to adequate food.
- Category 2 - Marginal food insecurity: households had rare or occasional anxiety and problems in accessing adequate food, but their food intake (quantity, quality, and variety) was not significantly reduced.

- Category 3 – Low food security: the quality, variety and desirability of the food consumed by these households were significantly disrupted, but the quantity and eating patterns of their meals was not significantly disrupted.
- Category 4 – Very low food security: the eating patterns of one or more household members were disrupted at times during the survey period, and the quantity of their food also reduced due to lack of resources or money for food (USDA 2014).

The nine HFIAS questions are placed in order of increasing severity and each of the questions have a frequency of occurrence question which are coded as 1 - rarely, 2 - sometimes and 3 - often. The HFIAS categories are calculated based on the answer to the nine questions and the occurrence. Households are placed on the HFIAS scale based on the sum of their responses to the frequency of occurrence questions.

The HFIAS module is used to capture household food insecurity occurrence, prevalence and severity in an area (Webb et al. 2006). Its ability to group households into food security categories makes it suitable for developing programme targets. It is used in assessing programme impacts and monitoring food assistance programmes as it is sensitive to changes over time (Coates et al. 2007). The HFIAS is commonly used to report prevalence of national household food insecurity (Webb et al. 2006; Bickel, Nord, et al. 2000).

Dietary Diversity Score (DDS)

The DDS was developed by the Food and Nutrition Technical Assistance (FANTA) project of the FAO to focus on the nutritional aspect of food security (Swindale & Bilinsky 2006). Information derived from the DDS can be used in measuring the nutritional state of the respondents or area, as the diversity of food has be found to correlate well with nutritional status (FAO 2010). DDS has been confirmed to have high correlation value with utilisation indicators like birth weight, child anthropometric measures, improved haemoglobin concentrate, reduced occurrence of hypertension and reduced cardiovascular disease related death. DDS also correlates well with food access and nutritional adequacy at both individual and household level (Swindale & Bilinsky 2006a; Becquey et al. 2010; Webb et al. 2006; Kennedy et al. 2010).

The DDS is designed as a proxy for food access at the household level, and a proxy for nutritional adequacy at the individual level (Kennedy et al. 2010). It is designed to capture the nutritional aspect of food security, to be less subjective and time sensitive in terms of changes

over time and take less survey and analysis time (Hoddinott et al. 2002). It is a good proxy indicator of food security for the reasons that:

- Having a more diversified diet is a vital outcome in and also of itself.
- Improved outcomes such as birth weight and anthropometric status are associated with more diversified diets.
- It is highly correlated with factors such as household income and protein, micro nutrient and calorie adequacy.
- It recognises the existence of hidden hunger, which stems from micronutrient deficiency.
- It is applicable to both household and intra household level.
- The indicator is relatively simple to understand for both field workers and respondents. It takes about ten minutes per household to collect the data (Swindale & Bilinsky 2006).

3.8. TOWARDS COMPREHENSIVE FOOD SECURITY MEASURES

The search for indicators that can capture a fuller picture of the different dimensions of food security has led to suggestions that more than one measure for food security measurement should be used (FAO 2003; Nathalie 2012). Maxwell et al. (2013) emphasised that the focus of food security measurement improvement should be on identifying how the three most widely used indicators complement each other. In the previous section, the HFIAS, DDS, and CSI were introduced, and this section now unpacks their strengths and weaknesses to explore their complementarities for potential use together as a measure of food security. Table 3.2 summarises which dimensions of food security are addressed by each indicator.

Table 3.2 The dimensions of food security addressed by the three key indicators

Dimensions of food security	**Key indicators of food security**		
	HFIAS (9 items)	CSI (coping strategies)	DDS (food groups)
Food availability and access	Limited variety of food; Small meal; Fewer meals per day; No food in house; Go to sleep without food;	Consumed seed stock held for next season; Limit portion size at meal time; Reduce number of meals eaten in a day; Purchase on credit; Gather wild food; Hunt or	Access to 12 different food groups viz: Cereals; White tubers and roots; Vegetables; Fruits; Meat; Eggs; Fish and other seafood;

	Skip entire day without food (Coates et al. 2007).	harvest immature crops; Limit consumption of adult for children to eat; Feed working members of the household at the expense of others; Skip entire day without meat (Maxwell et al. 2003).	Legumes, Nuts and seeds; Milk and milk products; Oils and fats; Sweets; Spices; Condiments and beverages (Kennedy et al. 2011)
Utilisation	Less preferred food; Limited variety of food; Eat food not wanted (Coates et al. 2007).	Rely on less preferred and cheap food; Borrow food; Send household members to eat elsewhere; Begging for food (Maxwell et al. 2003).	All DDS questions are meant to measure nutritional adequacy, both micro and macro nutrients e.g. protein (plant and animal source), vitamins sources, mineral sources (Kennedy et al. 2011).
Stability: This dimension is built into each question in each module using time dimension. The questions are based on the time of instability in availability, access or utilisation of food.	How often within the past 30 days (or any chosen survey time frame) did the household have adequate food?	How many days out of the last seven days (or any chosen survey time frame) did the household use the coping strategies?	How many food groups consumed in the last 24 hours?

Source: Author

Food availability and access. Availability captures the quality and diversity of food, in addition to quantity; while access considers how people acquire the food they eat. The summary in Table 3.2, demonstrates that food availability and access is captured by all three key indicators, but from different angles. HFIAS items generally probe whether food available and accessed by the household was enough for the household to have a complete number of full meals for each day,

without putting much emphasis on how the food was sourced, nor on the nutrition derived from eating diverse food groups. Whereas the CSI food availability and access questions are dynamic in nature, exploring how the available or consumed food was sourced (e.g. consuming seed that could have been planted, wandering in the wild for food) and whether the quantity of food was enough for a full meal at a time (every member eating but a smaller quantity per time, reducing the number of people to feed). It also explores the day to day responses to lack of food and how households relate to their environment and assets during lack of food, which exposes the vulnerability, risk and sustainability of household behaviour in coping with food insecurity. The DDS questions go further from asking whether food is available to identifying the nature of available food. The DDS tries to specifically measure the actual food consumed out of the available and accessed food. Hence, these three indicators when used together will communicate more detailed and comprehensive information on the problems of household access to enough quantity and quality of food in a socially acceptable and sustainable manner (i.e. in a manner that does not deplete their health, assets or environment beyond its renewable ability).

Food utilisation. For food utilisation, the summary in table 3.2 illustrates that all three indicators contain questions that probe food utilisation (dietary needs, social acceptability and food preferences) in different ways. The HFIAS and CSI may seem to do very little in this area (Coates et al. 2007), but it is important to note that these two indicators can show food preference and social acceptability, which are also very important in determining what food types a household eats. A food type that is not accepted or preferred by the household might have little chance of getting into their food menu and contributing to their nutritional status. The DDS is the more robust measurement of nutritional adequacy. It is very focused on the nutritional importance of the food. DDS can show access to different varieties of food, while HFIAS and DDS show whether the varieties were diverse or limited, and the CSI reveals whether the food varieties were accessed through socially undignified or unaccepted means (begging, borrowing, or stealing etc.). So using HFIAS, CSI and DDS together in a survey is more likely to capture more of the dimensions of utilisation (the nutritional adequacy, preference and social acceptability) of food in a household, than can be captured by using each one of them as a sole indicator.

Food stability. The time dimension of food security is captured mainly in the HFIAS and CSI by looking at how often food was unavailable or not accessed by the household over a given time. Using the optimum recall periods suggested for each of them, both indicators tend to look at how food availability and access fluctuates in the household over time. The CSI also explores further to examine how the shortfall was managed. DDS may be used to captures what happens within a day, and so may not be able to show a typical household food diversity fluctuation or pattern (Kennedy et al. 2011). However, the DDS can provide a wealth of information on nutritional adequacies of food, especially if it is used together with other indicators that have a longer recall period like HFIAS and CSI.

To reiterate, the strengths of the three indicators are highlighted. The HFIAS is contextually and theoretically grounded for defining food insecurity and identifying clearly the food insecure households. It objectively groups households into levels of food insecurity and has the ability to mirror the psychological undertone of food insecurity. It has the capability to estimate with precision the extent, prevalence and conditions of food insecurity and produce a target for food insecurity. The CSI identifies the behaviour of the food insecure and can be used in characterising the vulnerable groups and the trade-offs they make. The DDS satisfactorily captures dietary adequacy and differentiates between the different components of food accessed. It also suffers less from the potential response bias inherent in experience-based measures (Jones et al. 2013; Maxwell & Coates 2012; Webb et al. 2006; Coates et al. 2007; Maxwell et al. 2003). So, bringing HFIAS, DDS and CSI together in one survey will facilitate the capturing of experience of the food insecure, the types of food accessed by households and also the behaviour of vulnerable groups necessary for their characterisation, in addition to capturing food availability, access, stability and utilisation.

3.8. CONCLUSION

From the discussion, it is clear that there is no best measure of food security. The goodness of fit of any measure can only be evaluated by its comprehensiveness and precision in capturing food security in a reliable, timely, and cost effective manner. This article discussed the changing and evolving conception of food security towards a greater appreciation of its inherent complexity and a better understanding of the four key dimensions of availability, access,

utilisation and stability. The fact that the methodology and the underlying purpose of each measure are different calls for a proper understanding and use of these indicators.

It is clear that a single composite indicator will not be found for some time to come. Therefore, following suggestions in the literature, this paper looked at how to exploit the underlying strengths of the three key indicators, HFIAS, CSI and DDS, looking also at the robustness of each in measuring specific dimensions and the validity of the measures. It was found that using them in combination means that all four dimensions of food security will be measured from different angles, providing a nuanced and deeper understanding of food security.

Further research in using these measures together in one survey will be a big leap forward in the effort to give the multidimensional phenomenon of food security a multidimensional treatment. Other areas for further research include: better understanding of the time sensitivity of the key indicators, the number and nature of items to include in a questionnaire and the cost of administration.

CHAPTER 4 - SECOND ARTICLE - MEASURING HOUSEHOLD FOOD SECURITY STATUS IN TARABA STATE, NIGERIA: COMPARING KEY INDICATORS

ABSTRACT

The article explored the complementary relationship between three key food security indicators: the Household Food Insecurity Access scale (HFIAS), the Dietary Diversity Score (DDS) and the Coping Strategies Index (CSI). These three indicators were adapted and employed in a cross-sectional survey, involving 409 randomly selected households in Taraba State, Nigeria. The results of the survey show that while only 8% of households could be considered food secure, 69% were severely food insecure. About 34% of the households used very erosive coping strategies. Very low food security status is associated with: a household head who is a farmer, less educated, or divorced; low household income and expenditure; high food share of income; large household size; and having no access to large land size. The study showed that the indicators followed a clear complementary pattern. The bivariate analysis showed a significant difference ($p<0.01$) in DDS and CSI across HFIAS categories. This confirms that worsening food insecurity strongly correlates with employing more coping strategies and lower dietary diversity. The study recommends more research on this topic.[6]

[6] To be submitted to the *Ecology of Food & Nutrition* journal for publication

4.1 INTRODUCTION

Food security is *"a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (FAO 2014: 50). This definition, a global benchmark reference, includes the four major dimensions of food security: food availability, access, utilisation and stability. Improving the food security status of communities, households and individuals requires reliable information about every dimension of food security, especially how it manifests in different contexts and its causes and diverse consequences. Collecting such information, mainly but not exclusively for evidence-based food policy actions, in turn, presupposes adequate knowledge of how to measure this multidimensional social concern.

Measuring individual aspects of food security is not new and has in fact matured, but the limits and shortcomings of this traditional approach have stimulated extensive critique (Maxwell et al. 2013; Jacobs 2009; Nathalie 2012). However, finding a comprehensive indicator that incorporates all elements captured in the standard international definition of food security has remained a challenge for researchers and food security agencies alike. Efforts to use more than one indicator have advanced towards more comprehensive, nuanced and realistic understandings of what it means to be food secure or insecure (Faber et al. 2009). Some studies exist where two or more indicators were used together in measuring food security (Napoli et al. 2011; Jacobs 2010; Rose & Charlton 2002; Maxwell et al. 2013; Haese et al. 2013).

It is important to note that some researchers have made considerable progress in terms of developing so called composite measures. One example is the continuum of food poverty and low energy availability indicators derived from food expenditure and nutritional intake data (Rose & Charlton 2002) whereas another popular measure is the Poverty and Hunger Index (International Food Policy Research Institute 2013). However it has been observed that even these measures provide insufficient information about intra- and inter-household food security and are insensitive to household composition, diet adequacy and time (Jacobs 2010).

It is reasonable and logical to, at least, consider a strategy for better food security measurement from the angle of aligning dimensions of food security with well-tested and validated component indicators and measures. The question to be answered then, is how the traditional uni-

dimensional measures that capture either food availablity, access, utilisation or stability might be able to complement each other in a more comprehensive measure. This is a tricky task because each traditional measure is now treated as a component of a complex system with dynamic interactions and varied feedback effects. Nothwithstanding this difficulty, it is one step towards identifying indicators that could be combined or developed into a more comprehensive measure for a rounded and increasingly realistic view of this multifaceted societal challenge.

Maxwell & Coates (2012), among other researchers in this field, suggested that more effort should be geared towards understanding how the indicators, especially the 4th generation indicators (HFIAS, DDS, and CSI), complement each other, and further, innovative ways of adapting such indicators to local contexts. Taking into consideration the key dimensions of food security, with its inherent human and societal complexities (societal values, perception, anxiety, response to lack of food, etc.), Maxwell et al. (2013) combined the HFIAS, CSI and Food Consumption Survey (FCS) - similar to DDS - in a household food security survey. This multifacted approach to food security measurement adopted by Maxwell et al. (2013) aimed at developing a composite measure, and identifying households that could have been misclassified when restricting measurement to a single measure. They concluded that about 27% of their sample could have been misclassified by using a single indicator. The survey also revealed the trade-offs between the quality and quantity of foods that households obtained, and crucial policy-relevant evidence for identifying the most needy food insecure households or individuals.

Contributing to this modern strand in food security measurement and indicator literature, this study has carried out a survey of the food security status of households in Taraba State, Nigeria, using an adapted version of the above-mentioned core food security indicators, namely HFIAS, DDS, and CSI. Food security is poorly studied in northeast Nigeria. In fact, information about the food security status of northeast Nigerian households is limited to the traditional approach that heavily relies on national agricultural production data. Liverpool-Tasie et al. (2011) observed that there are only a few studies that have collected household data on food security within north-central and southern parts of Nigeria using an adapted version of the HFIAS as a sole indicator of food security. In an effort to close the gaps in available food security measurement research in Nigeria; this study brings together the three core food security indicators in one household survey, to provide answers to the following questions: What is the depth and breadth of food security in Taraba? How do categories of households classified in terms of their food security

status compare in terms of food consumption and other socio-economic variables? What percentage of the households is considered vulnerable based on the coping strategies used? How do the key food security indicators complement each other to give a multifaceted view and measure of food security and insecurity households in Taraba?

The rest of the article is organised as follows. Section 4.2 of the article outlines the research approach and methodology, which includes study design, data collection, and data analysis procedures. The results of the survey will be presented and discussed in Section 4.3. Lastly, the conclusions and recommendations, as well as areas for further research, will be presented in the Conclusion section.

4.2 RESEARCH APPROACH AND METHODOLOGY

Different researchers and institutions, using different indicators, typically grounded in a diverse range of traditional one-dimensional approaches, have measured food security differently. The need for a more comprehensive measurement and understanding of food security has been strongly and actively debated in food security literature. Little is known about the food security status of households in the northeast of Nigeria, especially Taraba State. To date, no research in this area has attempted to measure all facets of food security as encapsulated in the standard international definition of this concept. To measure the food security status of households in Taraba State, this study systematically and consistently integrates three core food security indicators into one survey instrument.

Table 4.1 illustrates how the fundamental elements of the food security definition are embedded in the dominant measures - HFIAS, CSI and DDS. It is also worth noting that recall periods differ across these measures: HFIAS - one month (Coates et al. 2007), CSI - 7 days (Maxwell & Caldwell 2008), and DDS - 24 hours (Kennedy et al. 2011). Although other time frame longer or shorter than the optimum, as used for this study, can be adopted. This means that it is standard for the core measures to capture different timeframes - long-term, medium-term and short-term - with important effects on, and implications for, stability, vulnerability and risks. This high-level snapshot serves as a framework for exploring the dimensions of key food security indicators, rapidly appraising their strengths and framing the research methodology designed to achieve the objectives of this study.

Table.2.1: Conceptual framework of the dimensions covered by HFIAS, CSI and DDS

Indicators	Dimensions of Food Security			
	Availability	**Access**	**Utilisation**	**Stability**
HFIAS	◯	◯		◯ (food available and accessed at all times, in the last one month or at any given time)
CSI	◯	◯		◯ (Stable availability and access to food in the last seven days or at any given time)
DDS		◯	◯	◯ (diverse food groups accessed and actually consumed in 24 hours)
HFIAS/CSI/DDS	◯	◯	◯	◯ (food available, accessed and actually consumed when needed for a healthy life)

◯ Dimension captured

Source: The Author

Though Taraba State is noted for its crops and animal production, it is well documented that even with the aggressive support of the agricultural sector by the Government of Nigeria to achieve food security, the northeast region of Nigeria, which includes Taraba, is the most food insecure part of the country (Ajayeoba 2010; Liverpool-Tasie et al. 2011; Akinyele 2009). Liverpool-Tasie et al. (2011) and Akinyele (2009), in reviewing literature on food security studies in Nigeria, identified that there is a high incidence of food insecurity in the country, especially the northeast region, and made it clear that most studies generating food security information about Nigeria depend heavily on national data of food production, income, and calorie intake, which do not give a clear picture of household food security. This confirms that little has been done in measuring household levels of food security in Nigeria, yet the household is still the most important social unit for food preparation and consumption (Maxwell & Caldwell 2008).

The primary data used in the study was collected from households in Taraba State, located in northeast region of Nigeria. The State has a population of 2,294,800, and about 438,883

households; excluding homeless persons and people in transit (Nigeria Population Commission (National Population Commission 2006). It is a highly heterogeneous, multi-ethnic state, with over 80 indigenous ethnic groups and languages (Online Nigeria 2003).

Taraba is made up of sixteen Local Government Areas (LGAs) that are divided into four (4) agro-ecological zones. The zones and their constituent LGAs are: (1) Wurkari Zone: Gassol, Ibi, and Wurkari; (2) Zing zone: Jalingo, Ardo Kola, Yorro, Lau, Zing, and Karim Lamido; (3) Bali Zone: Takum, Kurmi, Ussa, Bali, Donga, and Gashaka; (4) Gembu Zone: Sardauna (Federal Ministry of Information 2012). The people of Taraba are predominately engaged in crop and pastoral farming. They are involved with the subsistence cultivation of yams, cowpeas, sugar cane, rice, vegetables, cassava, millet, sorghum, beniseed, etc., and the rearing of animals including cattle, goats, sheep, and donkeys (Online Nigeria 2003; Kuku-shittu et al. 2013).

A multi-stage sampling technique was used in selecting 450 households[7] using the total number of households reported in Nigeria's 2006 Census as the sampling frame[8]. First, three out of the four agricultural zones in the state were purposively selected (the zones selected have more LGAs than other zones). Secondly, five (5) LGAs were selected from the zones: Wurkari, Jalingo, Yorro, Bali, and Takum. Thirdly, four (4) communities were selected from each of the LGAs. Fourthly, two (2) villages were selected from the twenty communities, making a total of 40 villages. Lastly, twelve households were randomly selected from each village.

A questionnaire containing the adapted versions of HFIAS, CSI and DDS was used as an interview guide to collect data on food security, socio-economic characteristics, and climate shocks. The questionnaire was translated with the assistance of the fieldworkers[9], who were also involved in the focus group discussions with local people that were used to adapt the CSI, DDS and HFIAS to the local conditions. The adapted questionnaire was sent to food security experts for input, and then piloted among local people in Taraba. The pilot study resulted in further slight adaptations of the questionnaire before it was deemed ready.

[7] For this study, a household is defined as people living together and sharing a common source of food, having a sense of belonging together, and with a distinct household head. They may or may not be sharing the same roof but are living within the same compound.
[8] According to the 2006 census, the total number of households in Taraba, which form the sample frame, is 438,883 (though there is massive outmigration from this area due to conflict). The sample size has an error margin of 4% at 5% confidence level.
[9] Twelve trained field workers assisted in the data collection. Adult(s) involved with household feeding were interviewed for each household.

Data analysis combined the application of both inferential and descriptive statistical techniques. Rasch model scoring (Coates et al. 2007), CSI calculation (Maxwell & Caldwell 2008), and FAO HDDS calculation method (Kennedy et al. 2011) were used in analysing the data collected using the three food security core questions. For the comparative part of the study, the Spearman correlation, Bonferroni test statistics and ANOVA were used. For categorical relations, Chi-Square was used to test for differences across the three HFIAS groups. The HFIAS categories derived from the survey are explained in the table and in more detail in the following section.

Table 4.2: Description of the three HFIAS categories for the study

HFIAS 1	HFIAS 2	HFIAS 3
Category 1 and 2 (High food security and Marginal food insecurity) - this group is made up of households with little/no problem or anxiety most of the time in accessing adequate food. Their food intake quantity, quality, and variety are not significantly reduced.	Category 3 (Low food security) – the quality, variety, and desirability of the food taken by these households are significantly disrupted, but the quantity and eating pattern of their meals are not significantly disrupted	Category 4 (Very low food security) – the eating pattern of one or more household members are disrupted at times during the survey period. Also the quantity of their food is reduced due to lack of resources or money for food

Adapted from United States Department of Agriculture 2014; United Nations 2014.

4.3 RESULTS AND DISCUSSION

Against the backdrop of the foregoing conceptual synthesis and methodological overview, this section presents and discusses the empirical results generated through an application of the research framework sketched out above. This discussion is anchored around household food security categories derived from the HFIAS indicator that is used to compare the socio-economic profiles of surveyed households before an in-depth examination of variations in their food security status. With regard to food security measurement, the rest of this section specifically looks into how food spending and consumption patterns relate to the HFIAS categories as well as how the key food security indicators compare and could potentially complement each other.

Household food security categories and socio-economic profiles

The HFIAS indicator was adapted and used in ascertaining the prevalence of food insecurity in the state. This is because the HFIAS, apart from being the most validated and widely used among the three indicators, is still preferred in terms of having a more widely accepted universal threshold, which allows for more uniform grouping of households into categories of food security (Maxwell & Coates 2012).

Following Agresti (2007), the HFIAS categories obtain using the Rasch scoring, was adapted into three groups instead of the original four HFIAS categories to improve the reliability of the results. The first two categories for this study were merged due to the small percentage (2%) of households contained in the original first HFIAS group. Thus three HFIAS categories were obtained in this survey: HFIAS 1 – high/marginal food security, HFIAS 2 - low food security, and HFIAS 3 - very low food security. The rest of the result discussion in this section is anchored around these three HFIAS categories.

Survey results reported in Table 3 show that even though 69% of the households in Taraba could be classified as food insecure (HFIAS 3), there is significant variation in the food access scores across the local government areas. Households in Jalingo appeared to be more likely than households in other localities to be food secure with about 25% of these households classified under HFIAS 1 compared to 9% in Yorro and 5% in Takum. Unsurprisingly there was no household living in Bali or Wurkari found in HFIAS 1, as the conflict was concentrated in these two LGAs, but the greater proportion of households in Bali (97.5%) and Wurkari (98.8%) were found HFIAS 3.

Table.4.3 Prevalence of household food insecurity in Taraba (regrouped), by LGA

LGA	HFIAS 1 n=32	HFIAS 2 n= 95	HFIAS 3 n= 282	Total no. of valid observations	Chi-Square
	%	%	%		
Wurkari	0	1.25	98.75	80	
Jalingo	25	33.33	41.67	84	
Bali	0	2.47	97.53	81	158.76**
Yorro	8.64	28.4	62.96	81	
Takum	4.83	49.4	45.78	83	

Note: Chi Square test is significant at 0.01%

Household food security status varies in terms of the socio-economic status of households as reported in Table 4. Food insecurity prevalence was high among households headed by females, having a greater proportion of them in HFIAS 3 than their male counterparts, although the difference between the food security of the female- and male-headed households was insignificant. Food insecurity was highest among divorced, separated, or widowed households as a greater proportion of them were found in HFIAS 3, followed by households headed by married persons. More than 70% of households that had children below the age of 18 years were in HFIAS 3, compared with only around 48% of those without children. Households that have a head of the females in the household[10] who is without any education, were more likely than those with educated females to be food insecure. In HFIAS 3, over 83% of the heads of the females had no educational qualifications, 82% had a first school (primary school & junior secondary) certificate and 69% had O level (senior) qualifications, whereas of the households with head of the females found in HFIAS 1 50% had postgraduate degrees, 32% had first degrees/HNDs and 17% had NCEs/ONDs (Nigeria Certificate in Education/Ordinary National diploma). None of the female heads of the females with no education and first school qualifications were found in HFIAS 1.

Households tend to be more food secure in line with an increased number of years spent in formal education by the household head. Food insecurity was highest with households headed by someone that spent an average of 8.5 years (did not complete junior secondary) in school, and lowest for those that spent an average of 14.4 years in school (may have completed a diploma course).

Among occupations of the household heads, the food security also differs across the three groups. Households headed by a civil servant were more likely than other household types to be food secure. For civil servant households, about 14% of them were in HFIAS 1, whereas less than 1%, 8%, 6%, and 10% of households headed by farmers, private sector employees, artisans, and traders respectively, were in HFIAS 1. The arrangement was almost reversed in HFIAS 3. The greater proportion of households headed by farmers (85%), private sector

10 Head of the females is not necessarily the household head, but she is the head of the other females in the household. They are usually the mother, first wife, adult daughter or female in the household who has the responsibility of managing the affairs of the women in the household.

Table 4.4: Food security categories by household socio-economic characteristics

Categorical Household Characteristics	HFIAS 1 n=32	HFIAS 2 n= 95	HFIAS 3 n= 282	Total no. of households	Chi-Square
	%	%	%		
Household head gender					
Male	8.62	24.62	66.77	325	3.88
Female	4.76	17.86	77.38	84	
Household head marital status					
Single	10.45	11.94	77.61	67	
Married	8.76	27.01	64.23	274	15.36**
Divorced/separated	1.47	19.12	79.41	68	
Household with children					
No	11.43	40	48.57	70	
Yes	7.08	19.76	73.16	339	15.63**
Educational qualification heads of females					
No education	0	16.04	83.96	106	
First school	0	17.65	82.35	85	
O level	3.7	26.85	69.44	108	87.58**
NCE/OND	16.95	40.68	42.37	59	
First degree/HND	32	20	48	25	
Postgraduate	50	30	20	10	
Household head primary occupation					

Civil servant	14.04	25.44	60.53	114	
Farmer	0.81	13.82	85.37	123	
Private sector employed	8.16	24.49	67.35	49	33.98**
Artisan	6.45	32.26	61.29	62	
Trader	10	32	58	50	
Continuous Variable (Mean (Std))	**HFIAS 1 n=32**	**HFIAS 2 n= 95**	**HFIAS 3 n= 282**		**f-Value**
Household size	5.28 (5.27)	7.09(3.17)	8.88(5.43)		10.452**
Household head age	41.72(9.38)	47.99(10.19)	48.69(14.11)		4.1405**
Household head years of school	14.38(1.58)	11.72(4.27)	8.51(4.76)		36.918**
Number of income earner	2.34(2.34)	2.47(1.17)	2.16(0.82)		3.1248**
Household income (₦)	116861.35 (45259.12)	93873.77 (43828.45)	30134.64(30923.60)		172.6**
Head of females income (₦)	54844.56 (11507.25)	32497.69 (23354.24)	11551.77 13750.80)		123.79**
Number of plots of land owned (a plot = 463.6sqm)	5.47(4.05)	4.03(2.50)	2.79(2.30)		21.629**

** Significant at 0.01 level

employees (67%), artisans (61.3%), civil servants (61%), and traders (58%) were found in HFIAS 3.

The relationship between ownership of land and food security was explored. The Chi-Square result showed a significant difference in the land size owned across the different HFIAS categories at $p<0.001$. Those that owned an average of 5.47 plots (a plot = 463.6sqm) were found in HFIAS 1, whereas those that had an average of 3.79 plots where found in HFIAS 3.

This result is not surprising as it followed an expected pattern. Nathalie (2012), Battersby (2011), Rose and Charlton (2002) and Haile et al. (2005) independently found that an increase in household head education, through increased income, leads to an increase in household food security. Education influences income, and therefore the ability of the household to access more food. Additionally, the survey revealed that female education is strongly linked with household food security status.

The gender nature of poverty makes it easy to expect the female headed households to be more food insecure than their male counterparts (Battersby 2011). In support of this general view households with a female head were certainly more in HFIAS 3 (77.3%). However the difference was not significant, giving credence to the observation of Battersby (2011) that the gender differences of food security are not as great as expected, though there exists significant correlation between gender and HFIAS scale.

Though farming plays some important role in ensuring food security, especially in providing extra food to the household, this survey supported the findings of Mjonono et al. (2009) and Battersby (2011), revealing that households headed by farmers are more likely to fall into the very low food security category than those of other occupations. This shows that food security is not entirely about having farms and producing food. Policies only supporting agriculture may not automatically lead to food security even in rural settings like most of the sites of this survey.

Food insecurity shows a positive link with the age of the household heads; most elderly heads tend to be in very low food security categories, more so than the younger heads, however, the relationship was not significant. This supports Battersby (2011) who found a weak correlation between age and food security.

The household monthly income used for this study was calculated by totalling all the income of the households' members in a month, excluding tax, so it shows the amount of money at the disposal of the household (disposable income). The monthly expenditure of the household (consumption expenditure) was calculated by summating the money value of the households' spending in a month, excluding savings and investment expenditure.

Food security is usually linked to income especially urban food security (Battersby 2011; Jacobs 2010; Nathalie 2012; Dube 2013). And Mjonono et al. (2009), working with the farming households in the rural area, they also found that income is strongly related to food security. The

survey result supports the evidence that households with a higher monthly income were more likely to be food secure.

The relationship between land ownership and food security was significant. It is not surprising that households that own large amounts of land were more food secure than others. As rightly observed by Igoe (2014), food security and land security go hand in hand. Most of the food insecure people always have these features: rural areas dwellers, depend on farm to survive, and own little or no land that they farm (Keyman 2014).

The overall indication of the result follows that an increase in food security is strongly associated with: living in Jalingo; having a single or married household head; male household head; no children; high income; highly educated heads that spent approximately fourteen years in school (completed at least a lower diploma course); a head of the females with postgraduate or at least a first degree/HND certificate; younger household heads; smaller household size; and a household head that is primarily employed as a civil servant.

Due to the fact that most people in Taraba are involved in farming as both their primary and secondary occupations, and also the recommendation of OXFAM (2014) to study the link between the food security and weather events; this study tried to look at the link between food security and weather extreme events. The weather extreme events captured in this survey were flooding, heatwaves, long periods of dry season/Harmattan, outbreak of climate related human, animal and plant diseases and pests (malaria, cholera, diarrhoea, meningitis, typhoid fever, etc.), erratic rainfall patterns, drying up of rivers and streams, and heavy and long periods of rain. A greater proportion of those that experienced the weather extreme events were in HFIAS 3; Table 4.1 shows that most farmers who might likely be at the receiving end of these weather events were in HFIAS 3. In simple terms, there were more extreme event affected households (more than three times the non-affected ones) in HFIAS 3.

The HFIAS categories varied significantly ($p<0.001$) by total monthly expenditure of the household, food expenditure, the main source of food, the main food groups that households buy, and where household members eat (table 4.2). Over 31% of households whose members ate at restaurants were in HFIAS 1. This is followed by households whose members did not eat out (10%), those that ate at a friend's house (6%), and least, from street food hawkers (1%). The pattern reversed completely for households in HFIAS 3: 85% of household members ate from

Table 4.5: Expenditure and food consumption pattern of the households

Food Consumption and Expenditure	HFIAS 1 n=32	HFIAS 2 n= 32	HFIAS 3 n= 282	Total no. of households	Chi-Square
	%	%	%		
Main source of food					
Own production	1.98	6.93	91.09	101	76.65**
Purchase	11.58	32.82	55.6	259	
Borrow, barter, gift	0	13.33	86.67	15	
Food aid	0	0	100	32	
Main food group purchase					
Starchy staple	3.3	23.3	73	378	159.464**
Processed food	57.1	14	28	7	
Meat, egg, milk	58.8	29	11.8	17	
Fresh fruit & vegetables	85	14.3	0	7	
Food consumption outside the home (within 24 hours)					
None	10.68	28.16	61.17	206	53.22**
Street food	1.43	12.86	85.71	140	
Restaurant	31.58	47.37	21.05	19	
Friend's house	5.88	11.76	82.35	34	

Household expenditure(₦)	**HFIAS 1 n=32 Mean(Std)**	**HFIAS 2 n= 95 Mean(Std)**	**HFIAS 3n= 282 Mean(Std)**	**f-Value**
Total expenditure	60565.59(31641.03)	59456.29(29344.02)	21205.85(20046.15)	117.37**
Food expenditure	23745.68(9809.54)	25176.10(9022.39)	11566.30(8198.55)	106.03**
Food spending share of total expenditure	0.51(0.18)	0.75(0.93)	0.67(0.56)	1.724
Food spending share of total income	0.23(0.10)	0.49(0.54)	0.50(0.37)	6.551**

** Significant at 0.01 level

street food hawkers; closely followed by those that ate at their friend's house (82%); 61% did not eat out (61%); and the least ate at restaurants (21%).

When the main sources of food for the households were considered, the survey revealed that only about 2% of those that get most of their foods from their own production (farm) were in HFIAS 1, whereas 91% of them were found in HFIAS 3. About 12% of households whose main source of food is purchased were in HFIAS 1, and 56% of them were in HFIAS 3. For those that source most of their food from borrowing, bartering, gifting, and in exchange for labour, none of them were found in HFIAS 1, about 13% were in HFIAS 2 and 87% were in HFIAS 3. Households that depend mostly on food aid as their main source of food were all in HFIAS 3.

When the food groups that households spend most of their income to buy were considered, about 3% of households that spend most on the purchase of starchy staples were in HFIAS 1, and 73% of them in HFIAS 3. For those that spent most on the purchase of processed foods, about 57% were in HFIAS 1 and 28% in HFIAS 3. Households that spent most of their income on the purchase of meat, eggs, fish and milk were in HFIAS 1 and 3, about 59% and 12% respectively. For households that spent most on buying fresh fruits and vegetables, 85% of them were in HFIAS 1 and none of them were in HFIAS 3.

As expected, total household spending and food expenditure per household differed across the HFIAS categories. Households in HFIAS 1 and 2 reported spending almost three times the amount of those in HFIAS 3 in a month. Unsurprisingly, households spending more on foods (in nominal monetary value) found themselves to be more food secure.

When the food share of total expenditure was compared for the three HFIAS categories, surprisingly there was no significant difference in the food share of the household expenditure across the three categories, although HFIAS 1 seemed to spend the least proportion of their total household spending on food. One possible explanation for this anomaly is perhaps due to the large proportion of farmers in HFIAS 3, whose food expenditure may be under-reported due to the consumption of their own production (Battersby 2011). Farm households are unlikely to purchase the full variety of foods and usually do not keep records of how much they consume thus precluding the imputation of the monetary values of farm output consumed within the household.

The food spending share in total household income was also explored to check for any significant differences across the three food security categories. The result showed a significant difference across the HFIAS categories at $p<0.01$. The average household in HFIAS 1 spent about 23% of their income on food, compared to 49% for HFIAS 2, and 50% for HFAIS 3 (food insecure households).

From the share of household spending results presented in Table 5, it can be deduced that the use of food share expenditure in measuring food security, especially in a pure agrarian context, might not give an accurate picture of food security in that society. As can be seen from the survey, the food security category (HFIAS 3) that has the greatest proportion of farmers may be food insecure, earn very little income, spend a very high proportion of their income on other goods and services, and spend little of their income on food purchases due to their own production and consumption that characterises subsistence farming.

The overall indication is that households whose members ate food from street food vendors were more likely to be located in HFIAS 3 than those who ate food in other places, especially restaurants. Households that get most of their food from food aid, borrowing, gifts, and their own production are more likely to be in HFIAS 3 than the ones who source their food mainly by purchases. Households that spend most in purchasing milk, eggs, meat, fish, fresh fruit and vegetables, and processed food, are more likely to be in HFIAS 1 than those who spend most on the purchase of staple starches. Considering the expenditure behaviour of the different food security categories, households with a lower income and such low expenditure are more likely to be food insecure. This is particularly true for households located in areas where most foods are purchased.[11]

The complementary information from the three key indicators

Becquey et al. (2010), in validating the complementary and valid contribution of HFIAS and DDS to food security, observed that the two measures did well in approximating the diet adequacy, and were also very informative as food security indicators. It is well recorded that DDS is a good indicator of diet adequacy, and HFIAS is a good measure of households' experience of food availability and access (Becquey et al. 2010; Maxwell & Coates 2012; Maxwell et al. 2013; Webb

[11] Seeing that the food share of expenditure was not giving us a result that corresponded to existing literature on the relationship between food share and food security, we decided to explore further using the food share of the total income of the household, to verify the result.

et al. 2006), while CSI, in addition to measuring food access, provides information on human responses to a lack and perceived lack of food.

Exploring the complementary information of the three indicators, the survey showed a variation among HFIAS categories. Results displayed in Table 6 show that the indicators followed a clear complementary pattern. As food insecurity (HFIAS) increased, the households used more coping strategies and ate less diversity of food. The mean CSI significantly increased across the HFIAS category; from the secure (HFIAS 1) group to the insecure (HFIAS 3) group, while DDS decreased across the increasing HFIAS categories. This may suggest that as food insecurity experiences increased, the households tended to use more coping strategies to keep afloat, which may also involve some quality-quantity trade-off strategies. Trying to get an indebt information from each of these indicators in this study, helps us to understand the complex nature of food security- HFIAS result which is derived using an algorithmic model (Rasch), contextually and theoretically defined food insecurity and identifying clearly the food insecure households. It objectively grouped the households into 3 levels of food insecurity and mirror the psychological undertone of food insecurity in each of the groups. It estimated with precision the extent, prevalence and conditions of food insecurity and produce a target for food insecurity. The CSI identified the behaviour of the food insecure, which can serve as a pointer in characterising the vulnerable groups and the trade-offs they make. It equally showed us how the food insecure relates to their environment in search of food, and the tradeoffs between the quality and quantity of food, and food and other livelihood assets. The DDS satisfactorily captured dietary adequacy and differentiates between the different components of food accessed.

It is important to note that households in HFIAS 3 (very low food security) used about 18.6 times the coping strategies of HFIAS 1 (high/marginal food security), while households in HFIAS 2 used about 5.2 times the coping strategies of HFIAS 1. This may denote that a small shift from food security to insecurity can lead to an increased and disproportionate use of food insecurity coping strategies. The light that these three indicator sheds to the complex nature of food security is not worth loosing for just a little more effort needed in combining the three indicators in one study. The time and efforts required in achieving this multiple dimensional view of food security using the HFIAS,CSI, and DDS, is quite minimal.

Table 4.6: Relationship between HFIAS categories and the two other indicators: DDS and CSI

	Household Food Security Category			
Food security indicator	**HFIAS 1 n=32**	**HFIAS 2 n= 95**	**HFIAS 3 n= 282**	**F-Value**
DDS (Mean(Std.))	9.44 (2.18)	8.25 (2.27)	7.17 (1.84)	25.626**
CSI (Mean(Std.))	3.90 (5.59)	20.15 (12.63)	72.38 (34.79)	162.00**

**Correlation and t-value significant 0.01 level (2-tailed)

Exploring further to identify the nature of the coping strategies used by each of the HFIAS categories, given the wide gap in their mean CSI, the result showed that the HFIAS categories significantly differ in their use of coping strategies. HFIAS 1, generally, used the lowest number of coping strategies.

To show the nature of coping strategies used by each HFIAS category, the least and the most severe coping strategies were selected, as they can be said to represent what happens within each HFIAS category (Table 7). The least severe food insecurity coping strategies (according to the ranking of the strategies during question adaptation) were found in HFIAS 3 where about 74% of households limited their portion sizes, and 89% reduced the number of eating times. Whereas only 2% who limited their meal size and 0.3% who reduced the number of times they ate were in HFIAS 1. Almost all the households that used the most severe (unsustainable unhealth and social degrading) coping strategies (skipping food the entire day (100%) and begging for food (99.1%)) were in HFIAS 3.

Table 4.7: Coping Strategies used by HFIAS categories

Severity rank	Coping strategies (severity rank)	HFIAS 1 n=32	HFIAS 2 n= 95	HFIAS 3 n= 282	Total no. of households	Chi-Square	df
1	**Limit portion size at meal time**						
	No	66.67	22.22	11.11	36	110.83**	2
	Yes	2.14	23.32	74.53	373		
1	**Reduce number of meals**						

	No	26.72	54.31	18.97	116	203**	2
	Yes	0.34	10.92	88.74	293		
4	**Skipping entire day**						
	No	12.55	37.25	50.2	255	153.26**	2
	Yes	0	0	100	154		
4	**Beg for food**						
	No	10.74	31.54	57.72	298	89.95**	2
	Yes	0	0.9	99.1	111		

**Correlation and t-value significant 0.01 level (2-tailed). 1- Least severe, and 4 - very severe

When the differences in the consumption of iron and vitamin A rich foods of the different HFIAS categories were explored, the Chi-Square showed a significant difference at $p<0.001$ across the HFIAS categories. Accessing vitamin A rich foods from plants was not a problem in the study area, due to the abundant presence of palm oil in Nigeria. About 12% of those who ate animal based vitamin A rich foods were found in HFIAS 1 compared with 2% that did not. About 10% of households that consumed iron rich foods were found in HFIAS 1, compared with less than 1% of households that did not. A greater proportion of households that did not eat both the animal based vitamin A and iron rich foods were found in HFIAS 3.

The overall indication of the result is that the depth of food insecurity is heavily concentrated among the most extreme group - HFIAS 3. As food insecurity increases, households tend to use more coping strategies, both in number and severity. The use of the very severe coping strategies by any households is an indication of serious food insecurity. As can be seen from the result, it is likely they have used up the available less erosive strategies and are now living on very unsustainable strategies (begging and skipping food all day). This may in turn affect their ability to achieve food security in the future. This information from the three indicators may be helpful in identifying the very vulnerable households even among food insecure groups. Hence using the three indicators will provide information on what to look out for, in terms of coping strategies, among the food insecure, which will help in identifying them as vulnerable or not. The combination of these indicator, also provides information to policy makers and food agencies on the type of food needed in each community and group being considered for food aid.

4.4 CONCLUSION

The study has examined how three longstanding and validated food security indicators – HFIAS, DDS, and CSI - could be used together for a detailed investigation of food security. From a conceptual or theoretical perspective, this blended approach to household food security measurement captures the main facets embedded in the benchmark food security definition. It sheds informative light on a very complex social phenomenon central to the quality of human life. Combined usage of these measures which take very little additional effort, time and cost, as early explained, provides information that overcomes the shortcomings of the traditional one-dimensional measurement of food security, and provides a basis for more effective food policy interventions.

The application of this multidimensional food security measurement framework has revealed a more nuanced picture of the depth and breadth of food insecurity in Taraba State. Whilst 8% of surveyed households could be considered as food secure, 69% are very food insecure. About 34% of the households in the study were very vulnerable (they begged for food or had skipped food for an entire day, within the 7 days prior to the survey) and many food insecure households were lacking in animal based vitamin A and iron rich foods.

There was significant difference in the household characteristics of the households in each HFIAS group. HFIAS 3 is characterised by: living in Bali and Wurkari LGAs; more experience of weather extreme events; household heads with the least schooling; heads of females in the household without education; ownership of smaller land size; large household size; large proportion of divorced/separate household heads; female household heads; lowest income and expenditure; highest percentage of farmer household heads.

The fact that subsistence farmers were more food insecure than other household types, shows the need for improved food systems, a system of social protection, and a farming insurance scheme. This study in consonance with some other studies, argues that supporting the agricultural sector alone might not automatically ensure that households consume adequate food for a healthy life. All the aggressive farmer support programmes targeted at farmers in this state have done very little in helping the poor farmers to improve their welfare. Hence institutional mechanisms should be put in place to help farmers out of their food insecurity situation. This mechanism may include training farmers on advanced farming methods and

techniques, and providing educational and financial support that can help them to acquire the necessary skills and education that can increase their opportunity to do other jobs.

The result confirms that worsening household food insecurity strongly correlates with more coping strategies and lower dietary diversity. Moreover, the complexity of food insecurity favours moving beyond one indicator to help shed light on the different dimensions and how they interact for improved food security.

Areas of further research and policy can be suggested:

- More research is needed in the area of food security dimensions and their indicators.
- There is a need for a time series data collection and the use of other analytical methods; this will give more insight into food security over time.
- A study of this kind is needed in other states in Nigeria and even at national level controlling for state level differences.
- There is need to investigate why farm households remained the most food insecure, even amidst aggressive agricultural support.
- In the area of policy. There is need for the policy makers to encourage the combined use of these indicators (HFIAS,CSI, and, DDS) as it will shed great informative light on what it means to be food secure, in terms of the psychological undertone, actual food consumption and composition, and tradeoffs happening within the food insecure groups.
- There is a need for the re-evaluation of Nigerian food production, distribution and the consumption system
- Given the high food insecurity in Taraba State, there is a need for a constant monitoring and evaluation of food security projects in the state, and in Nigeria at large.
- A review of Nigerian food and agricultural programmes is urgently needed in view of their strong links to food insecurity.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS FROM OVERALL FINDINGS

Given the multidimensional nature of food security and the uni-dimensional focus of existing indicators, it is clear that there is no best indicator of food security. The usefulness of any measure can only be assessed by its breadth and precision in capturing food security in a reliable, timely, and cost effective manner. However, the use of more than one complementary indicator is highly recommended for a multidimensional and fuller understanding of food security.

The first article reviewed the evolving conceptualisation of food security; looking at the importance of food security measurement and the underlying difficulties in food security measurement, the different dimensions of food security and their indicators, and the different methodologies and the underlying purposes of food security indicators. This conceptual part of the study shed light on the three dominant and most validated measures of household food security- HFIAS, DDS, and CSI, investigating their strengths, robustness and successes in measuring food security. It discussed extensively the extent to which each of these core food security indicators captures the four main dimensions of food security. Having proven that the three indicators discussed are valid for the measurement of the four major dimensions of food security, the article suggested bringing them together in one survey, for a practical application, and investigation of how they complement each other.

An empirical study was carried out in Taraba State, Nigeria, employing a well-designed survey instrument that contained the three core indicators. The study aimed at exploring the complementary relationship among the three key indicators and illustrating how they can be used together for a detailed investigation into the multidimensional problem of food insecurity.

Bringing the three indicators together to investigate the food security status of household in Taraba State, the survey showed that food insecurity is perverse and severe in Taraba State.

In conclusion, the research questions were answered as follows:

1. **How well do the three key indicators (HFIAS, CSI, and DDS) capture the four main dimensions of food security?**

In addition to capturing the psychological undertone of, and societal influences on, food security (anxiety, preference, experiences), the HFIAS is a valid indicator of availability, access and stability of food in the household over a period, e.g. 30 days. The CSI equally captures the three dimensions, but in a more dynamic manner as it looks at how food was sourced and how any shortfalls were managed, giving insight to human behaviour towards lack of food, which might help us understand the ripple effects of food insecurity on the society and ecology. The DDS focuses more on the quality aspect of food and better captures the utilisation dimension than the other two. It is also static in nature as it measures the situation over the past 24 hours, but is very helpful in identifying the actual food consumption out of the available and accessed food, which is very important in determining the nutritional state of the household. Using the recommended different time frames for the three indicators improves their ability to provide a more detailed picture of the stability of availability, access and utilisation of food over time.

2. **What is the breadth and depth of food insecurity in Taraba State?**

The study identified that only 8% of the households in Taraba were in the high/marginal food security category (HFIAS 1), while 23% were in low food security category (HFIAS 2), and the greatest proportion, 69%, were in the very low food security category (HFIAS 3).

3. **What percentage of the households is considered vulnerable based on the coping strategies used?**

About 34% of the households in the study were very vulnerable (they had begged for food or skipped an entire day without a meal within previous seven days of the survey).

4. **How do households compare across the HFIAS food security categories in terms of socio-economic variables?**

Most of the socio-economic characteristics of the households were significantly different across the three HFIAS groups at $p < 0.01$. The greater proportion of households in HFIAS 3 was

located in Bali and Wurkari LGAs. This very food insecure category were characterised by: highest experience of extreme weather events, household heads with least number of school years, heads of females without education, lowest ownership of or access to resources, large household size, large proportion of divorced/separated household heads, female household heads, lowest income and expenditure, highest food share of income and highest percentage of farmer household heads.

5. **Is there a difference in the consumption patterns of the HFIAS food security categories?**

The consumption patterns of the three HFIAS groups showed significant differences at $p<0.01$. HFIAS 1 is characterised by sourcing their food mainly through purchase, eating out in restaurants, and spending most of their income on the purchase of fresh vegetables and fruits, meat, eggs, milk and processed foods. Whereas the HFIAS 3 depended mainly on their own production and food aid as their main source of food, ate mainly from street food hawkers, when they eat out, and spend most of the food expenditure on the purchase of starchy staples.

6. **How do the consumption of iron and vitamin A differ across HFIAS categories?**

About 12% of those who ate animal based Vitamin A rich foods were found in HFIAS 1 compared with 2% that did not. For iron rich foods, 10% of households that consumed it were found in HFIAS 1, compare with less than 1% of households that didn't.

7. **How do the three key indicators complement each other?**

The survey showed that the indicators followed a clear complementary pattern. HFIAS 1, the most food secure group, used the least severe and the lowest number of food insecurity coping strategies, and ate the highest number of food groups. Whereas the pattern reversed completely for the HFIAS 3, the very low food security group, as they used the most severe and the highest number of coping strategies, and also had the lowest food diversity. Notably, HFIAS 3 was the only HFIAS category that used the two most unsustainable coping strategies: begging for food and skipping an entire day without eating. Using the three indicators together in the survey revealed that the depth of food insecurity is heavily concentrated among the most extreme group HFIAS 3. The differences in the CSI and DDS of the different HFIAS categories were highly significant at $p< 0.01$.

Apart from the main aim of measuring the multiple dimensions of food security, bringing these indicators together is of great importance to food security measurement due to its ability to satisfactorily give a detailed description of the complex problem and pattern of food insecurity and the use of various severity levels of coping strategies and trade-offs between food quantity and quality in different categories of food security. The results confirm that the higher the food insecurity level, the higher the tendency to use more coping strategies, and the lower the dietary diversity. It has shed an informative light on the interactions of the food security dimensions, society and personal values that bring about food insecurity situations. The way food insecurity manifests in the household and the reason why food insecurity should be eradicated at an earlier stage can be truly appreciated by looking at how the change in food security status leads to increasingly disproportionate use of coping strategies and reduction of food quality. It is easy to think that the food insecure should use more coping strategies, but by how much they increase their coping strategies and the nature of strategies they are subjected to by this lack, as shown in this study, is a matter of grave concern. So using the three core indicators together not only tells us that households are experiencing food insecurity (lack of availability, access, utilisation and stability of food), but also that this food insecurity experience has led them to using unsustainable (unhealthy, uneconomical, environmentally destructive and/or socially un-dignified) means to keep afloat. It also shows us what food type is most likely lacking in this food insecure group, which can then be targeted by food security interventions. This brings us to the conclusion that the complexity of food insecurity calls for the use of more than one indicator that will help shed light on the different dimensions and how they interact to bring about the food security situation.

5.2 RECOMMENDATIONS

The use of these three indicators in one food security study is recommended in ascertaining the true level and nature of food insecurity, as it will highlight the food insufficiencies and inadequacies of both quality and quality of food consumed over a given time frame. This section contains recommendations for future research and recommendations for policy makers and food security aid agencies.

While this study has provided a snapshot of the food security situation in Taraba, there is a need for a time series data collection to shed more light on food security and changes therein over time.

Other analytical methods can be employed for this type of study e.g. the use of regression analysis.

Further household level studies of this kind are needed in other states in Nigeria or even at the national level controlling for state-level difference.

Proper estimation of the time sensitiveness of these key indicators, the number and nature of questions to be included, and the cost of administration, is needed.

In the area of policy, there is clearly a need for a re-evaluation of Nigeria's food production, distribution and consumption system.

There is a need to investigate why farm households remain the most food insecure, even amidst aggressive agricultural support.

Making policies that will increase income earning and enable more equitable income distribution is important, given that the food secure group mainly consist of those that purchase most of their food.

Given the high prevalence of food insecurity in Taraba State, there is a need for constant monitoring and evaluation of food security programmes and projects in the State and in Nigeria at large.

A review of Nigerian food and agricultural programmes is urgently needed in view of the strong but complex link between farming and food insecurity.

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APPENDICES

Appendix A: questionnaire and adapted food security modules and sample site selection

1 Households food security status assessment questionnaire on household

Introduction

Good day/*sannu*. My name is.... I am part of a team carrying out a study on food security measurement in Taraba State Nigeria. This study is for a Masters research in Sustainable Development, Department of Public leadership, Faculty of Economic and Management Science, University of Stellenbosch. We are asking households for detailed information on their food security status. Your responses to the questions are purely for academic purposes and will be treated confidentially and anonymous too. You may chose not to answer or stop at any point in the discussion. Declining to participate will not in any way affect you or any member of your family. We intend to get honest answers from you.

Thanks for your kind cooperation

MODULE 1: Household characteristics

1) Date and time of interview ----------
2) Local government ……
3) Household size i.e. the number of people in the house ……..
4) Household with children below 18 years of age [ ] household without children [ ]
5) Gender of the household head (a) male [ ] (b) female [ ]
6) Age of the household head ……
7) Marital status of the household head (a) single [ ] (b) married [ ] (c) widowed/divorced [ ]
8) Number of years spent in formal education (school) by the household head ……
9) The educational qualification of the head of the females in the household (a) no education[ ] (b) first school leaving [ ] (c) O level [] (d) NCE/OND [ ] (e) first degree/HND (f) post graduate certificate [ ]
10) Primary/major occupation of the household head (tick ☑ against the correct answer)

Civil servant	farmer	Private sector employed	artisan	trader	student	unemployed	Others specify

13 a. Does the household head have another (secondary) occupation (a) yes [ ] (b) no []

If yes tick ☑ against the correct answer.

Civil servant	farmer	Private sector employed	artisan	trader	student	unemployed	Others specify

15. The total monthly income of the household ……..

15 a. The number of income earners in the household.....

15b. how much does the head of the females in the house earn/month.....

15 c. The total monthly expenditure of the household.....

16. The amount spent on food for the household in the last one month …….

17. On which class of food does the household spend the most (a) Cereal, root and tubers, and staple grains [ ] (b) processed food [ ] (c) meat, fish, egg and milk [ ] (d) fresh fruit and vegetables [ ] (e) others, specify.....

Section 1: **Shocks**; **Crisis and Climate Change Evidences/Events experienced in the last 12 months**

17. Identify the weather extreme event experienced by your household by ticking ☑

Extreme events	yes
1. Massive floods/ Storm surges	
2. Heat wave	
3. Drying of rivers and stream	
4. Outbreak of pests/ disease	
5. Erratic rainfall pattern	
6. Long period of dry season /harmattam	
7. Heavy and long period of rainfall	
8. Other specify	

Has your household experienced any conflict either religious, ethnic conflict or political in the last 12 months (a) yes [ ] (b) No [ ]

18. **Section Two: Resource**

a. Does your household own Land (a) yes [ ] (b) no [ ]. If yes how many plots …….

b. Does the household have access to:

- farm/ other productive technology (a) yes [ ] (b) no [ ]
- Drinkable water (a) yes [ ] (b) no [ ]. If yes, is the distance from the house less than 1 km (a) yes [ ] (b) no [ ].
- Free drinking water from the borehole i.e. not bought (a) yes [ ] (b) no [ ]
- Paved roads (a) yes [ ] (b) no [ ].
- credit (a) yes [ ] (b) no [ ]
- information through phones, TV, radio or extension agents (a) yes [ ] (b) no [ ]
- Markets (a) yes [ ] (b) no [ ].
- Free medical care yes [ ] (b) no [ ]
- Electricity (a) yes [ ] (b) no [ ].

Module 2: Household Food Insecurity Access scale questions

In the last 1 months, that is about 4 weeks (did (I/ we)) because of lack of resources (money to purchase, food from garden or farm, from store or any other household usual means). If yes, how often did it happen?

No.	Occurrence Questions	Tick ☑ if yes	How often did it happen	How many days
1.	Did you worry that your household would not have enough food?			
2.	Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?			
3.	Did you or any household member have to eat a limited/few variety of foods due to a lack of resources?			
4.	Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?			
5.	Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?			
6.	Did you or any household member have to eat fewer meals in a day i.e. skip meal because there was not			

	enough food?			
7.	Was there ever no food to eat of any kind in your household because of lack of resources to get food?			
8.	Did you or any household member go to sleep at night hungry because there was not enough food?			
9.	did you or any household member go a whole day and night without eating anything because there was not enough food			

Impute, 1, or, 2, or 3 under the frequency of occurrence.
1 = rarely (once or twice in the past four weeks), 2 = Sometimes (three to ten times in the past four weeks), 3 = Often (more than ten times in the past four weeks). Days: ½ to 28 days

Module 3: Household Food Insecurity Coping Strategies

Identify the food insecurity coping strategies of your household in the last 7 days. Tick ☑ against it**.**

Food insecurity coping strategies	**Tick ☑**	**No of days/week**
a. Rely on less preferred and less expensive foods		
b. Borrow food, or rely on help from a friend or relative		
c. Purchase food on credit		
d. Gather wild food, hunt, or harvest immature crops		
e. Send household members to eat elsewhere, Such as neighbours, friends or relatives house		
f. Send household members to beg		
g. Consume seed stock held for next season		
h. Limit portion size at mealtimes		
i. Restrict consumption of adults in order for small children to eat		
j. Feed working members of HH at the expense of non-working members		
k. Ration the money you had and buy prepared food		

l. Reduce number of meals eaten in a day		
m. Skip entire days without eating		

Module 4: DDS questions
In the last 24 hours what did your household eat for:

Breakfast	**Snack**	**Lunch**	**Snack**	**Dinner**	**Snack**

Question number	**Food group**	**Examples**	**Yes=1 No=0**
1	Cereals	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products)	
2	White roots and tubers	white potatoes, yam, cassava, or other foods made from these roots (e.g. *alibo, garri, fufu, tuwo*)	
3	Vitamin A rich vegetables And tubers	pumpkin, carrot, squash, or sweet potato that are orange in colour inside + *other locally available vitamin A rich vegetables (e.g. red/ yellow sweet pepper,)*	
4	Dark green leafy vegetables	dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such *as* Amaranth, cassava leaves, *yakwa/zogole (*Moringa*), fluted pumpkin, pumpkin leave,* garden egg leave*,utazi, okazi, bitter leave, oziza,* spinach*, Ayoyo, oha, Uturukpa.*	
5	Other vegetables	other vegetables (e.g. tomato, onion, eggplant, garlic) + *other locally available vegetables*	

6	Vitamin A rich fruits	ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya (pawpaw), dried peach, and 100% fruit juice made from these + *other locally available vitamin A rich fruits, palm fruit, palm oil,*	
7	Other fruits	other fruits, e.g. *debino, gingiya*, including wild fruits and 100% fruit juice made from these	
8	Organ meat	liver, kidney, Intestine, heart or other organ meats or blood-based foods	
9	Flesh meats	Beef, pork, lamb, goat, rabbit, game, turkey, guinea fowl, chicken, duck, other birds, and. insects (termites, locust, crickets).	
10	Eggs	Eggs from chicken, quail, duck, guinea fowl or any other egg	
11	Fish and seafood	Fresh or dried fish or shellfish, crayfish, prawns, lobster, crab, shellfish and other sea foods	
12	Legumes, nuts and seeds	Dried beans, dried peas, palm kernel nut, beniseed, lentils (pigeon pea), nuts, walnut, *Ukwa*, Barbara nut, groundnut, A*ya* seed, seeds or foods made from these (e.g. *moi-moi, akara, Kunu gida*, peanut butter)	
13	Milk and milk products	Milk, cheese, yogurt or other milk products like *nunu* or fresh milk	
14	Oil and fat	Margarine, butter, vegetable oil, bleached palm oil, beniseed oil groundnut oil, olive oil, sunflower oil etc.	
15	Sweets	Sugar cane, sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes	

16	Spices, condiments, Beverages	Black pepper, salt, condiments (soy sauce, Maggi cube, Royco cube, Knor, Jumbo, Ajino moto, hot sauce, *Uda,* and other local spices etc.), coffee, tea, alcoholic beverages	

Did you or anyone in your household eat any food OUTSIDE the home yesterday? yes [ ], no [] , if yes where did the person eat from (a) street food [ ] (b) Restaurant [ ] (c) local food kiosk [ ] (d) food relief/ aid project [ ] (e) others .....

What is the primary source of your food?
1= Own production, gathering, hunting, fishing [ ],
2= Purchased [ ],
3= Borrowed, bartered, exchanged for labour, gift from friends or relatives [ ],
4= Food aid [ ],
5= other …….

2. **Questions adaptation tables**
(i) Identified Food Coping Strategies in Taraba State

Item number	Items
A	Rely on less preferred and less expensive foods (less exp)
B	Borrow food, or rely on help from a friend or relative (borrow)
C	Purchase food on credit (credit)
D	Working (house chore, farm) in exchange for meal
E	Attending uninvited occasions e.g. wedding, burial, naming ceremony etc. to eat food
F	Wild food hunt (wild)
G	Consume seed stock held for next season (stock)
H	Send household members to eat elsewhere, Such as neighbours, friends or relatives house (elsewhere)
I	Send household members to beg (beg)
J	Limit portion size at mealtimes (limit)
K	Restrict consumption of adults in order for small children to eat (restrict)
L	Feed working members of household at the expense of non-working members (working)
M	Ration the money you had and buy prepared food (ration)
N	Reduce number of meals eaten in a day (reduce)
O	Skip entire days without eating (skip)
P	Stealing food
Q	Prostitution to get money for food or food stuff in exchange
R	Selling of assets e.g. jewelling, cloths, phones, land, or other productive assets

(ii) CSI ranking by focus groups

	Food insecurity coping strategies	**Focus group ($f_{1..7}$) ranking of each strategies**

		F1	F2	F3	F4	F5	F6	F7	Av.	Rank
A	Rely on less preferred and less expensive foods (less exp)	1	1	1	1	1	1	1	1	1
B	Borrow food, or rely on help from a friend or relative (borrow)	3	2	2	2	2	2	2	2.1	2
C	Purchase food on credit (credit)	2	1	2	2	2	2	2	1.9	2
D	Working (house chore, farm) in exchange for meal or money to buy food	4	3	3	3	4	4	4	3.6	4
E	Attending uninvited occasions e.g. wedding, burial, naming ceremony etc. to eat food	1	1	2	2	2	2	1	1.6	2
F	Wild food hunt (wild)	3	3	3	4	3	2	3	3	3
G	Consume seed stock held for next season (stock)	3	3	3	3	3	3	3	3	3
H	Send household members to eat elsewhere, e.g. neighbours, friends, or relatives house	3	2	2	3	4	3	3	2.9	3
I	Send household members to beg for food (beg)	4	4	4	4	4	4	4	4	4
J	Limit portion size at mealtimes (limit)	1	1	1	1	1	1	1	1	1
K	Restrict consumption of adults in order for small children to eat (restrict)	2	1	2	2	1	1	2	1.6	2
L	Feed working members of household at the expense of non-working members (working)	2	3	3	3	3	3	2	2.7	3
M	Ration the money you had and buy prepared food (ration)	1	1	1	2	1	1	1	1.1	1
N	Reduce number of meals eaten in a day (reduce)	1	1	2	1	1	1	1	1.1	1
O	Skip entire days without eating (skip)	3	4	4	4	3	4	4	3.7	4

(III) Adaptation of HFIAS Keywords

Keyword	Interpretation
Lack of resources	No food or money to get the food
household	People living and eating together for at least 4 days a week, and having a sense of belonging together. May live in different roof but the same vicinity and under a household head.
worry	Anxiety and uncertainty about not having enough food. Having fear or anxiety on how you will manage the household feeding.
Less preferred food	The food that household would not have chosen if the choice is open and affordable. To Taraba that could be: eating very low grade, almost spoiling or dried but cheap vegetable and fruits like broken fresh tomatoes which the well-to-do people do not buy; eating without meat or fish; taking tea without milk, not out of choice or medical advice but lack.
Limited/few varieties	Eating monotonous diet. For Taraba, it is like eating *tuwo masara* (corn food) or drinking *Kunu* (drink made from corn) morning, afternoon and may be night because you have little or no choice, even when you know it is an unbalance diet.
Smaller meal	Eating less quantity of food than satisfies you. (when you *no chop belle full) i.e.* when you did not eat to your satisfaction, because the food or money to buy food was not enough
Fewer meals	Skipping meals. Instead of the 3 good (*square meals*) meals/day that is common to Nigerians, you ate once or twice/day, not during fasting as a religious activity, but due to lack of food and money to buy food
No food in the household	This needed no explanation
Sleep without food	Going to bed at night hungry, without supper or dinner and not even a snack. But you may have eaten in the morning or afternoon, but could not afford to eat night food and you went to bed hungry.
Whole day & night without food	Did not eat food from morning as you woke up till night when you went to bed

3. Sample Site Selection: selected villages and communities in Taraba State

LGA	Communities	Villages
Jalingo	Nukkai	Angwan Bola, Angwan TADP
	Sabaon Gari	Samunaka, Sarki Danwake
	Road Block	Abuja Phase I, Abuja Phase II
	Mile Six	Jolly Nyame Stadium, Angwan NNPC
Bali	Bali	Angwan TIV, Angwan Sabon Layi
	Garba Chede	Angwan Maishayi, Angwan Asibiti.
	Maihula	Angwan Yankakaboye, Angwan Jalo
	Suntai	Angwan Poly, Angwan Audu
Wurkari	Wurkari	Atoshi Street, Ajiduku Street
	Sondi	Kuduku street, Kyafa street
	Dorowa	Angwan Yankwala, Tafari
	Tsukundi	Angwan CRCN, Angwan Sarki
Takum	Takum	Angwan Tikare, Angwan Dutse
	Bete	Angwan Kauna, Angwan Alheri
	Tati Takum	Muji, Tati Kumbo
	Tampa	Old Air Port, Dadin Kowa
Yorro	Yorro	Angwan Butubu, Angwan Lankaviri
	Pupule	Angwan Kwaji, Angwan Nyaladi
	Kassa	Dakun, Katon
	Pkantinapo	Wagbala, santewa

Appendix B: Survey analysis result output

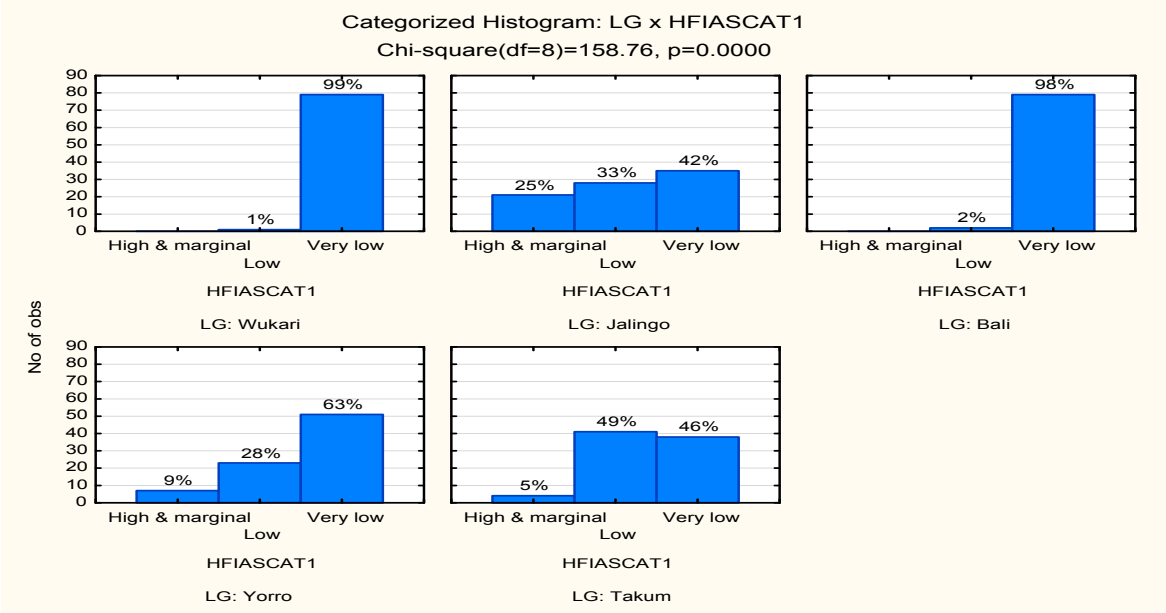
Basic Statistics/Tables (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

LG | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

LG : local goverment area	Marked cells have counts > 10. Chi-square(df=8)=158.76, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
Wukari	0	1	79	80
Row Percent	0.00%	1.25%	98.75%	
Jalingo	21	28	35	84
Row Percent	25.00%	33.33%	41.67%	
Bali	0	2	79	81
Row Percent	0.00%	2.47%	97.53%	
Yorro	7	23	51	81
Row Percent	8.64%	28.40%	62.96%	
Takum	4	41	38	83
Row Percent	4.82%	49.40%	45.78%	
Totals	32	95	282	409

Categorized Histogram: LG x HFIASCAT1

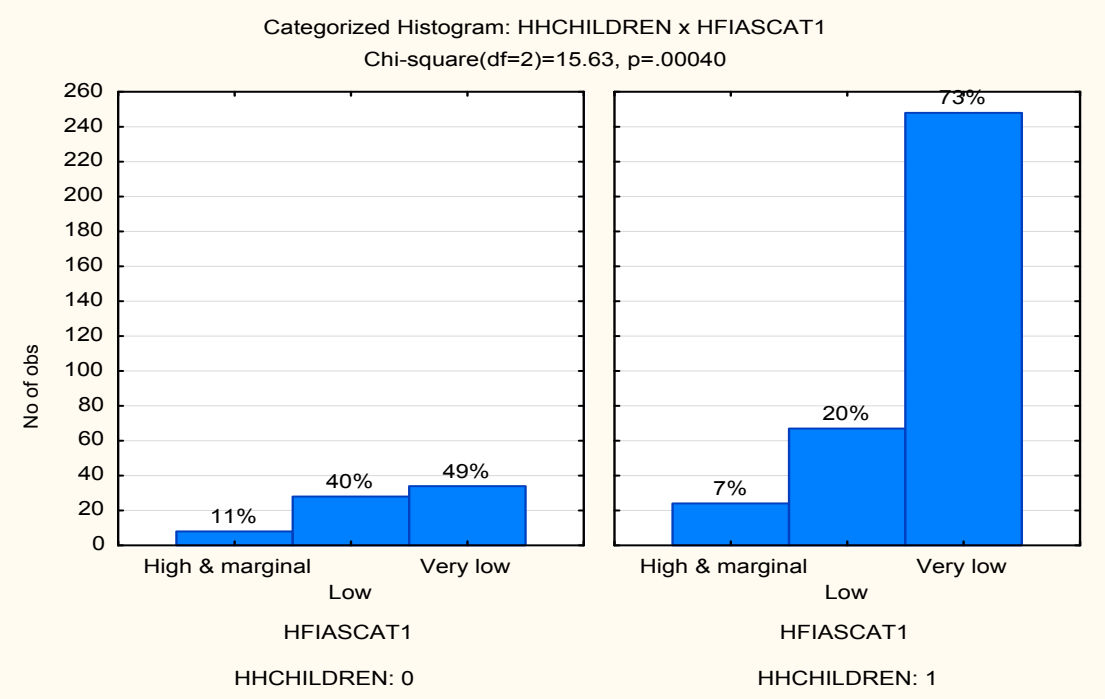


HHCHILDREN | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

HHCHILDREN: household with children	Marked cells have counts > 10. Chi-square(df=2)=15.63, p=.00040 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	8	28	34	70
Row Percent	11.43%	40.00%	48.57%	
1	24	67	248	339
Row Percent	7.08%	19.76%	73.16%	
Totals	32	95	282	409

Categorized Histogram: HHCHILDREN x HFIASCAT1

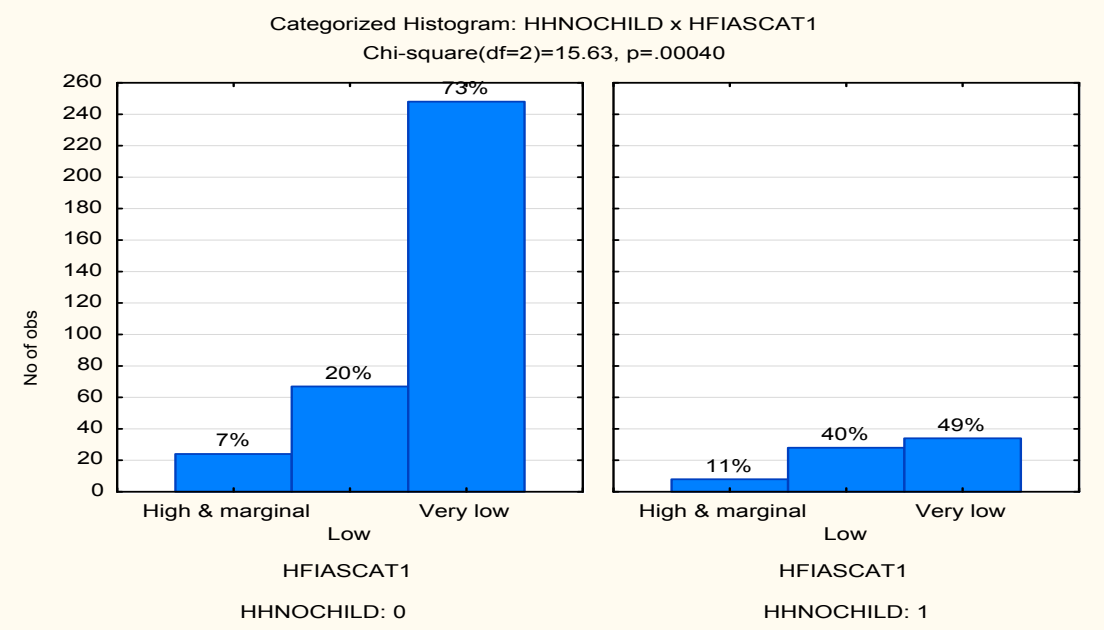


HHNOCHILD | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

HHNOCHILD: households without children	Marked cells have counts > 10. Chi-square(df=2)=15.63, p=.00040 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	24	67	248	339
Row Percent	7.08%	19.76%	73.16%	
1	8	28	34	70
Row Percent	11.43%	40.00%	48.57%	
Totals	32	95	282	409

Categorized Histogram: HHNOCHILD x HFIASCAT1

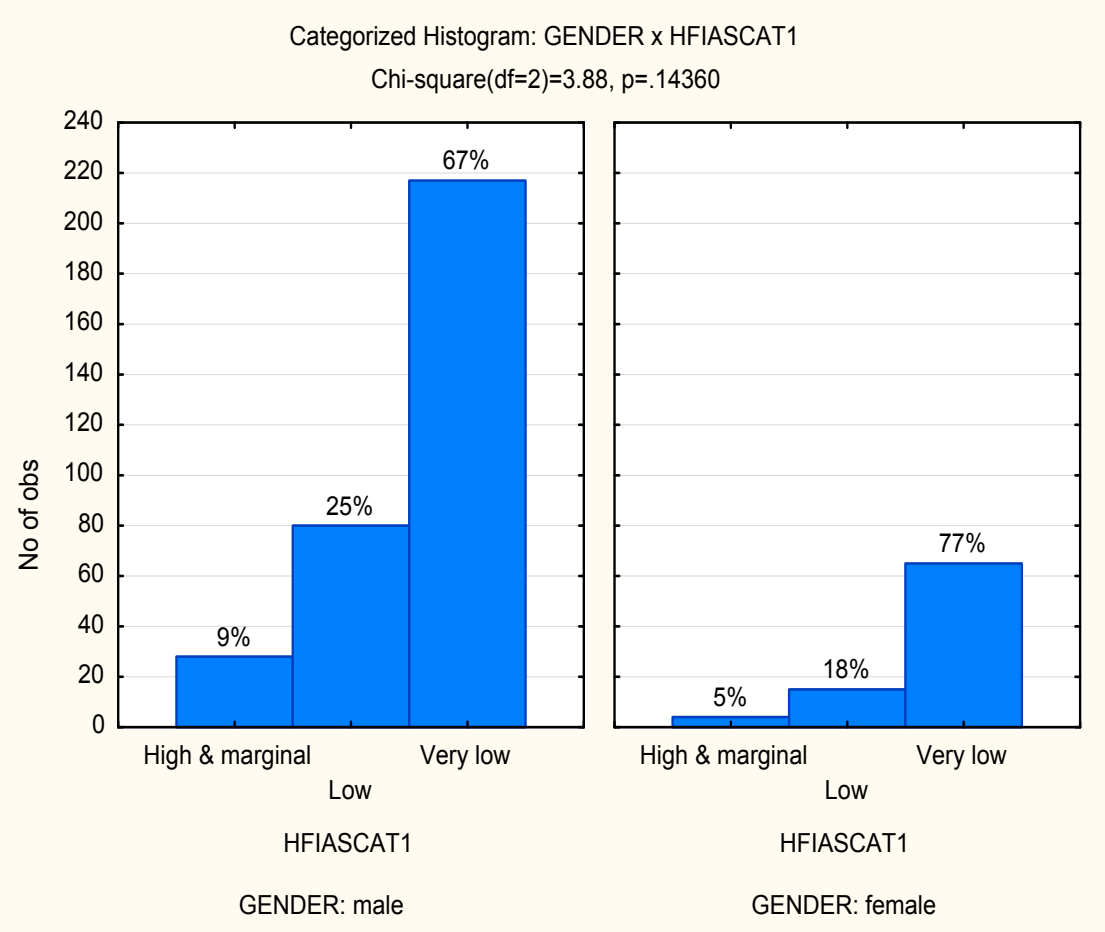


GENDER | HFIASCAT1

GENDER : gender of the household heac	Marked cells have counts > 10. Chi-square(df=2)=3.88, p=.143 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
male	28	80	217	325
Row Percen	8.62%	24.62%	66.77%	
female	4	15	65	84
Row Percen	4.76%	17.86%	77.38%	
Totals	32	95	282	409

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Categorized Histogram: GENDER x HFIASCAT1

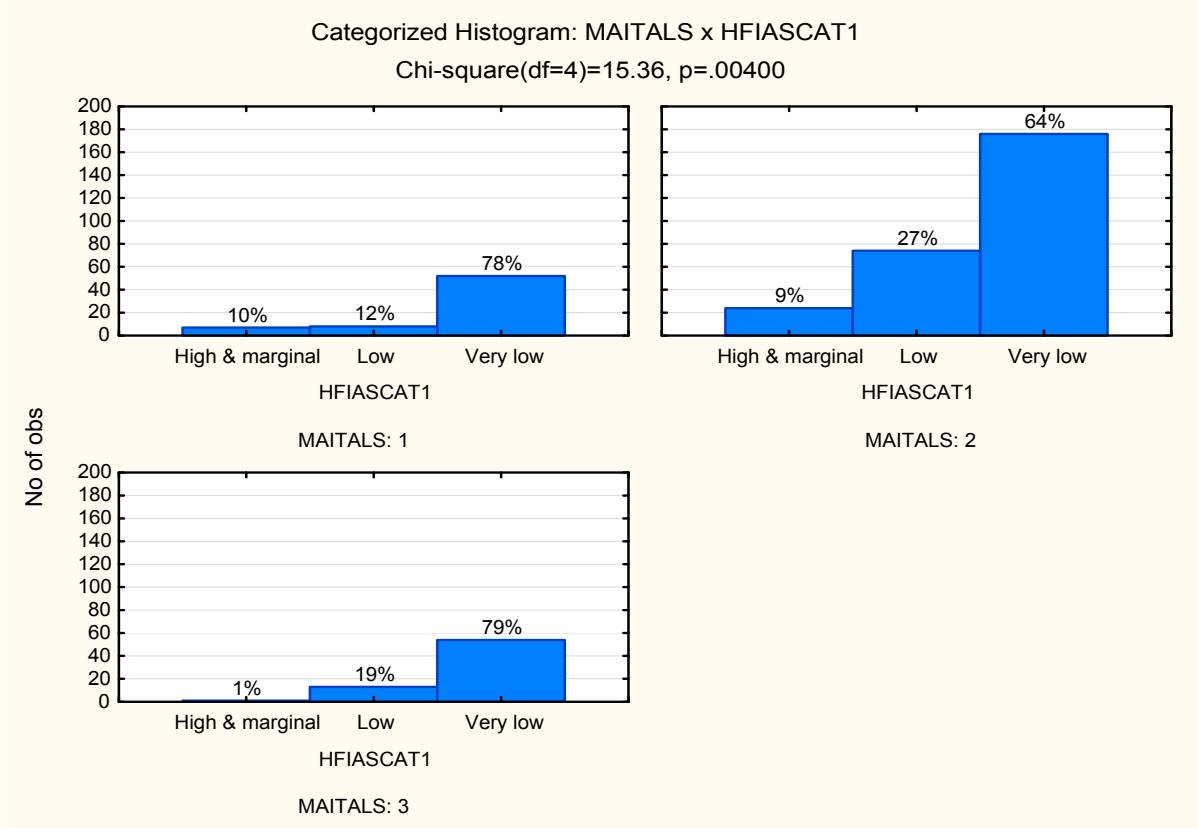


MAITALS | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

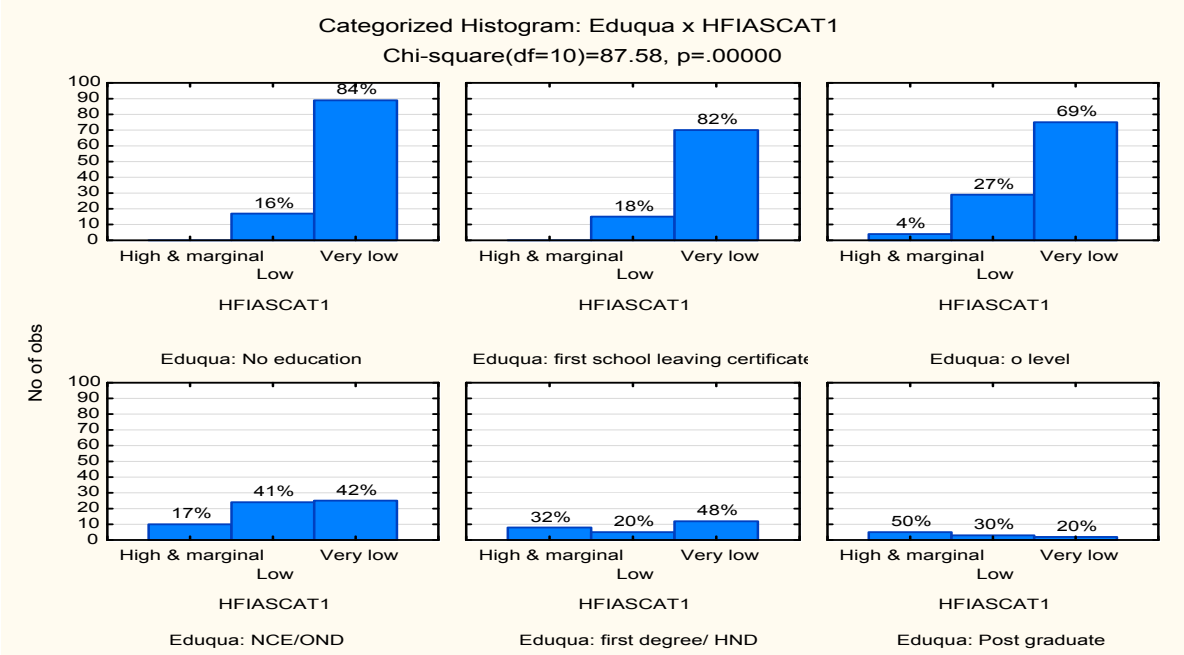
MAITALS : maritial status of the household head	Marked cells have counts > 10. Chi-square(df=4)=15.36, p=.00400 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
Single	7	8	52	67
Row Percent	10.45%	11.94%	77.61%	
married	24	74	176	274
Row Percent	8.76%	27.01%	64.23%	
divorce/separated	1	13	54	68
Row Percent	1.47%	19.12%	79.41%	
Totals	32	95	282	409

Categorized Histogram: MAITALS x HFIASCAT1



Eduqua | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw) Categorized Histogram: Eduqua x HFIASCAT1

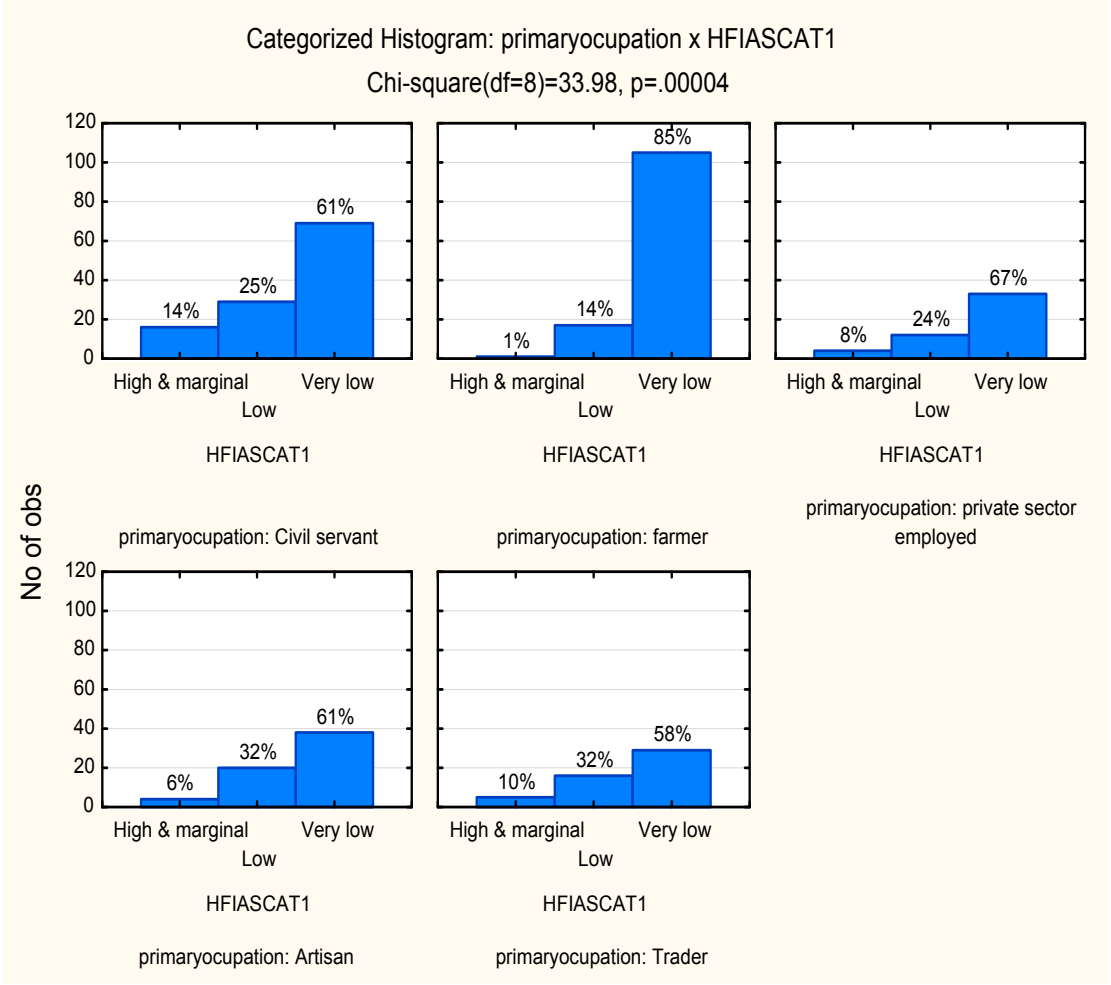
Eduqua : educational qualification of the female hea	Marked cells have counts > 10. Chi-square(df=10)=87.58, p=.00000			
	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
No education	0	17	89	106
Row Percent	0.00%	16.04%	83.96%	
first school leaving certificate	0	15	70	85
Row Percent	0.00%	17.65%	82.35%	
o level		29	75	108
Row Percent		26.85%	69.44%	
NCE/OND	10	24	25	59
Row Percent	16.95%	40.68%	42.37%	
first degree/ HND	8	5	12	25
Row Percent	32.00%	20.00%	48.00%	
Post graduate	5	3	2	10
Row Percent	50.00%	30.00%	20.00%	
Totals	27	93	273	393



primaryocupation | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

primaryocupation: primary occupation of hte household head	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
Marked cells have counts > 10. Chi-square(df=8)=33.98, p=.000(				
Civil servant	16	29	69	114
Row Percent	14.04%	25.44%	60.53%	
farmer	1	17	105	123
Row Percent	0.81%	13.82%	85.37%	
private sector employed	4	12	33	49
Row Percent	8.16%	24.49%	67.35%	
Artisan	4	20	38	62
Row Percent	6.45%	32.26%	61.29%	
Trader	5	16	29	50
Row Percent	10.00%	32.00%	58.00%	
Totals	30	94	274	398

Categorized Histogram: primaryocupation x HFIASCAT1

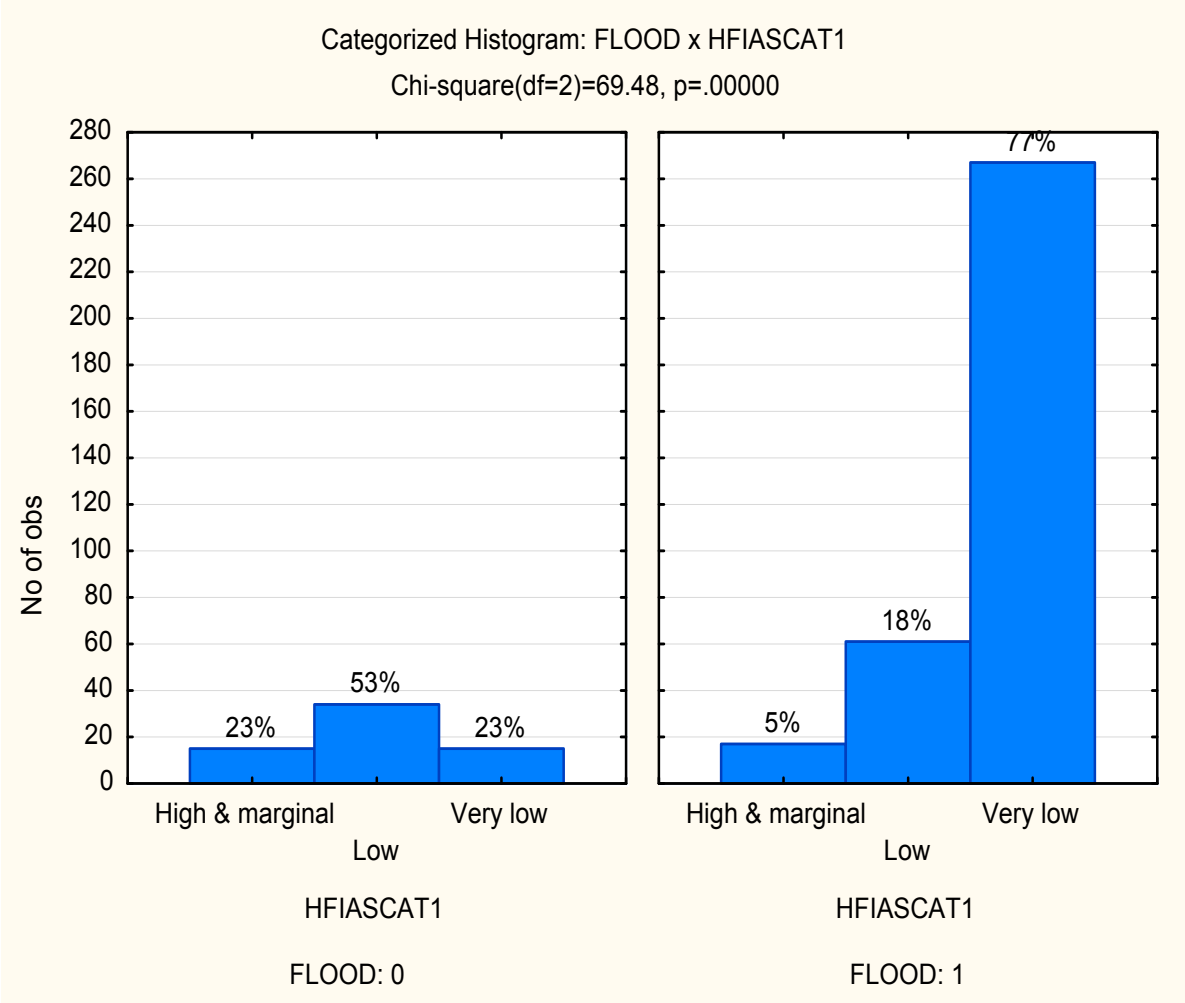


FLOOD | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

	Marked cells have counts > 10. Chi-square(df=2)=69.48, p=.00000			
FLOOD : flood	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	15	34	15	64
Row Percent	23.44%	53.13%	23.44%	
1	17	61	267	345
Row Percent	4.93%	17.68%	77.39%	
Totals	32	95	282	409

Histogram: FLOOD x Categorized HFIASCAT1

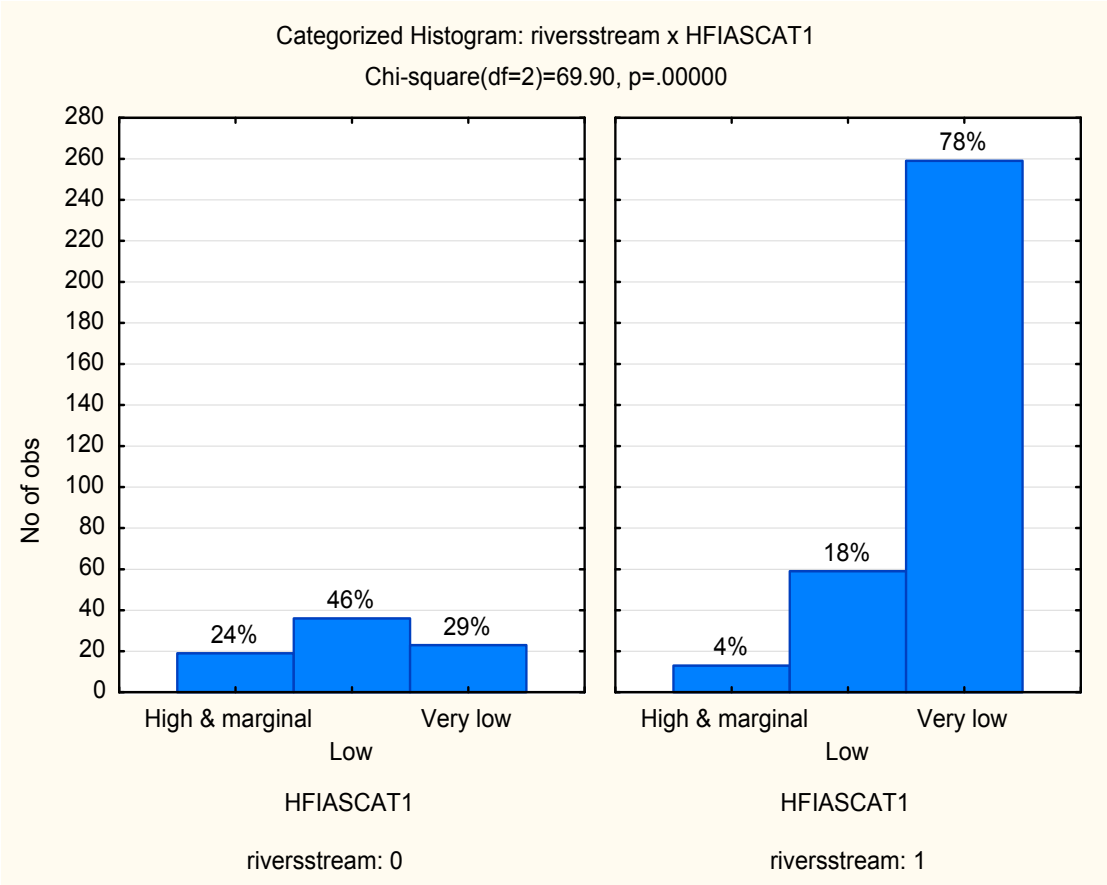


riversstream | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

riversstream: drying up of rivers and streams	Marked cells have counts > 10. Chi-square(df=2)=69.90, p=.00000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	19	36	23	78
Row Percent	24.36%	46.15%	29.49%	
1	13	59	259	331
Row Percent	3.93%	17.82%	78.25%	
Totals	32	95	282	409

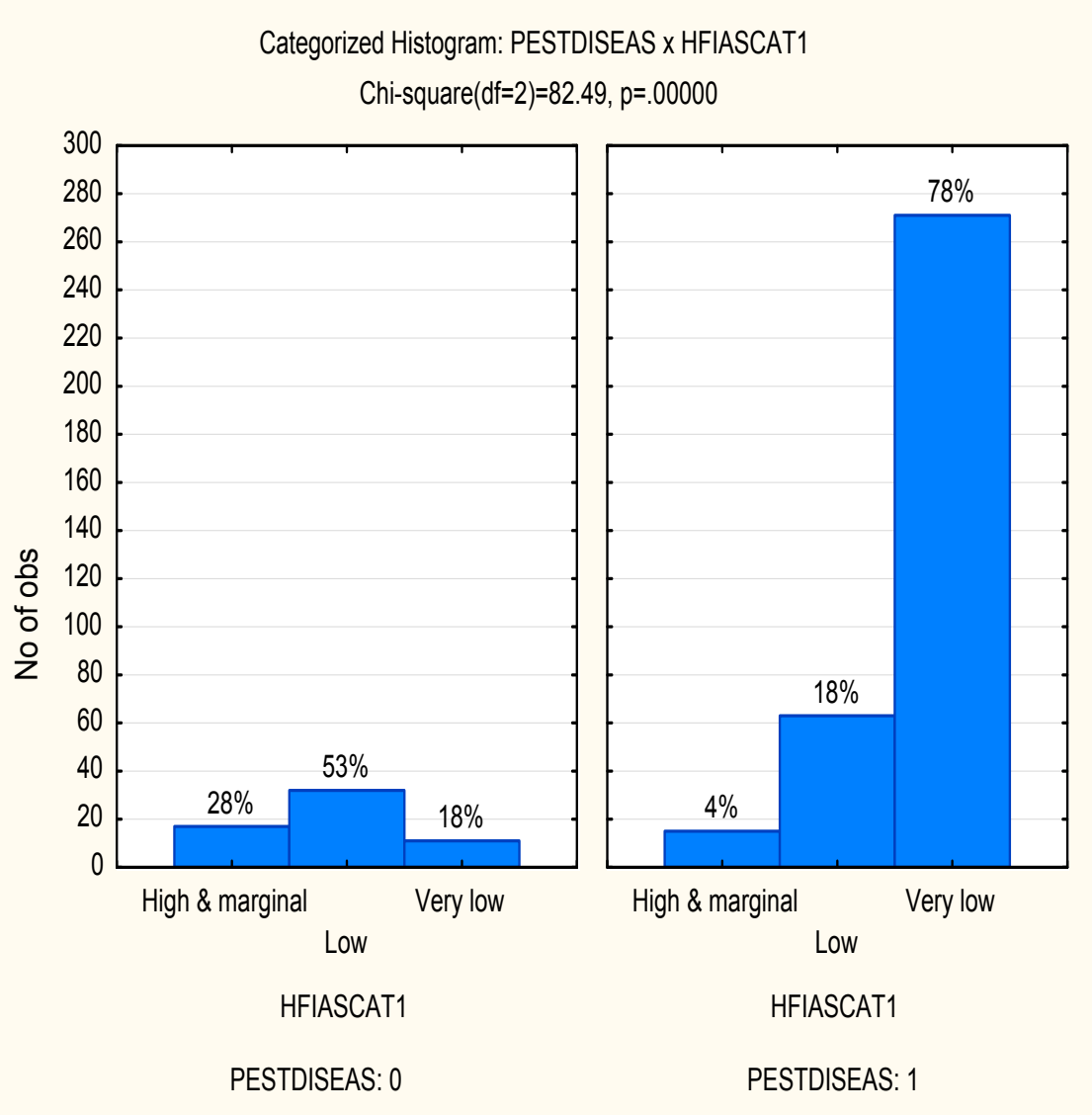
Categorized Histogram: riversstream x HFIASCAT1



PESTDISEAS | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

PESTDISEAS: outbreak of diseases and pest	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
	Marked cells have counts > 10. Chi-square(df=2)=82.49, p=.00000			
0	17	32	11	60
Row Percent	28.33%	53.33%	18.33%	
1	15	63	271	349
Row Percent	4.30%	18.05%	77.65%	
Totals	32	95	282	409

Categorized Histogram: PESTDISEAS x HFIASCAT1

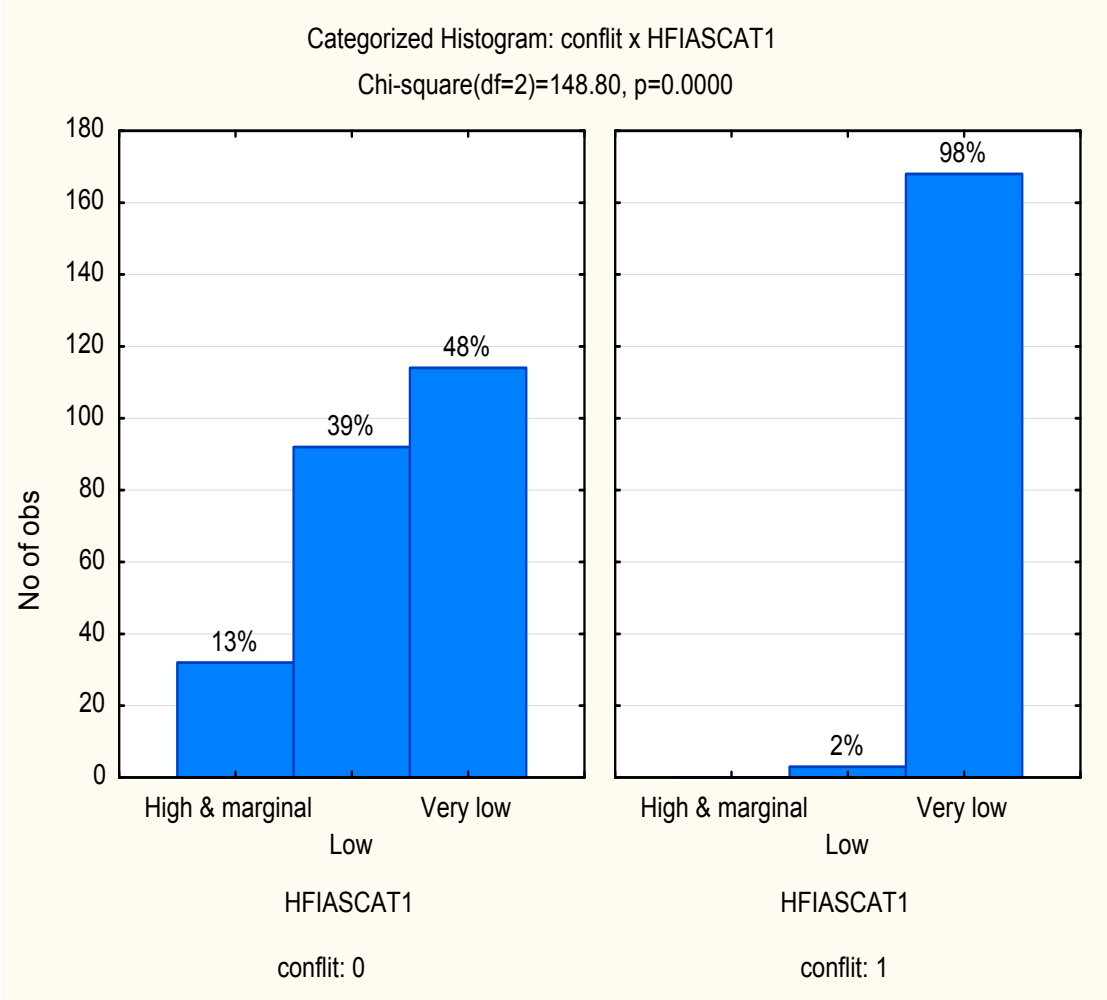


conflit | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

conflit : household conflict experienced	Marked cells have counts > 10. Chi-square(df=2)=148.80, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	92	114	238
Row Percent	13.45%	38.66%	47.90%	
1	0	3	168	171
Row Percent	0.00%	1.75%	98.25%	
Totals	32	95	282	409

Categorized Histogram: conflit x HFIASCAT1

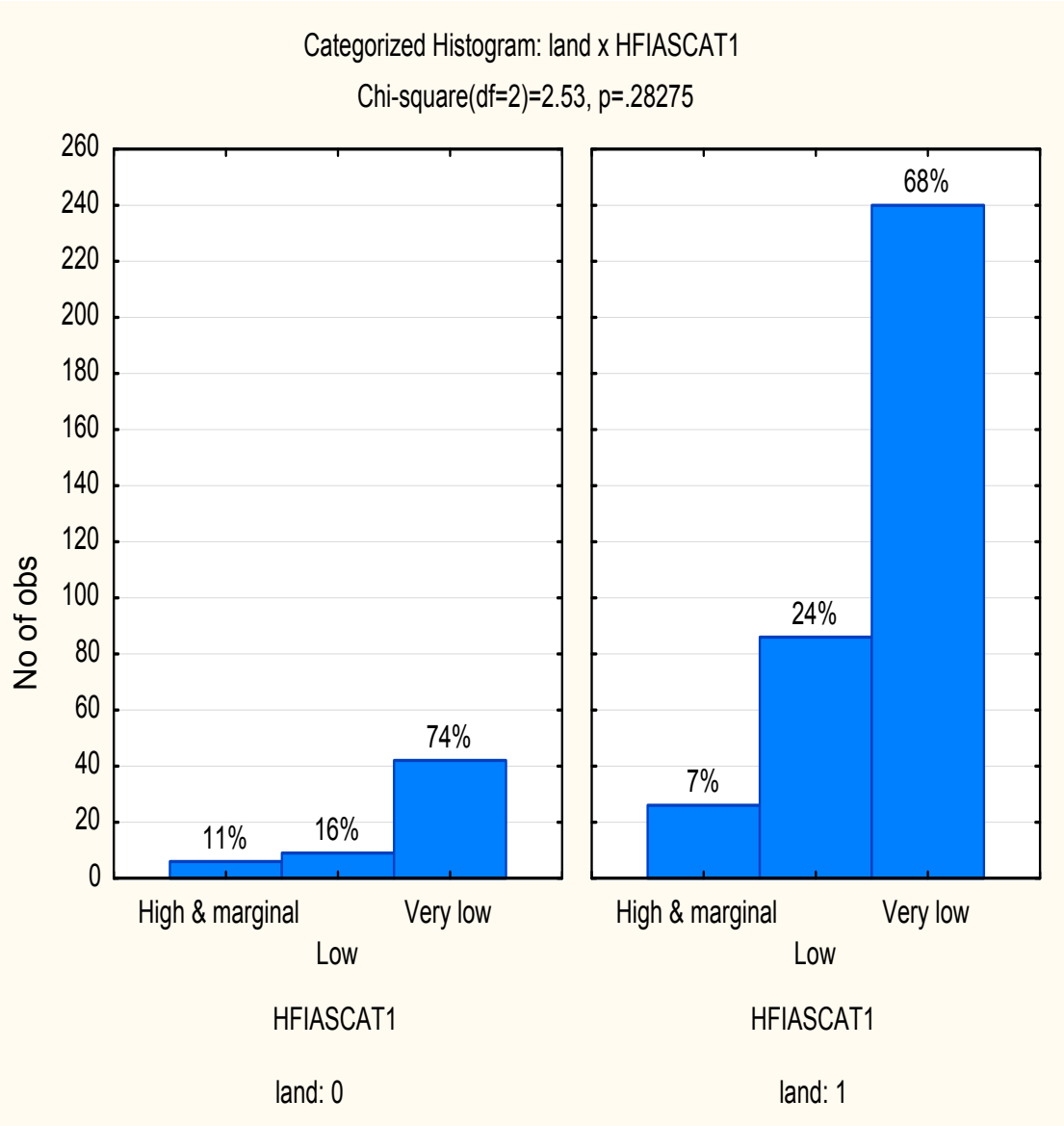


land | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Marked cells have counts > 10. Chi-square(df=2)=2.53, p=.28275

land : land ownership by the households	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	6	9	42	57
Row Percent	10.53%	15.79%	73.68%	
1	26	86	240	352
Row Percent	7.39%	24.43%	68.18%	
Totals	32	95	282	409

Categorized Histogram: land x HFIASCAT1

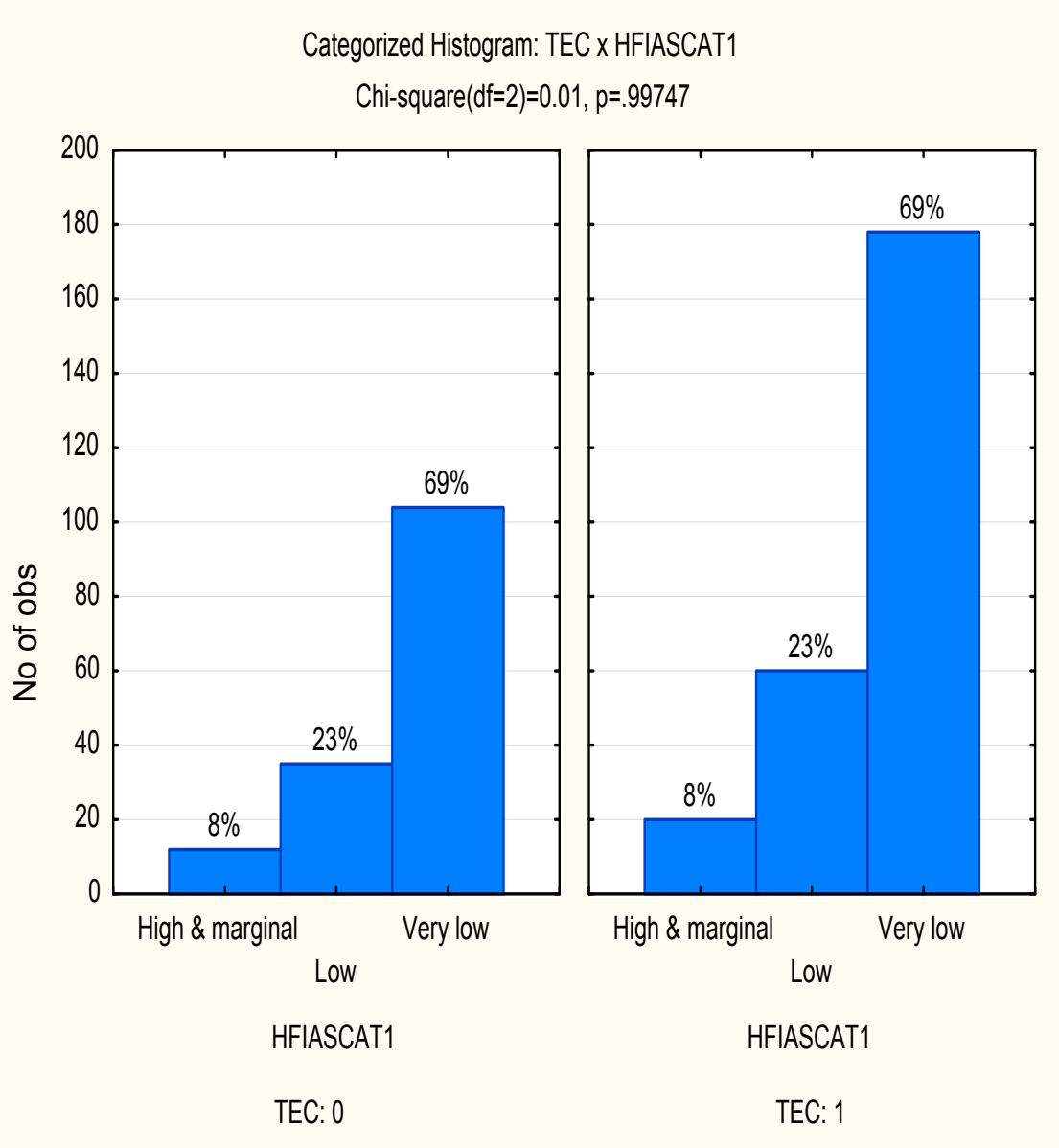


TEC | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Marked cells have counts > 10. Chi-square(df=2)=0.01, p=.99747

TEC : productive technology	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	12	35	104	151
Row Percent	7.95%	23.18%	68.87%	
1	20	60	178	258
Row Percent	7.75%	23.26%	68.99%	
Totals	32	95	282	409

HFIASCAT1

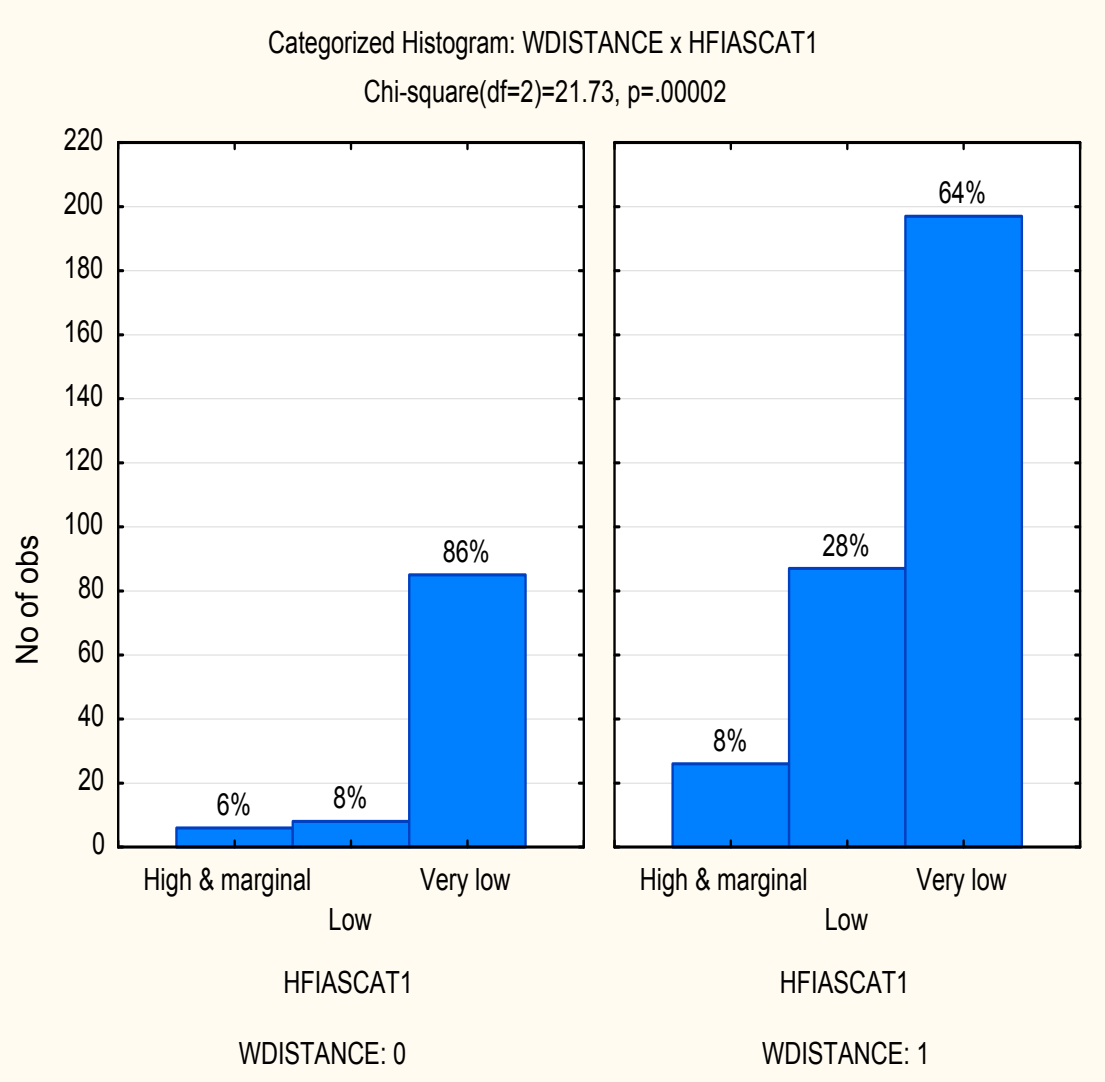


WDISTANCE | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

WDISTANCE: distance of water from home	Marked cells have counts > 10. Chi-square(df=2)=21.73, p=.00002 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	6	8	85	99
Row Percent	6.06%	8.08%	85.86%	
1	26	87	197	310
Row Percent	8.39%	28.06%	63.55%	
Totals	32	95	282	409

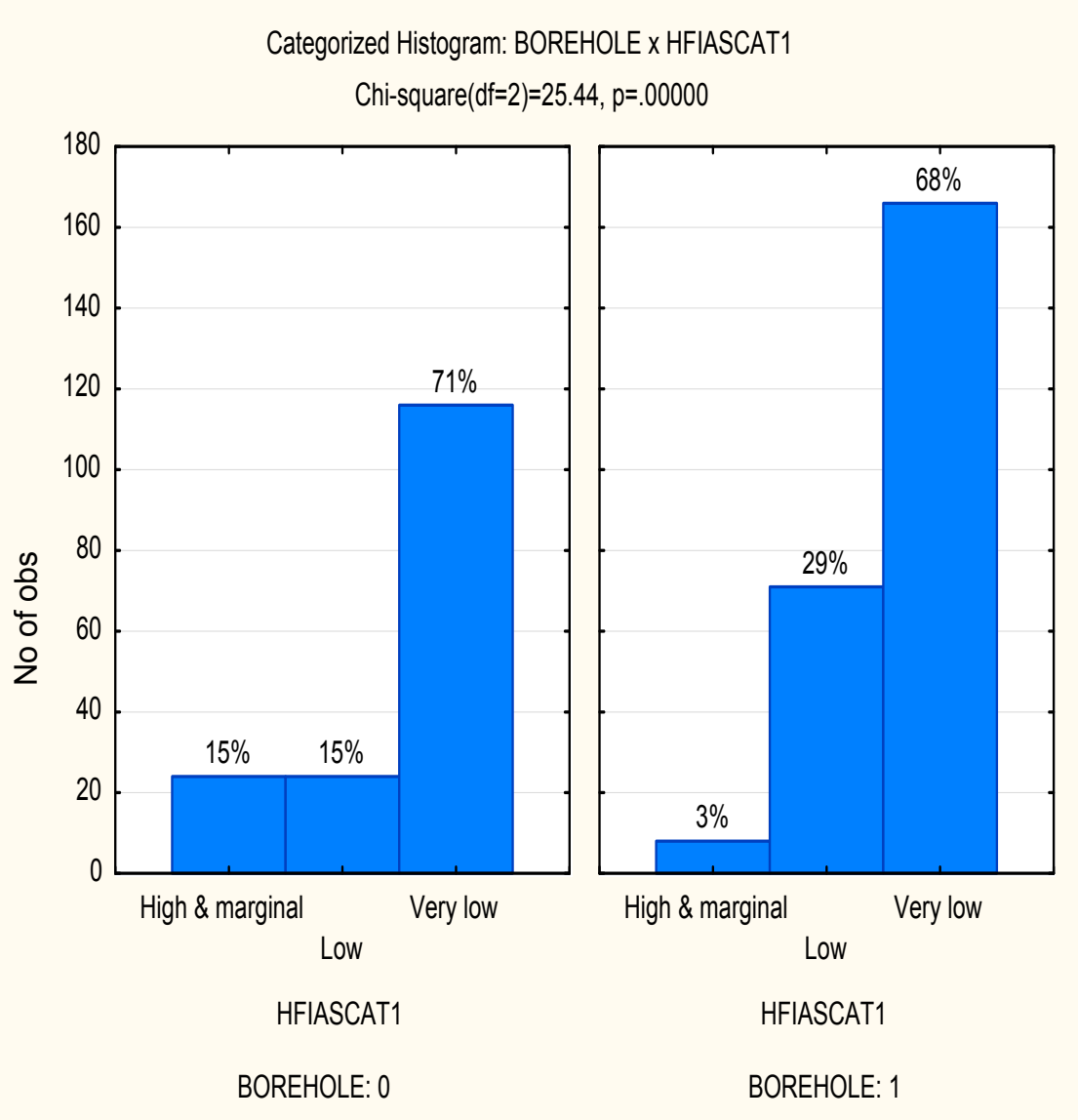
Categorized Histogram: WDISTANCE x HFIASCAT1



BOREHOLE | HFIASCAT12-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

	Marked cells have counts > 10. Chi-square(df=2)=25.44, p=.00000			
BOREHOLE: access to borehole water	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	24	24	116	164
Row Percent	14.63%	14.63%	70.73%	
1	8	71	166	245
Row Percent	3.27%	28.98%	67.76%	
Totals	32	95	282	409

Categorized Histogram: BOREHOLE x HFIASCAT1

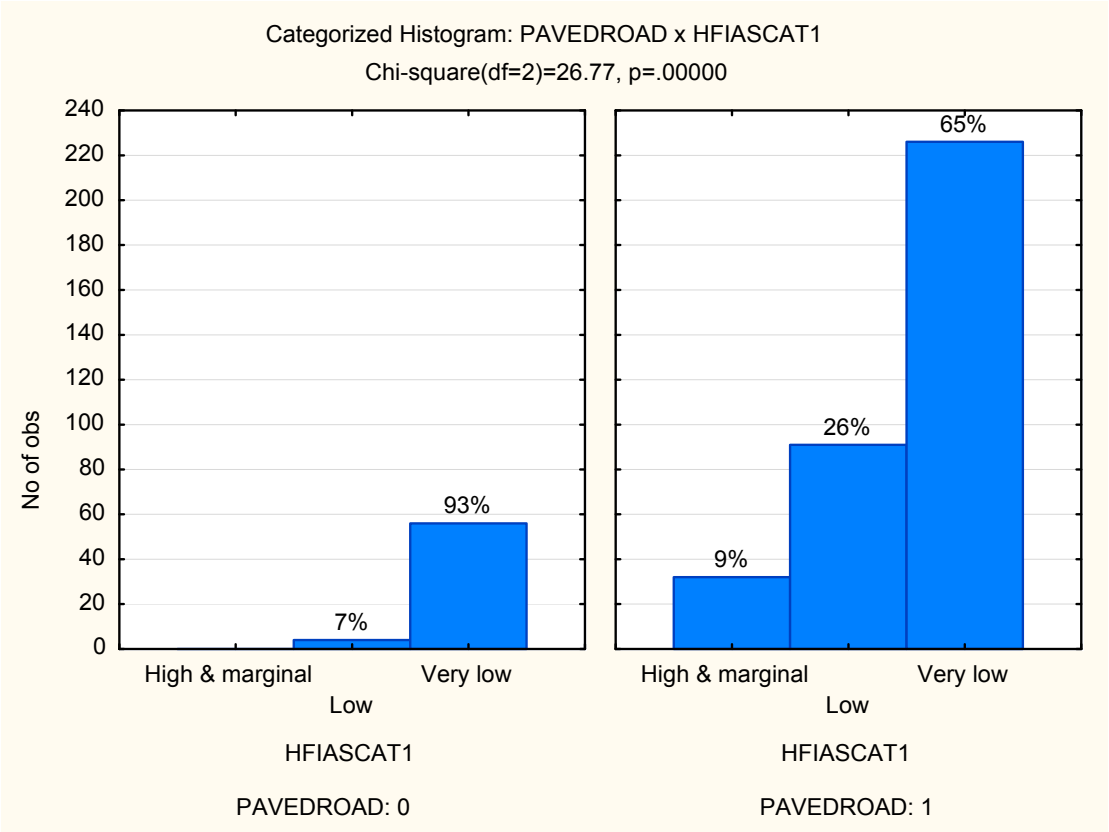


PAVEDROAD | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

PAVEDROAD: acess to paved roads	Marked cells have counts > 10. Chi-square(df=2)=26.77, p=.00000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	0	4	56	60
Row Percent	0.00%	6.67%	93.33%	
1	32	91	226	349
Row Percent	9.17%	26.07%	64.76%	
Totals	32	95	282	409

Categorized Histogram: PAVEDROAD x HFIASCAT1

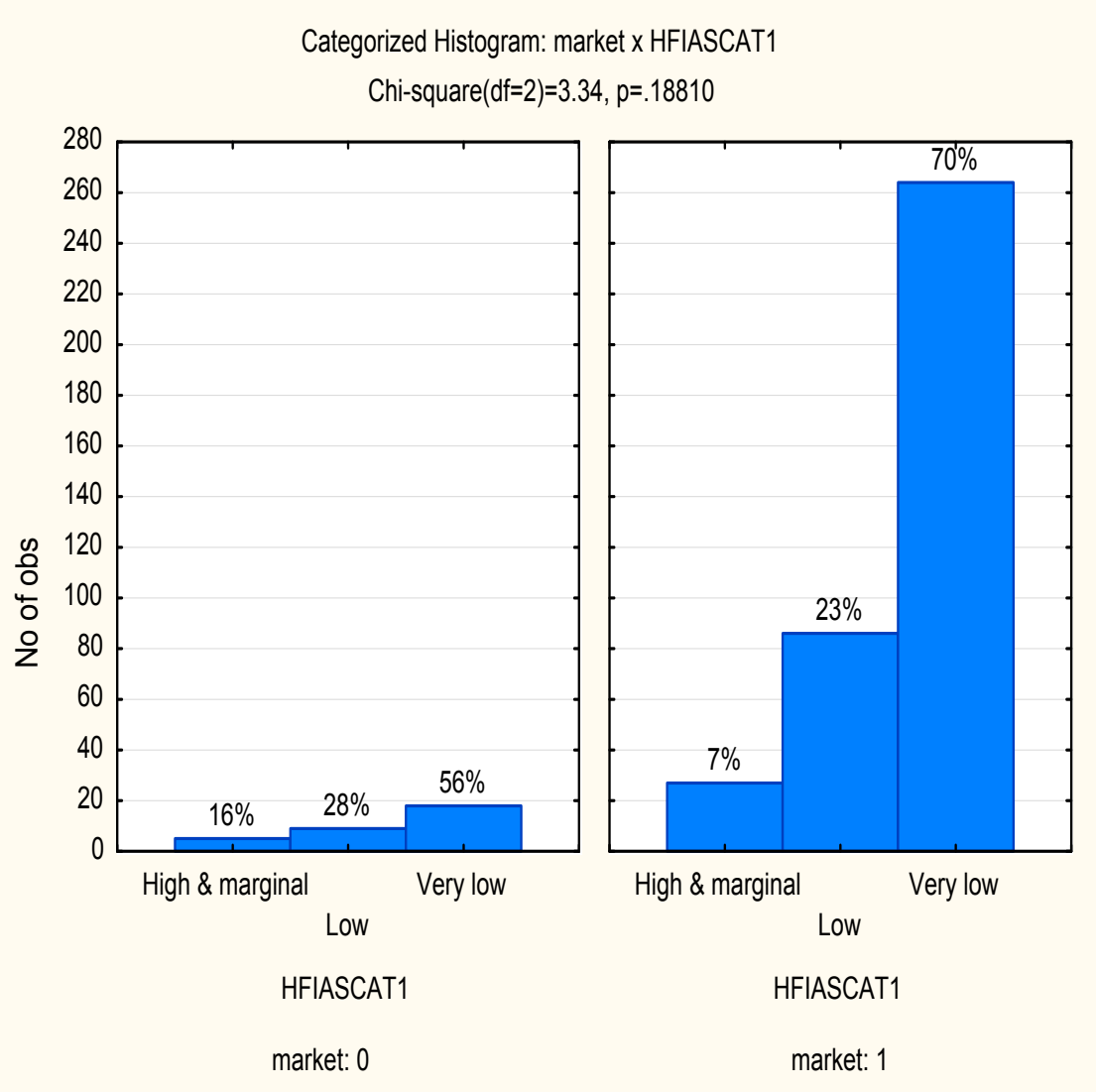


market | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

market : access to input and output market	Marked cells have counts > 10. Chi-square(df=2)=3.34, p=.18810 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	5	9	18	32
Row Percent	15.63%	28.13%	56.25%	
1	27	86	264	377
Row Percent	7.16%	22.81%	70.03%	
Totals	32	95	282	409

Categorized Histogram: market x HFIASCAT1

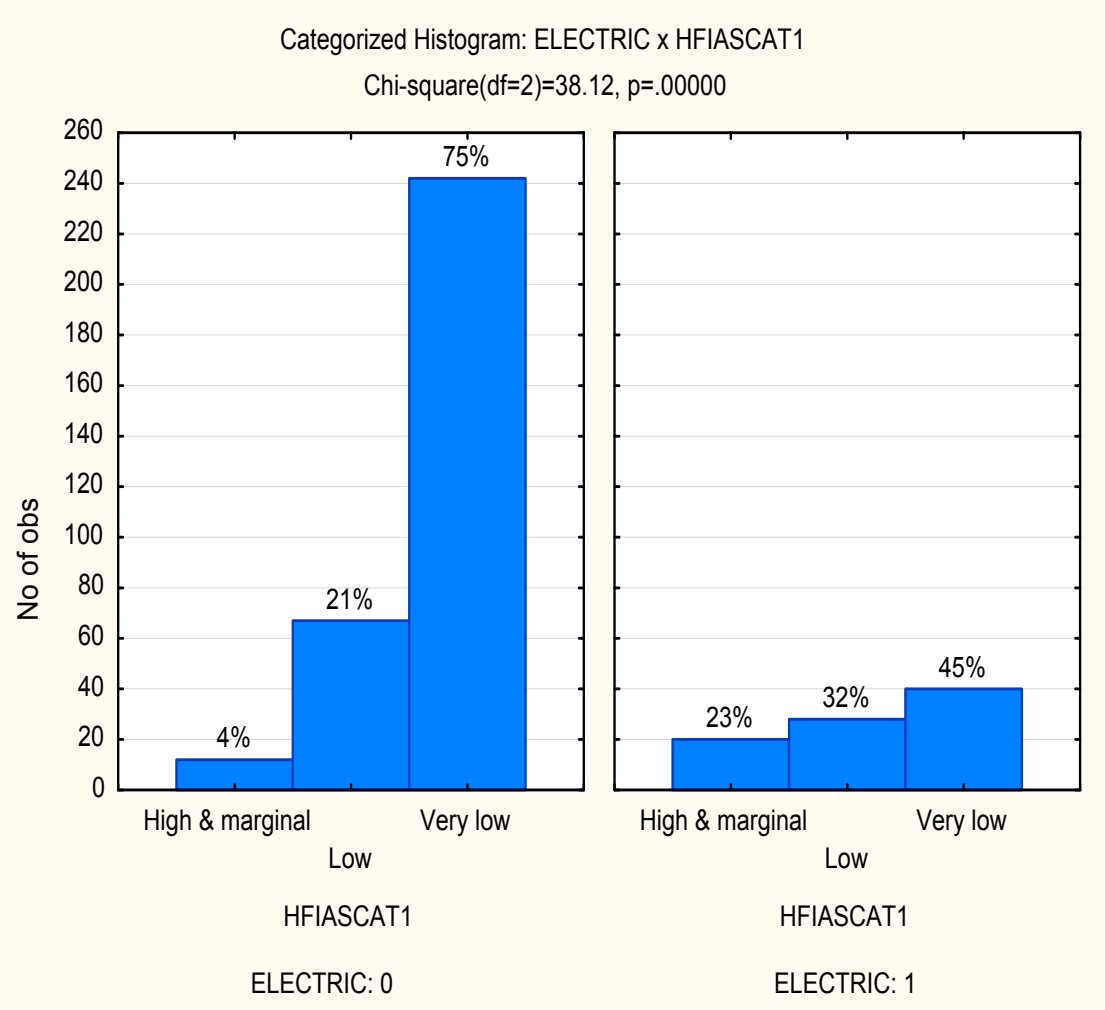


ELECTRIC | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

ELECTRIC: acess to electricity	Marked cells have counts > 10. Chi-square(df=2)=38.12, p=.00000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	12	67	242	321
Row Percent	3.74%	20.87%	75.39%	
1	20	28	40	88
Row Percent	22.73%	31.82%	45.45%	
Totals	32	95	282	409

Categorized Histogram: ELECTRIC x HFIASCAT1

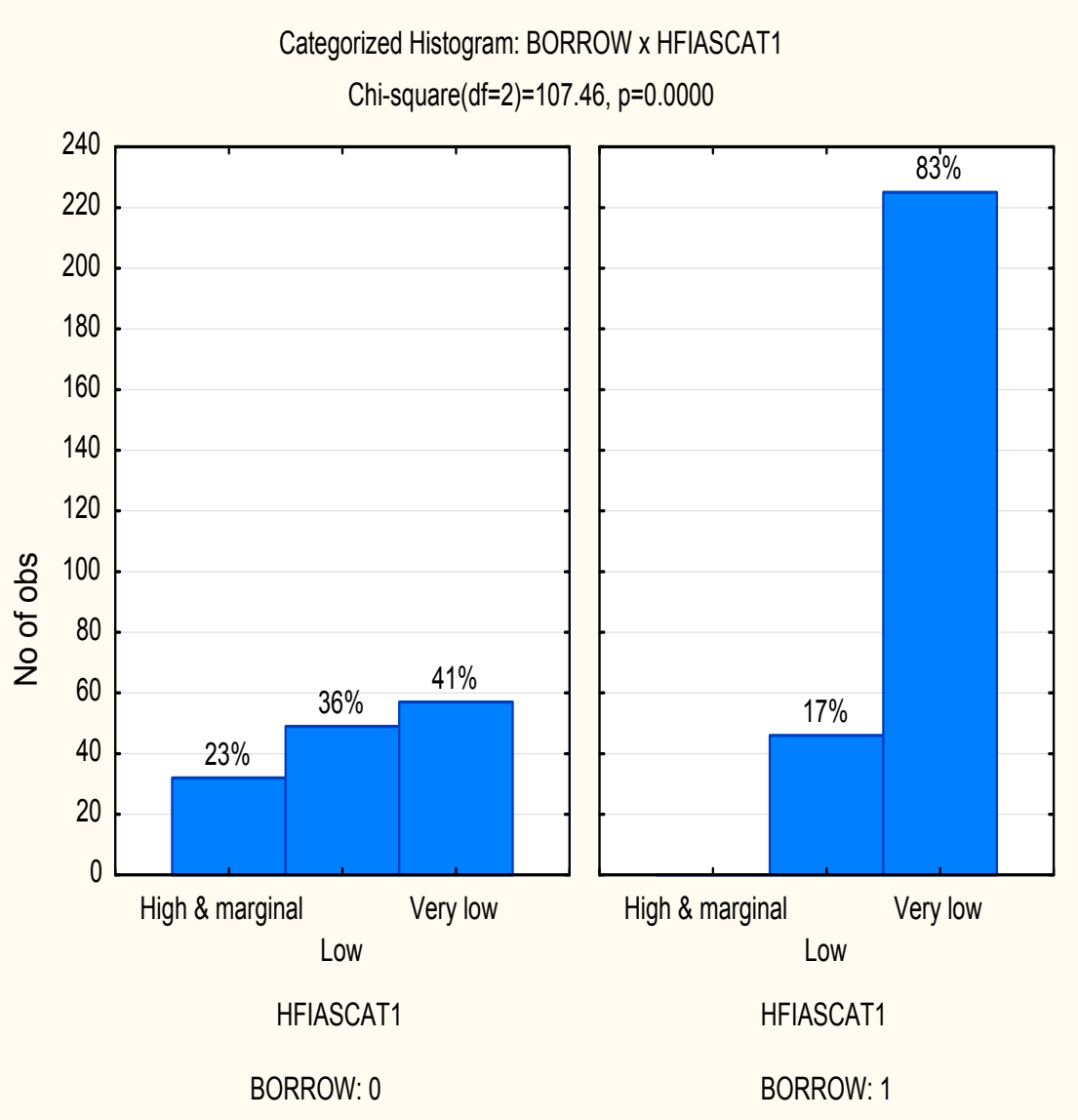


BORROW | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Marked cells have counts > 10. Chi-square(df=2)=107.46, p=0.0000

BORROW : borrow food	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	49	57	138
Row Percent	23.19%	35.51%	41.30%	
1	0	46	225	271
Row Percent	0.00%	16.97%	83.03%	
Totals	32	95	282	409

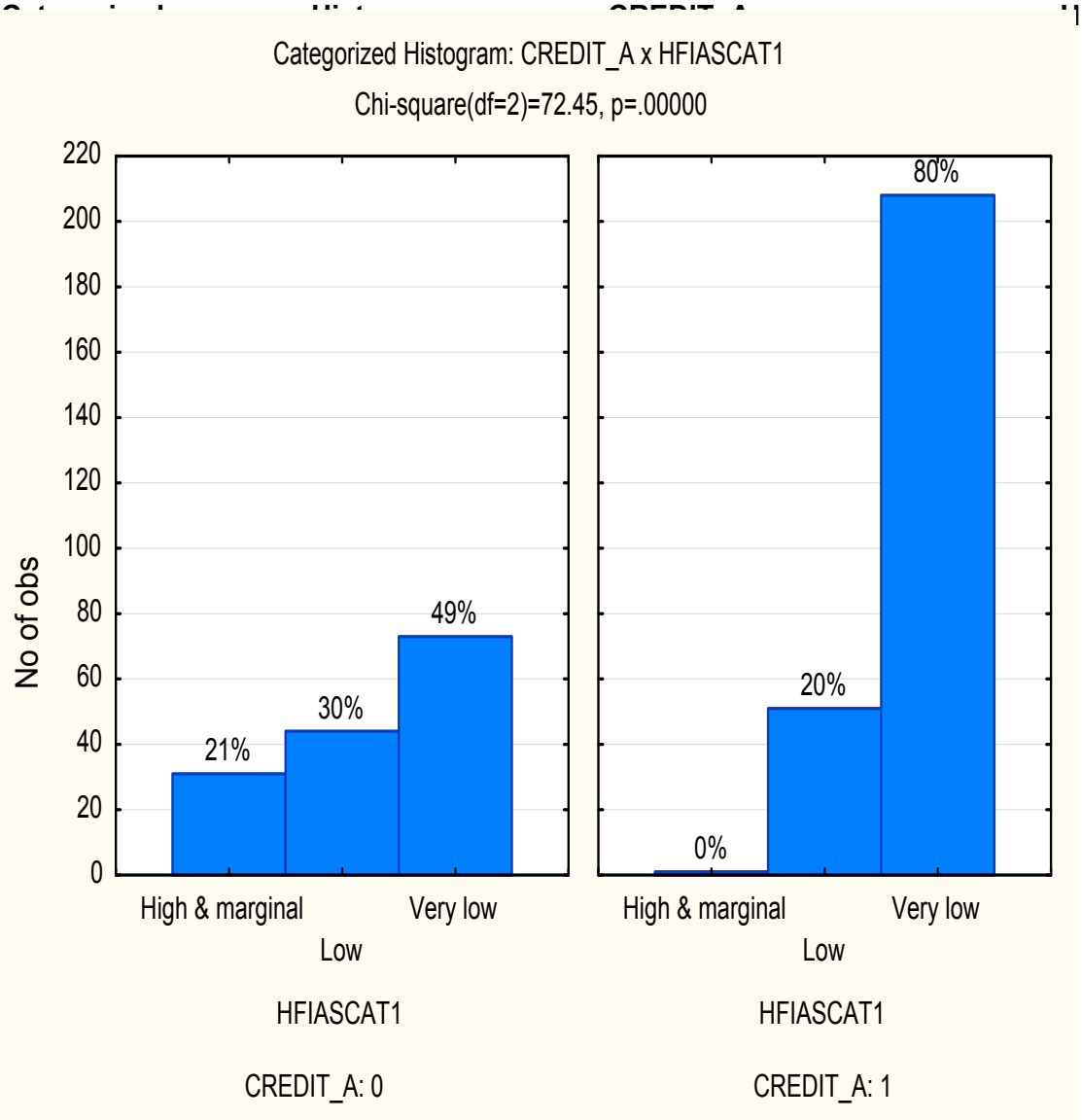
Categorized Histogram: BORROW x HFIASCAT1



CREDIT_A | HFIASCAT12-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

	Marked cells have counts > 10. Chi-square(df=2)=72.45, p=.00000			
CREDIT_A: buy food on credit	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	31	44	73	148
Row Percent	20.95%	29.73%	49.32%	
1	1	51	208	260
Row Percent	0.38%	19.62%	80.00%	
Totals	32	95	281	408

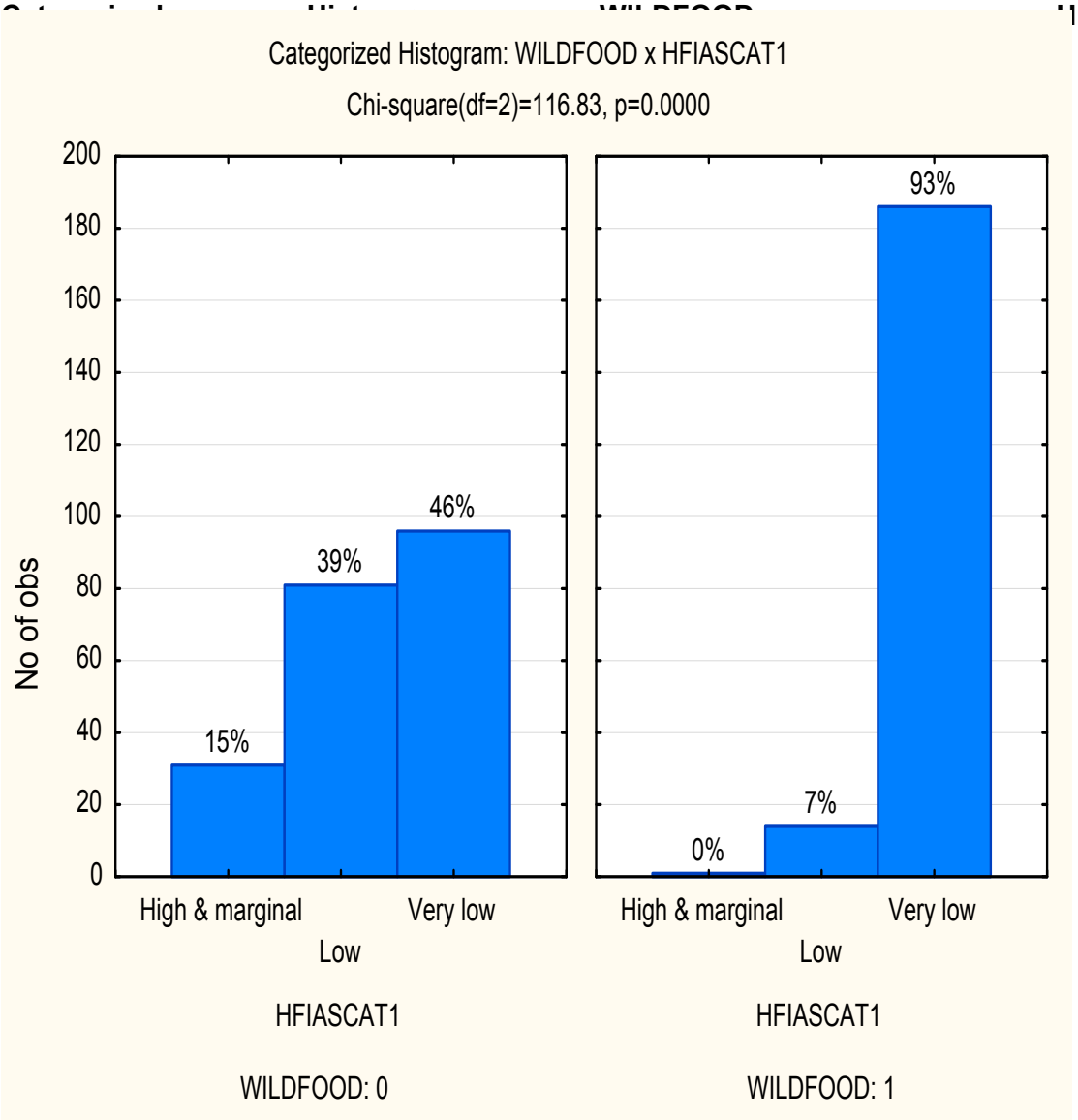
HFIASCAT1



WILDFOOD | HFIASCAT1 2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

	Marked cells have counts > 10. Chi-square(df=2)=116.83, p=0.0000			
WILDFOOD: gather wild food or hunt	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	31	81	96	208
Row Percent	14.90%	38.94%	46.15%	
1	1	14	186	201
Row Percent	0.50%	6.97%	92.54%	
Totals	32	95	282	409

IFIASCAT1

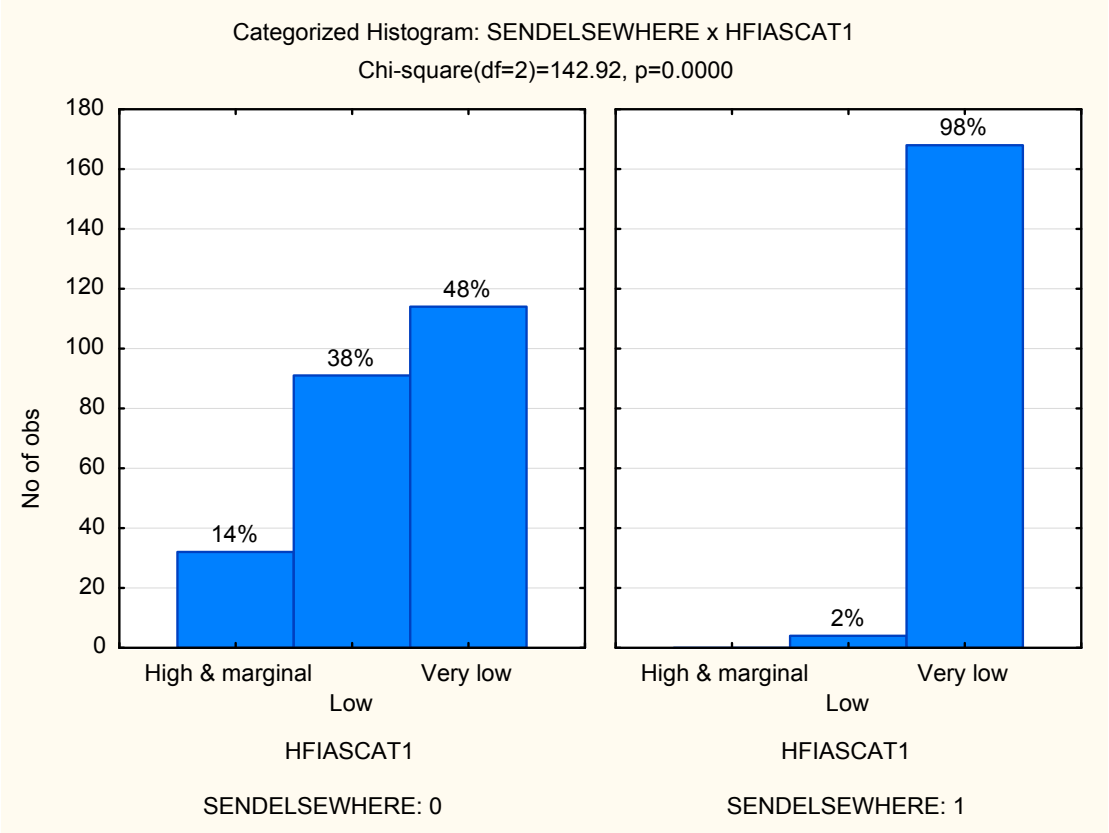


SENDELSEWHERE | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

SENDELSEWHERE: send household members elsewhere to eat	Marked cells have counts > 10. Chi-square(df=2)=142.92, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	91	114	237
Row Percent	13.50%	38.40%	48.10%	
1	0	4	168	172
Row Percent	0.00%	2.33%	97.67%	
Totals	32	95	282	409

Categorized Histogram: SENDELSEWHERE x HFIASCAT1

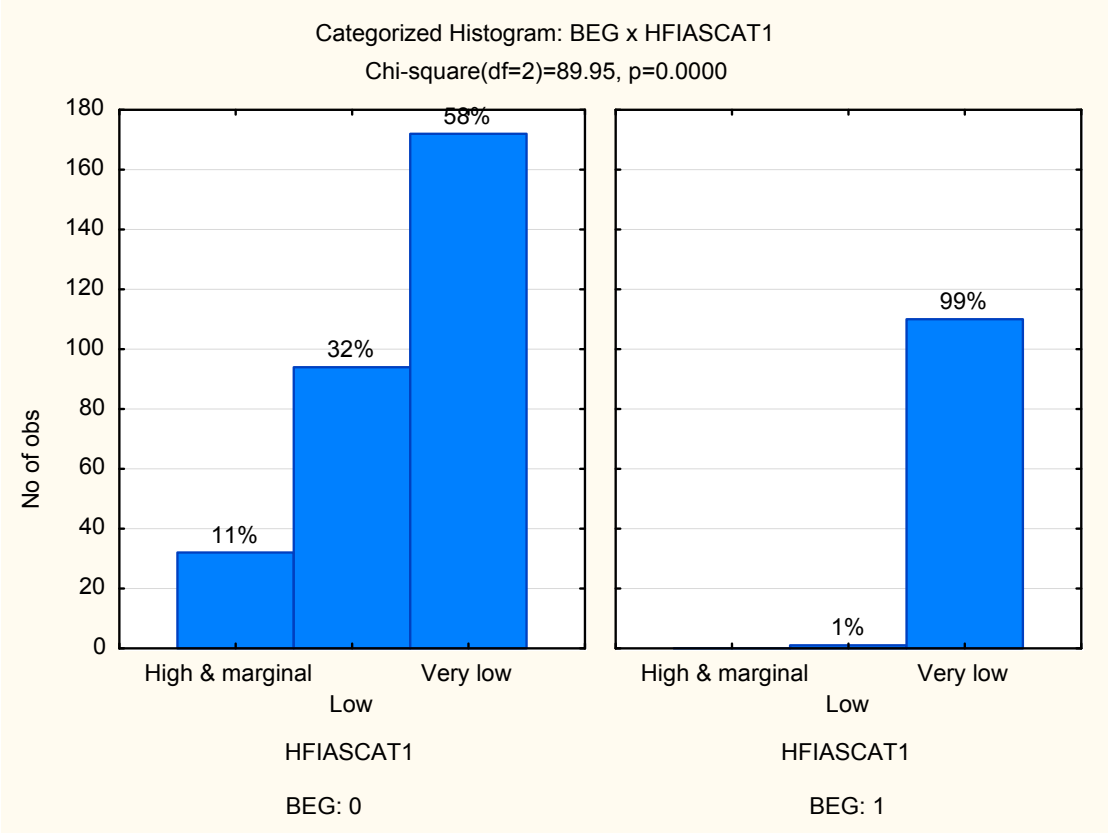


BEG | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

BEG : send household members to beg	Marked cells have counts > 10. Chi-square(df=2)=89.95, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	94	172	298
Row Percent	10.74%	31.54%	57.72%	
1	0	1	110	111
Row Percent	0.00%	0.90%	99.10%	
Totals	32	95	282	409

Categorized Histogram: BEG x HFIASCAT1

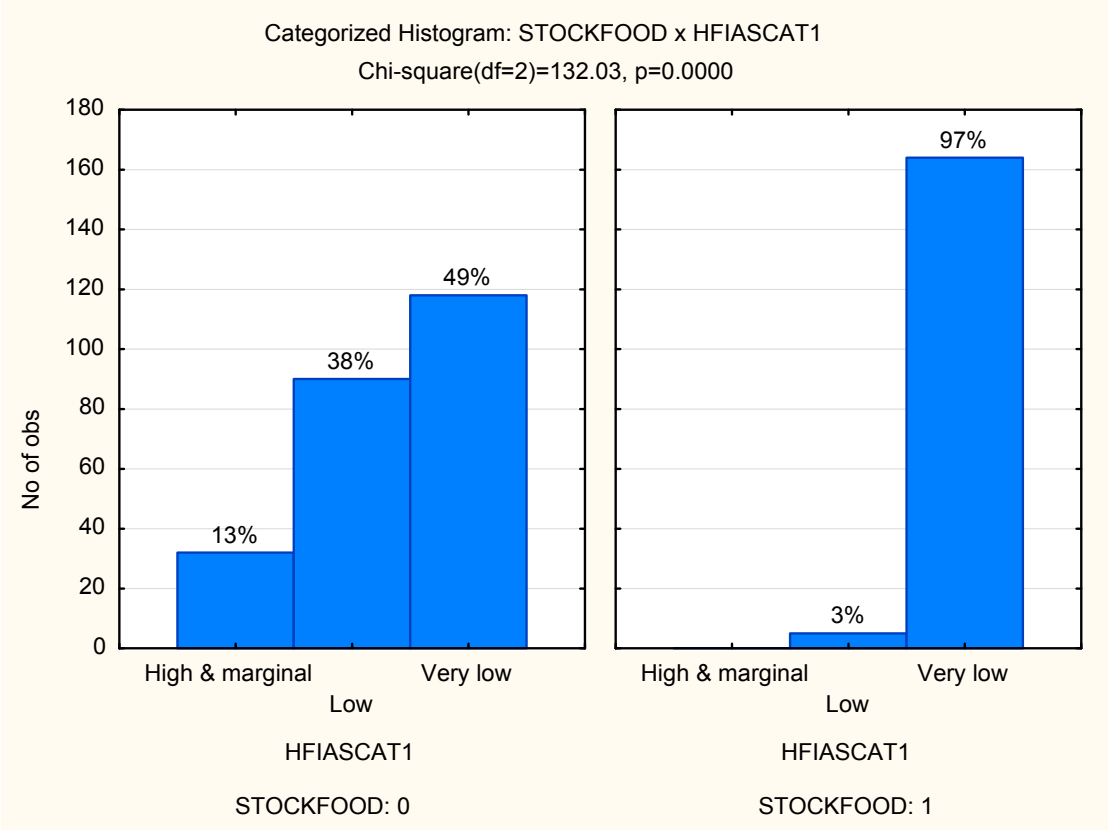


STOCKFOOD | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

STOCKFOOD: eat seed stock held to planting	Marked cells have counts > 10. Chi-square(df=2)=132.03, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	90	118	240
Row Percent	13.33%	37.50%	49.17%	
1	0	5	164	169
Row Percent	0.00%	2.96%	97.04%	
Totals	32	95	282	409

Categorized Histogram: STOCKFOOD x HFIASCAT1

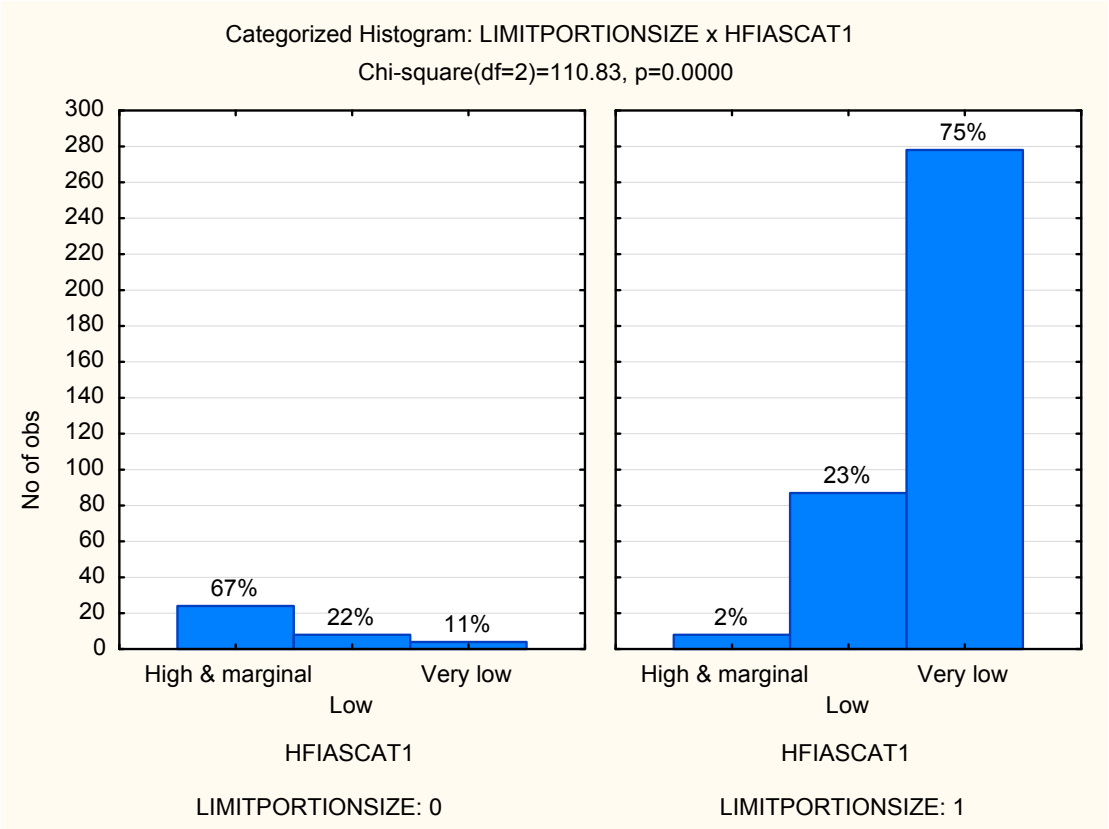


LIMITPORTIONSIZE | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

LIMITPORTIONSIZE: limit portion size at meal time	Marked cells have counts > 10. Chi-square(df=2)=110.83, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	24	8	4	36
Row Percent	66.67%	22.22%	11.11%	
1	8	87	278	373
Row Percent	2.14%	23.32%	74.53%	
Totals	32	95	282	409

Categorized Histogram: LIMITPORTIONSIZE x HFIASCAT1

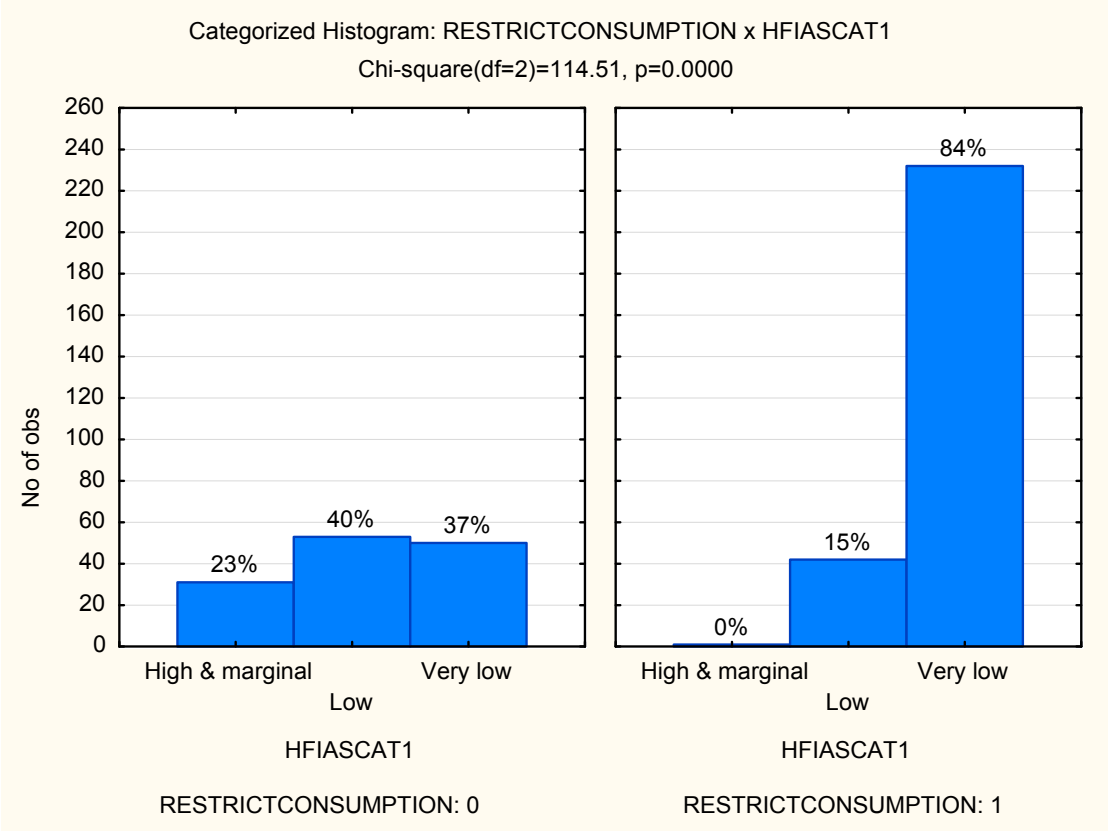


RESTRICTCONSUMPTION | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

RESTRICTCONSUMPTION: restrict the consumption of adult in othe	Marked cells have counts > 10. Chi-square(df=2)=114.51, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	31	53	50	134
Row Percent	23.13%	39.55%	37.31%	
1	1	42	232	275
Row Percent	0.36%	15.27%	84.36%	
Totals	32	95	282	409

Categorized Histogram: RESTRICTCONSUMPTION x HFIASCAT1

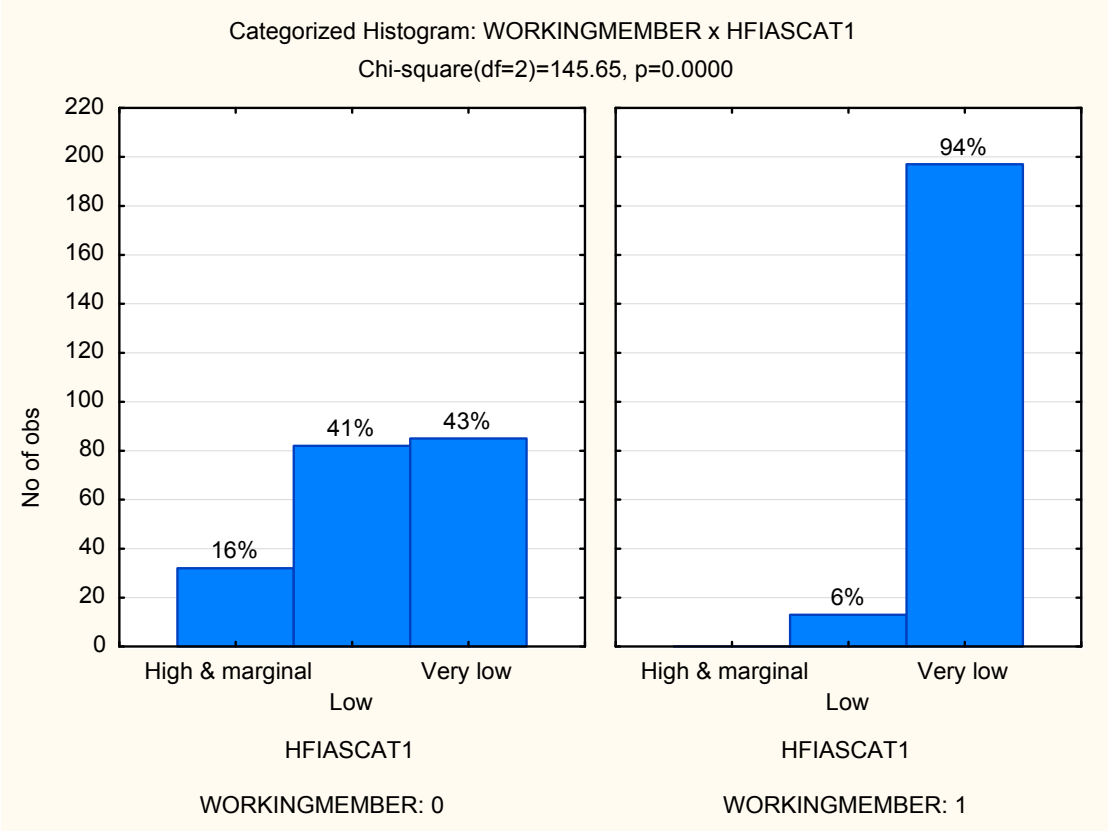


WORKINGMEMBER | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

WORKINGMEMBER: feed working members at the expense of non w	Marked cells have counts > 10. Chi-square(df=2)=145.65, p=0.00(HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	82	85	199
Row Percent	16.08%	41.21%	42.71%	
1	0	13	197	210
Row Percent	0.00%	6.19%	93.81%	
Totals	32	95	282	409

Categorized Histogram: WORKINGMEMBER x HFIASCAT1

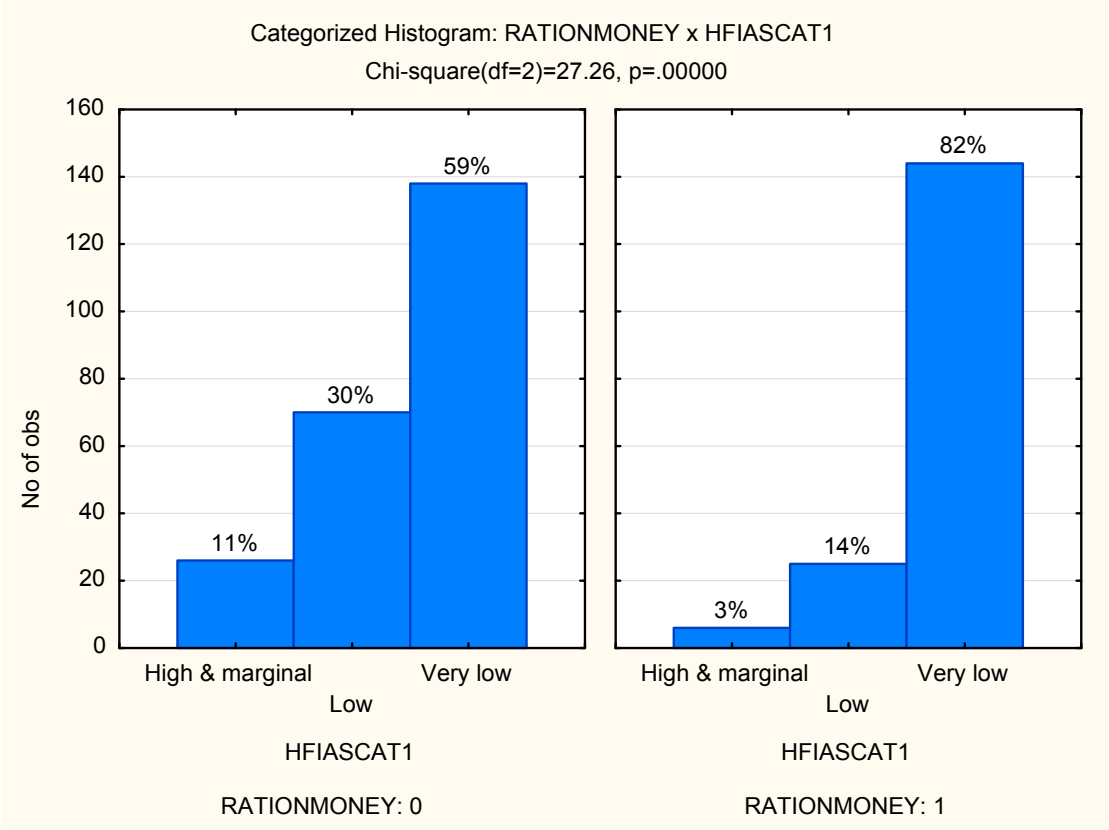


RATIONMONEY | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

RATIONMONEY: ration money to buy prepare food	Marked cells have counts > 10. Chi-square(df=2)=27.26, p=.00000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	26	70	138	234
Row Percent	11.11%	29.91%	58.97%	
1	6	25	144	175
Row Percent	3.43%	14.29%	82.29%	
Totals	32	95	282	409

Categorized Histogram: RATIONMONEY x HFIASCAT1

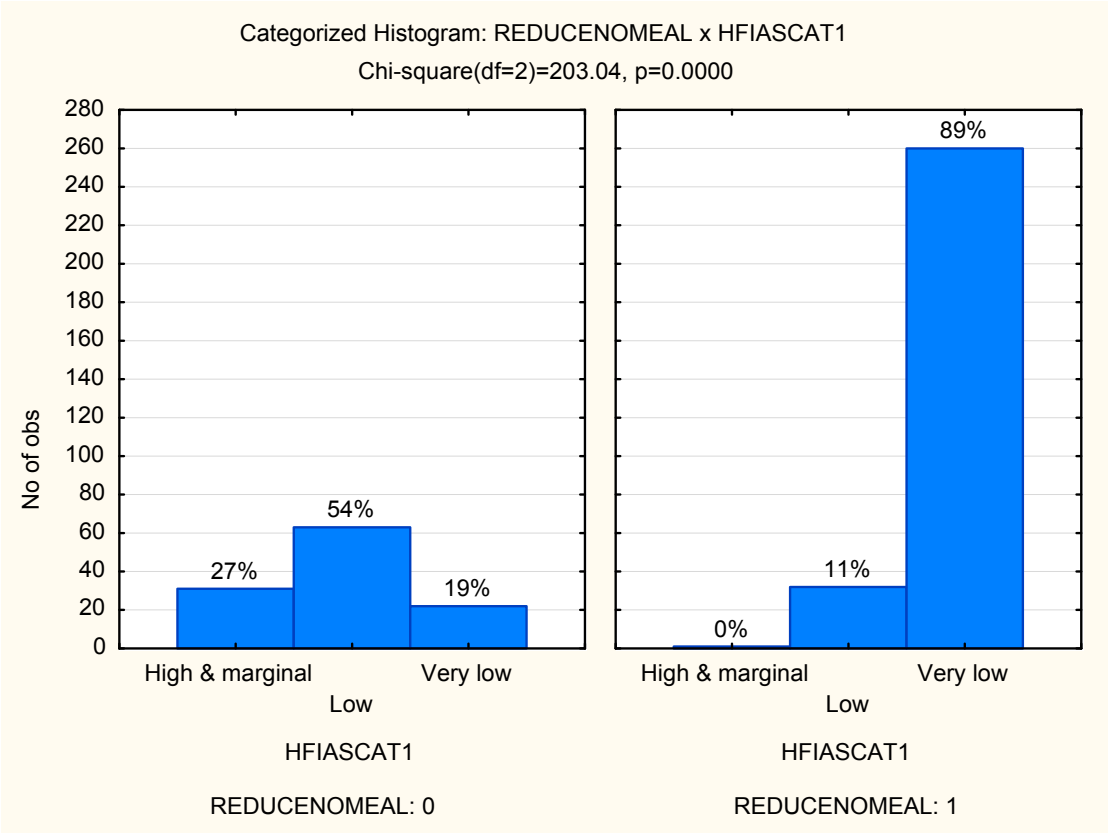


REDUCENOMEAL | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

REDUCENOMEAL: reduce number of meals e	Marked cells have counts > 10. Chi-square(df=2)=203.04, p=0.00(HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	31	63	22	116
Row Percent	26.72%	54.31%	18.97%	
1	1	32	260	293
Row Percent	0.34%	10.92%	88.74%	
Totals	32	95	282	409

Categorized Histogram: REDUCENOMEAL x HFIASCAT1

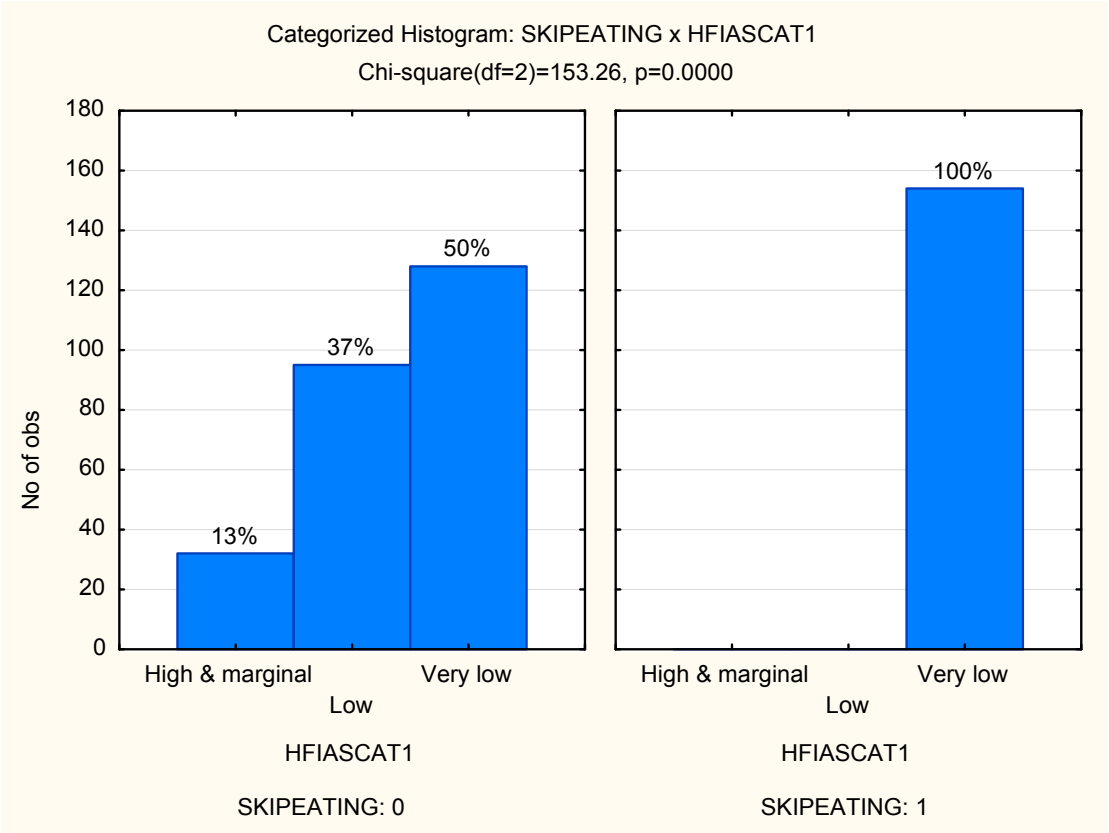


SKIPEATING | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

SKIPEATING: skip entire day without eating	Marked cells have counts > 10. Chi-square(df=2)=153.26, p=0.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	32	95	128	255
Row Percent	12.55%	37.25%	50.20%	
1	0	0	154	154
Row Percent	0.00%	0.00%	100.00%	
Totals	32	95	282	409

Categorized Histogram: SKIPEATING x HFIASCAT1



the class of food the household spend most of the food expenditure money on * HFIAS categories Crosstabulation

			HFIAS categories			Total
			Marginal Food security	Low Food security	Very low food security	
the class of food the household spend most of the food expenditure money on	starchy staples	Count	12_a	88_b	278_c	378
		% within the class of food the household spend most of the food expenditure money on	3.2%	23.3%	73.5%	100.0%
	processed food	Count	4_a	1_b	2_b	7
		% within the class of food the household spend most of the food expenditure money on	57.1%	14.3%	28.6%	100.0%
	meat, fish, egg, milk	Count	10_a	5_b	2_c	17
		% within the class of food the household spend most of the food expenditure money on	58.8%	29.4%	11.8%	100.0%
	fresh fruits and vegetables	Count	6_a	1_b	0_b	7
		% within the class of food the household spend most of the food expenditure money on	85.7%	14.3%	0.0%	100.0%
Total		Count	32	95	282	409
		% within the class of food the household spend most of the food expenditure money on	7.8%	23.2%	68.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	159.464[a]	6	.000
Likelihood Ratio	89.434	6	.000
Linear-by-Linear Association	107.483	1	.000
N of Valid Cases	409		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .55.

			HFIAS categories			Total
			Marginal Food security	Low Food security	Very low food security	
eat outside the house	0	Count	22$_a$	58$_a$	126$_b$	206
		% within eat outside the house	10.7%	28.2%	61.2%	100.0%
	Street food	Count	2$_a$	18$_a$	120$_b$	140
		% within eat outside the house	1.4%	12.9%	85.7%	100.0%
	restaurant	Count	6$_a$	9$_a$	4$_b$	19
		% within eat outside the house	31.6%	47.4%	21.1%	100.0%
	local food kiosk	Count	0$_{a, b}$	6$_b$	1$_a$	7
		% within eat outside the house	0.0%	85.7%	14.3%	100.0%
	food relief or aid projects	Count	0$_a$	0$_a$	3$_a$	3
		% within eat outside the house	0.0%	0.0%	100.0%	100.0%
	others	Count	2$_a$	4$_a$	28$_a$	34
		% within eat outside the house	5.9%	11.8%	82.4%	100.0%
Total		Count	32	95	282	409
		% within eat outside the house	7.8%	23.2%	68.9%	100.0%

Each subscript letter denotes a subset of HFIAS categories categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	70.084[a]	10	.000
Likelihood Ratio	68.164	10	.000
Linear-by-Linear Association	2.100	1	.147
N of Valid Cases	409		

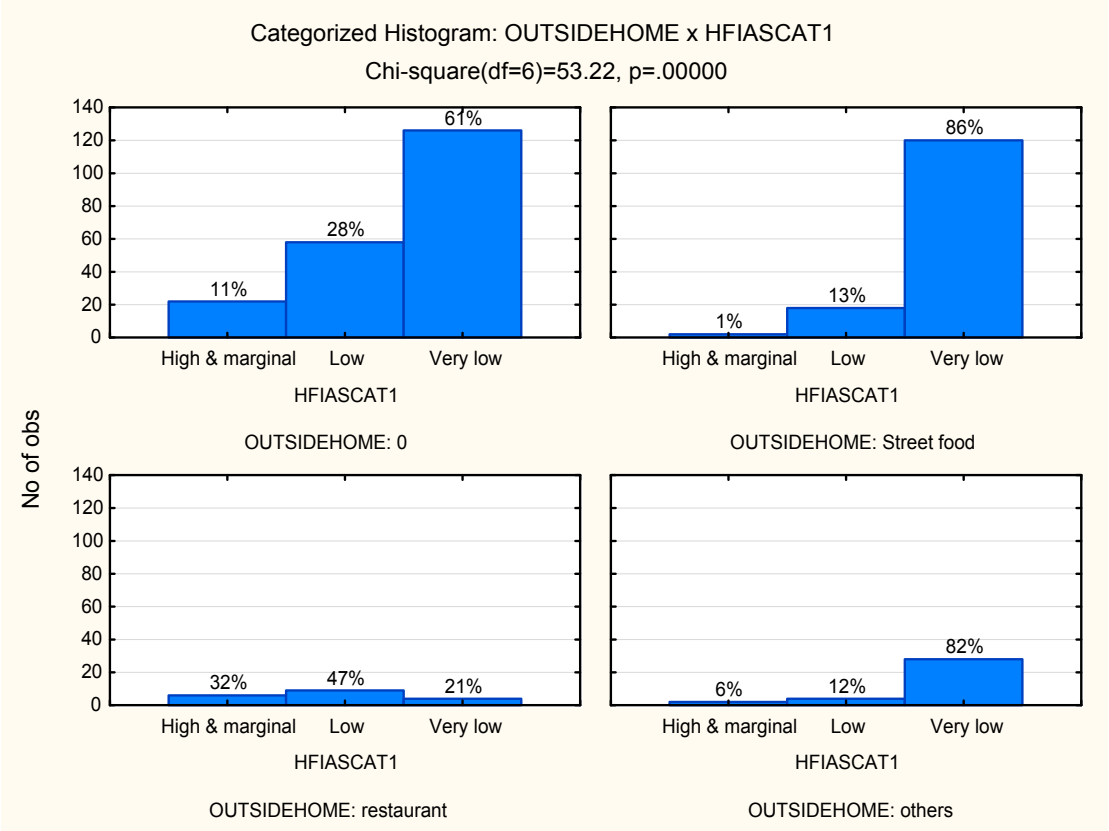
a. 9 cells (50.0%) have expected count less than 5. The minimum expected count is .23.

OUTSIDEHOME | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

	Marked cells have counts > 10. Chi-square(df=6)=53.22, p=.0000			
OUTSIDEHOME: eat outside the house	HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	22	58	126	206
Row Percent	10.68%	28.16%	61.17%	
Street food	2	18	120	140
Row Percent	1.43%	12.86%	85.71%	
restaurant	6	9	4	19
Row Percent	31.58%	47.37%	21.05%	
others	2	4	28	34
Row Percent	5.88%	11.76%	82.35%	
Totals	32	89	278	399

Categorized Histogram: OUTSIDEHOME x HFIASCAT1

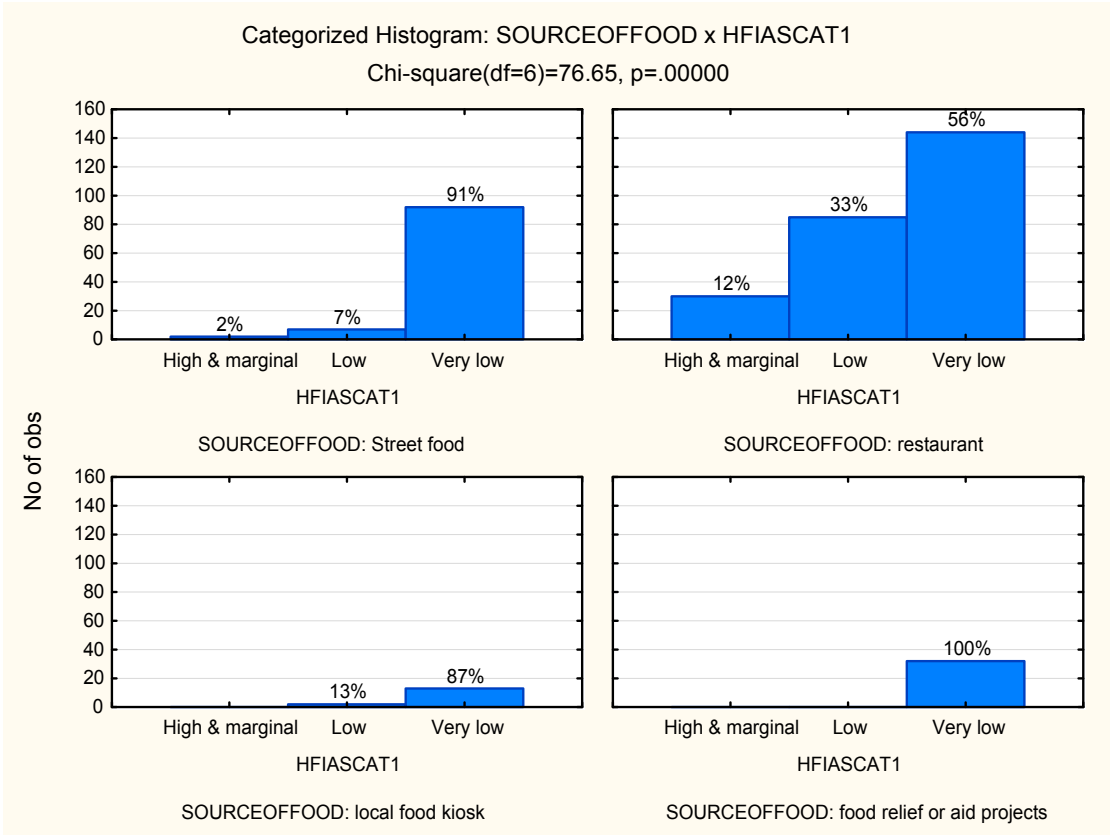


SOURCEOFFOOD | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

SOURCEOFFOOD: major source of food	Marked cells have counts > 10. Chi-square(df=6)=76.65, p=.0000(HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
own production	2	7	92	101
Row Percent	1.98%	6.93%	91.09%	
purchase	30	85	144	259
Row Percent	11.58%	32.82%	55.60%	
borrow,barter,exchange for labour, gift	0	2	13	15
Row Percent	0.00%	13.33%	86.67%	
food relief or aid projects	0	0	32	32
Row Percent	0.00%	0.00%	100.00%	
Totals	32	94	281	407

Categorized Histogram: SOURCEOFFOOD x HFIASCAT1

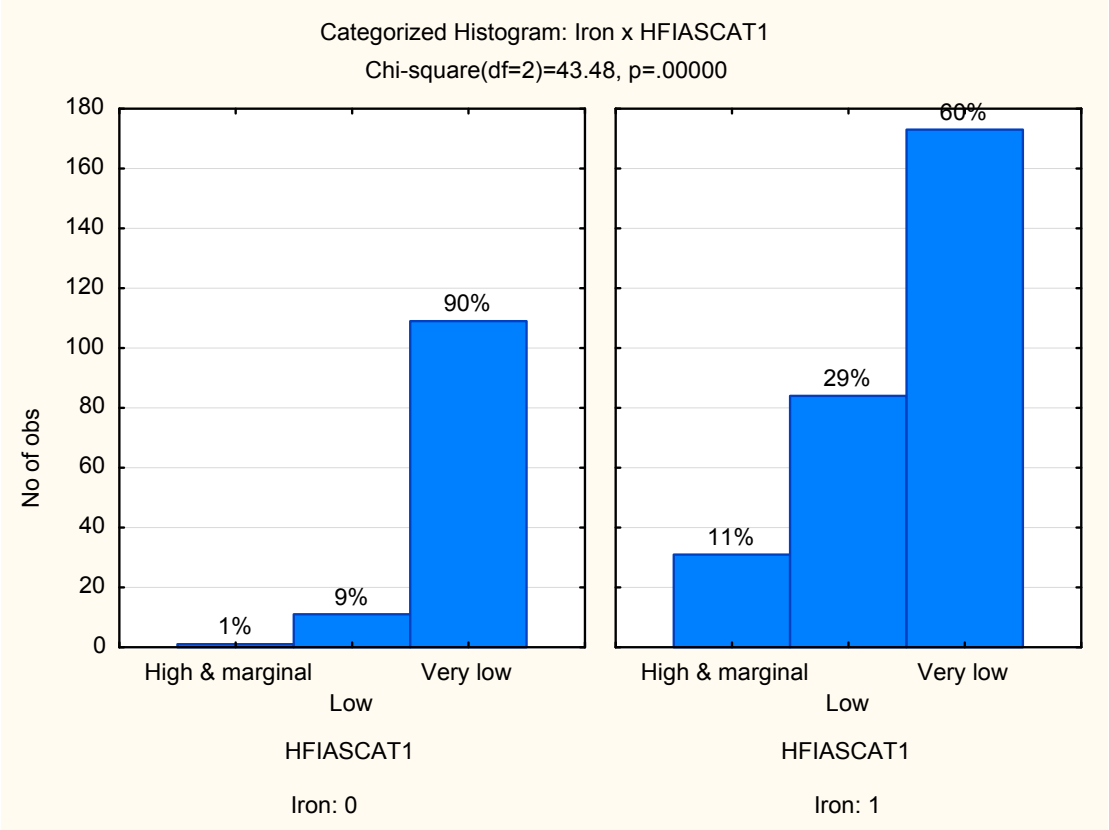


Iron | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Iron : Iron rich foods	Marked cells have counts > 10. Chi-square(df=2)=43.48, p=.00000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	1	11	109	121
Row Percent	0.83%	9.09%	90.08%	
1	31	84	173	288
Row Percent	10.76%	29.17%	60.07%	
Totals	32	95	282	409

Categorized Histogram: Iron x HFIASCAT1

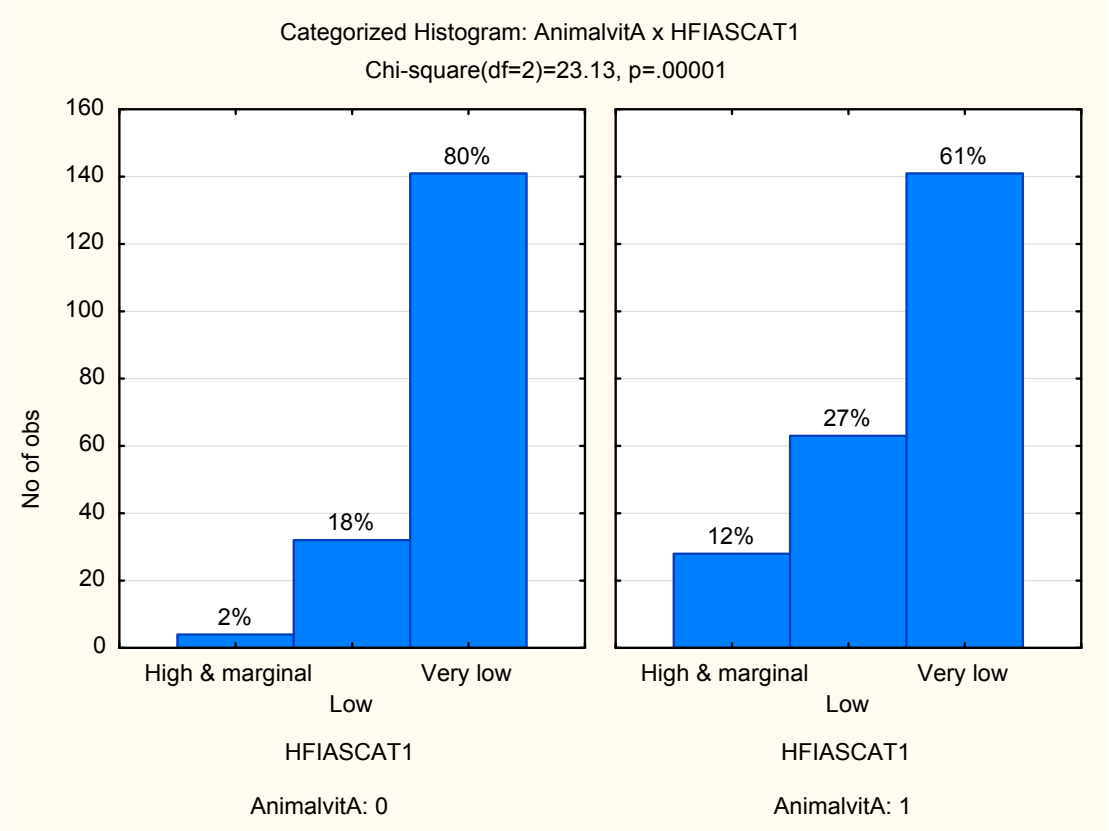


AnimalvitA | HFIASCAT1

2-Way Summary Table: Observed Frequencies (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

AnimalvitA: amimal based vit A foods	Marked cells have counts > 10. Chi-square(df=2)=23.13, p=.0000 HFIASCAT1 High & marginal	HFIASCAT1 Low	HFIASCAT1 Very low	Row Totals
0	4	32	141	177
Row Percent	2.26%	18.08%	79.66%	
1	28	63	141	232
Row Percent	12.07%	27.16%	60.78%	
Totals	32	95	282	409

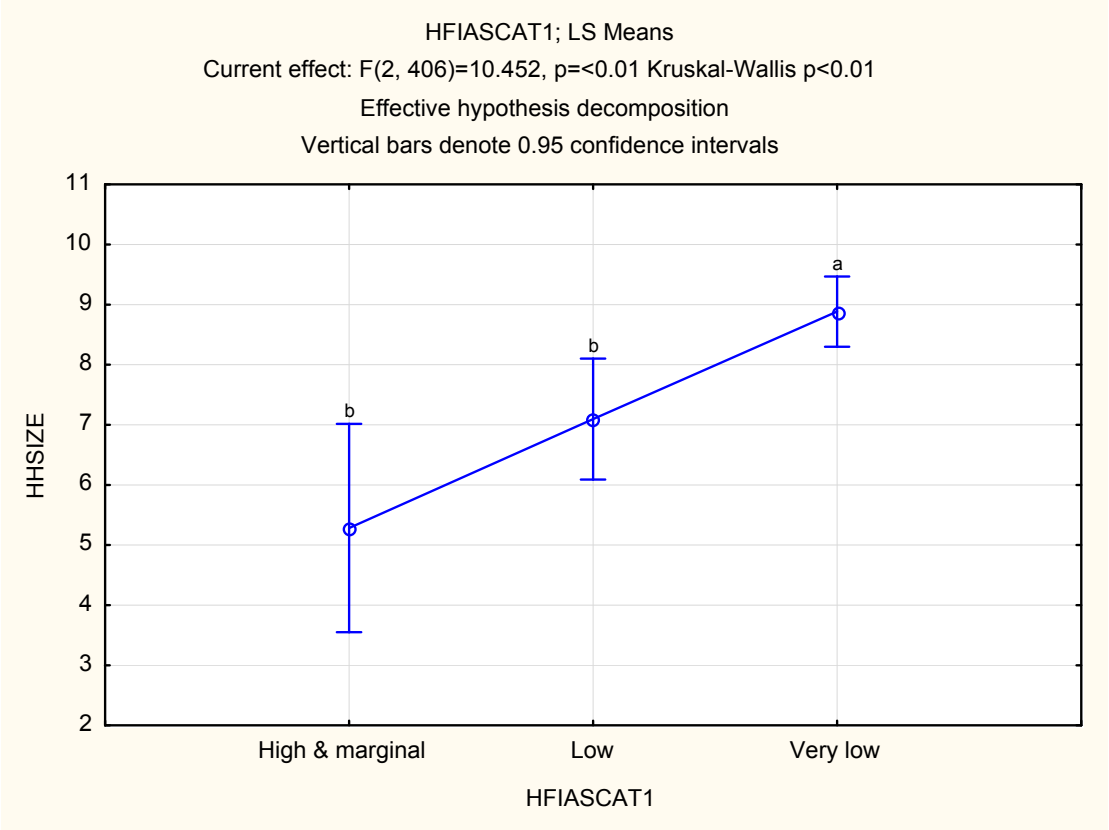
Categorized Histogram: AnimalvitA x HFIASCAT1



ANOVA (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

HHSIZE | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable HHSIZE (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

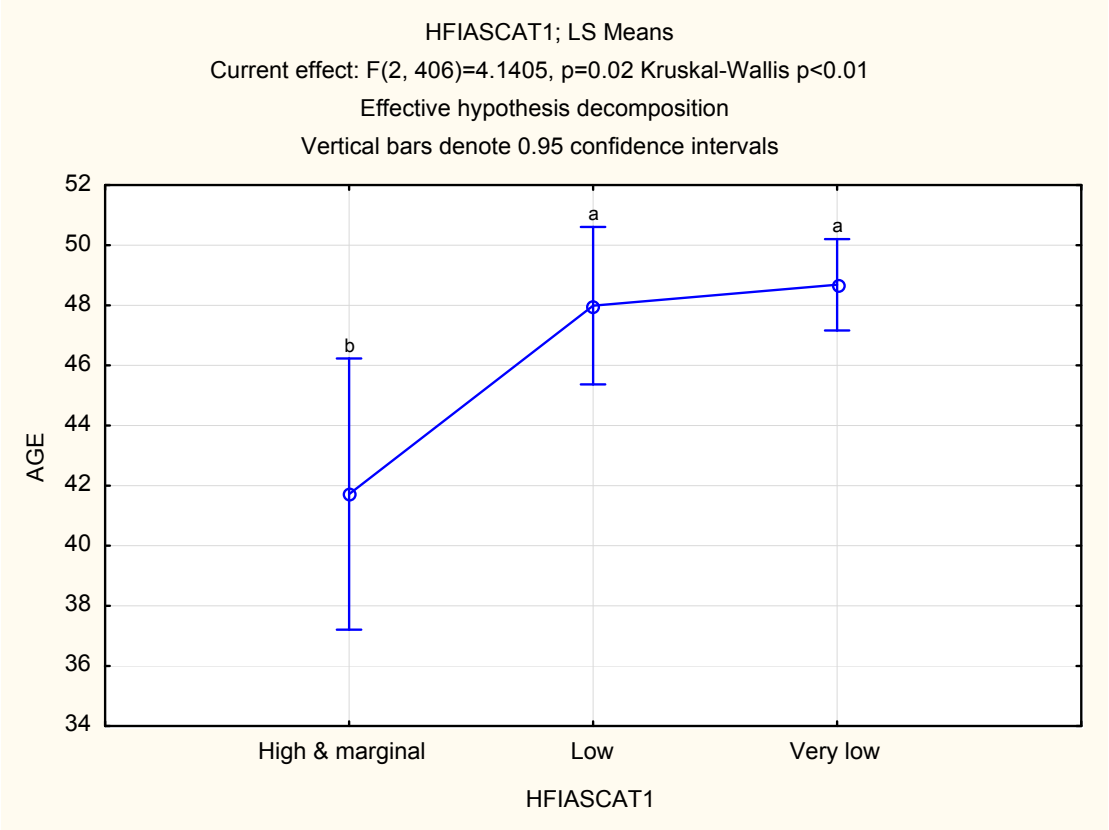
	LSD test; variable HHSIZE (FSNigeria_HH Profiles Taraba FIN Probabilities for Post Hoc Tests Error: Between MS = 24.881, df = 406.00			
Cell No.	HFIASCAT1	{1} 5.2813	{2} 7.0947	{3} 8.8830
1	High & marginal		0.076030	0.000126
2	Low	0.076030		0.002669
3	Very low	0.000126	0.002669	

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)						
	Level of Factor	N	HHSIZE Mean	HHSIZE Std.Dev.	HHSIZE Std.Err	HHSIZE -95.00%	HHSIZE +95.00%
Total		409	8.185819	5.102354	0.252295	7.689858	8.681780
HFIASCAT1	High & marginal	32	5.281250	5.268497	0.931347	3.381754	7.180746
HFIASCAT1	Low	95	7.094737	3.172601	0.325502	6.448445	7.741029
HFIASCAT1	Very low	282	8.882979	5.433237	0.323545	8.246100	9.519857

AGE | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable AGE (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Cell No.	HFIASCAT1	{1} 41.719	{2} 47.989	{3} 48.688
1	High & marginal		0.018596	0.004218
2	Low	0.018596		0.650426
3	Very low	0.004218	0.650426	

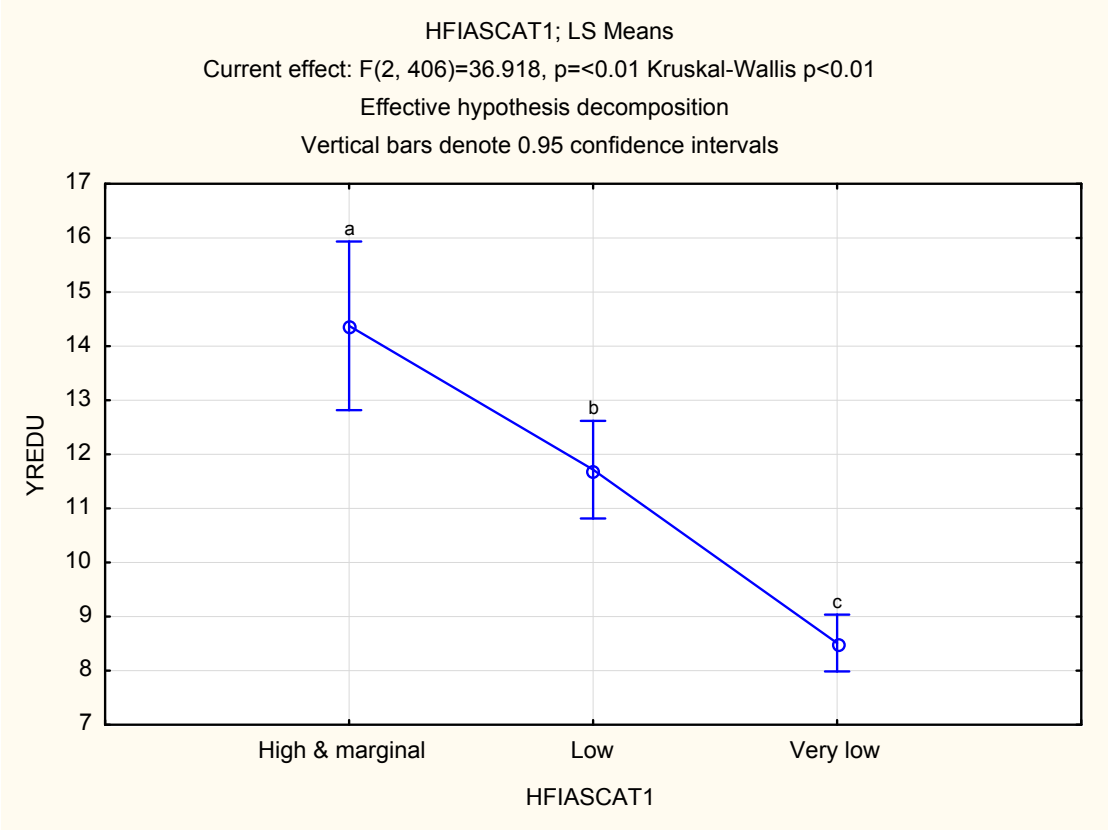
LSD test; variable AGE (FSNigeria_HH Profiles Taraba FINAL2
Probabilities for Post Hoc Tests
Error: Between MS = 168.56, df = 406.00

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Level of Factor	N	AGE Mean	AGE Std.Dev.	AGE Std.Err	AGE -95.00%	AGE +95.00%
Total		409	47.98044	13.08268	0.646897	46.70877	49.25211
HFIASCAT1	High & marginal	32	41.71875	9.38164	1.658455	38.33631	45.10119
HFIASCAT1	Low	95	47.98947	10.19125	1.045600	45.91341	50.06554
HFIASCAT1	Very low	282	48.68794	14.10996	0.840236	47.03399	50.34190

YREDU | HFIASCAT1 HFIASCAT1; LS Means



LSD test; variable YREDU (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Cell No.	HFIASCAT1	{1} 14.375	{2} 11.716	{3} 8.5106
1	High & marginal		0.003912	0.000000
2	Low	0.003912		0.000000
3	Very low	0.000000	0.000000	

LSD test; variable YREDU (FSNigeria_HH Profiles Taraba FIN
Probabilities for Post Hoc Tests
Error: Between MS = 20.102, df = 406.00

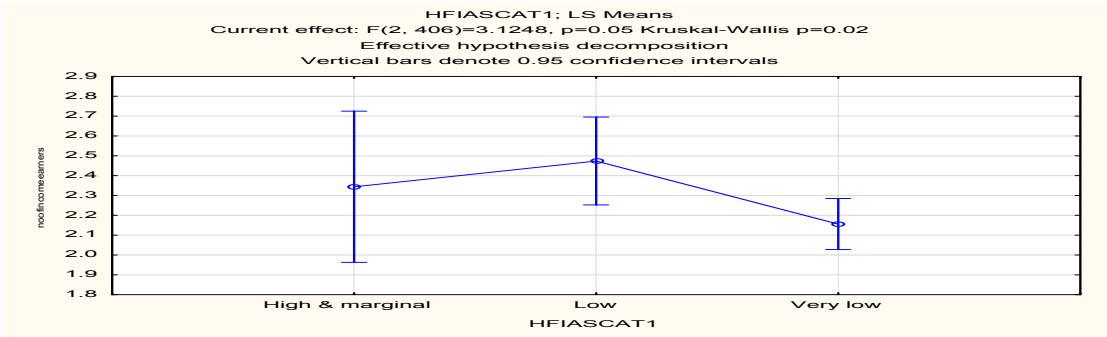
Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Level of Factor	N	YREDU Mean	YREDU Std.Dev.	YREDU Std.Err	YREDU -95.00%	YREDU +95.00%
Total		409	9.71394	4.862202	0.240420	9.24132	10.18655
HFIASCAT1	High & marginal	32	14.37500	1.581139	0.279508	13.80494	14.94506
HFIASCAT1	Low	95	11.71579	4.271786	0.438276	10.84558	12.58600
HFIASCAT1	Very low	282	8.51064	4.760629	0.283491	7.95260	9.06867

noofincomeearners | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable noofincomeearners (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Cell No.	HFIASCAT1	{1} 2.3438	{2} 2.4737	{3} 2.1560
1	High & marginal		0.562356	0.359227
2	Low	0.562356		0.015017
3	Very low	0.359227	0.015017	

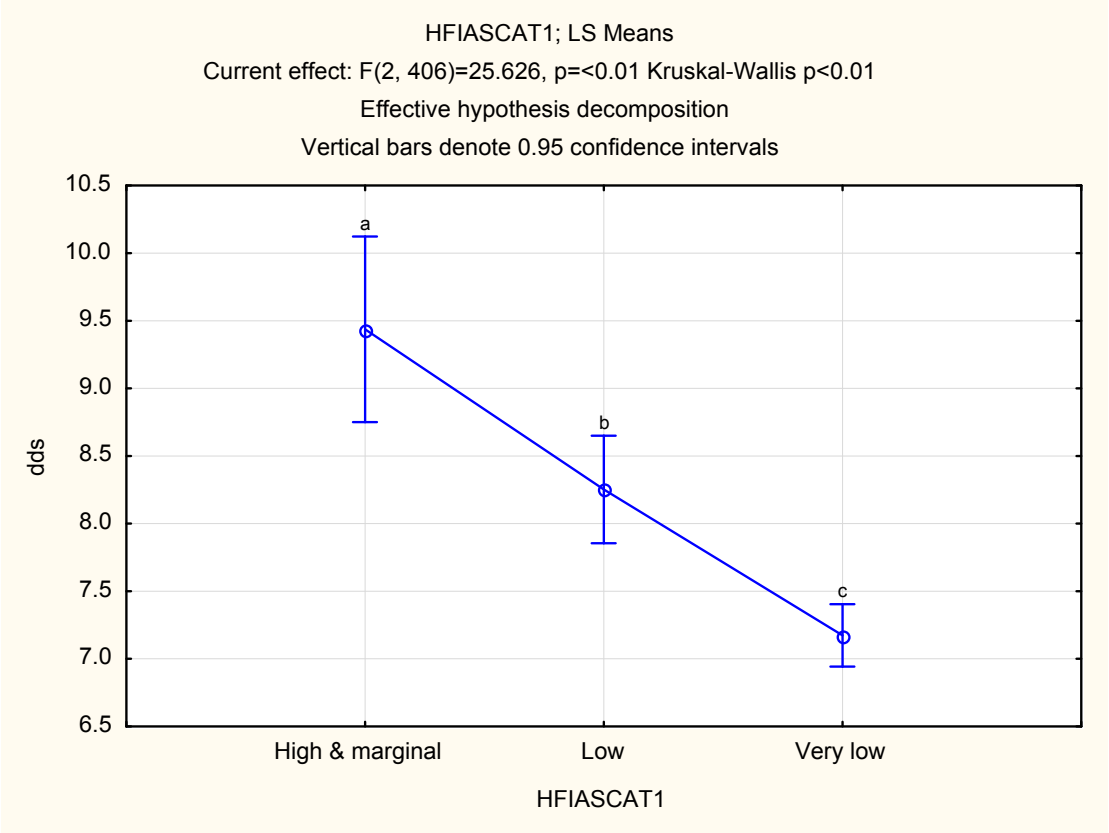
LSD test; variable noofincomeearners (FSNigeria_HH Profiles Tai
Probabilities for Post Hoc Tests
Error: Between MS = 1.2021, df = 406.00

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)					
	Level of Factor	N	noofincomeearners Mean	noofincomeearners Std.Dev.	noofincomeearners Std.Err	noofir
Total		409	2.244499	1.102082	0.054494	
HFIASCAT1	High & marginal	32	2.343750	2.336380	0.413017	
HFIASCAT1	Low	95	2.473684	1.174572	0.120509	
HFIASCAT1	Very low	282	2.156028	0.820413	0.048855	

dds | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable dds (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

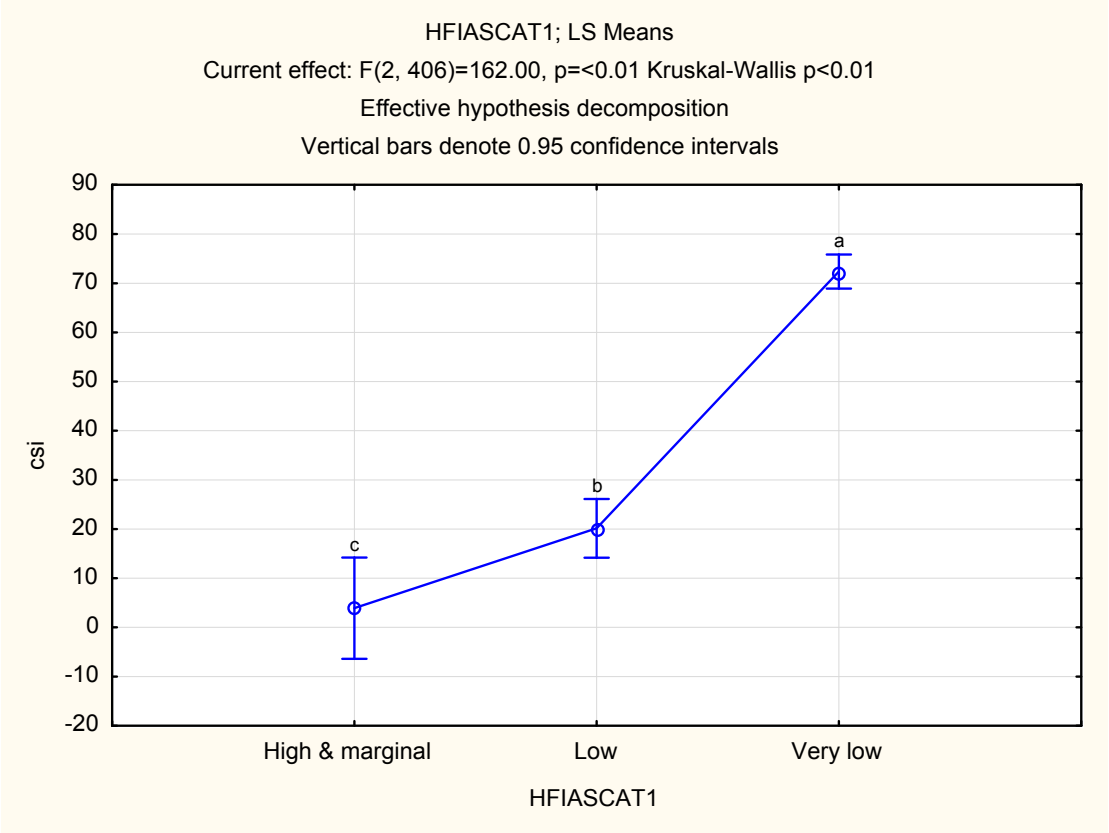
Cell No.	LSD test; variable dds (FSNigeria_HH Profiles Taraba FINAL2_ Probabilities for Post Hoc Tests Error: Between MS = 3.8973, df = 406.00			
	HFIASCAT1	{1} 9.4375	{2} 8.2526	{3} 7.1738
1	High & marginal		0.003509	0.000000
2	Low	0.003509		0.000005
3	Very low	0.000000	0.000005	

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw						
	Level of Factor	N	dds Mean	dds Std.Dev.	dds Std.Err	dds -95.00%	dds +95.00%
Total		409	7.601467	2.089915	0.103340	7.398322	7.80461
HFIASCAT1	High & marginal	32	9.437500	2.184070	0.386093	8.650059	10.22494
HFIASCAT1	Low	95	8.252632	2.273662	0.233273	7.789463	8.71580
HFIASCAT1	Very low	282	7.173759	1.837225	0.109405	6.958401	7.38912

csi | HFIASCAT1 pleading

HFIASCAT1; LS Means



LSD test; variable csi (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Cell No.	HFIASCAT1	{1} 3.9063	{2} 20.147	{3} 72.383
1	High & marginal		0.007591	0.00
2	Low	0.007591		0.00
3	Very low	0.000000	0.000000	

LSD test; variable csi (FSNigeria_HH Profiles Taraba FINAL
Probabilities for Post Hoc Tests
Error: Between MS = 877.00, df = 406.00

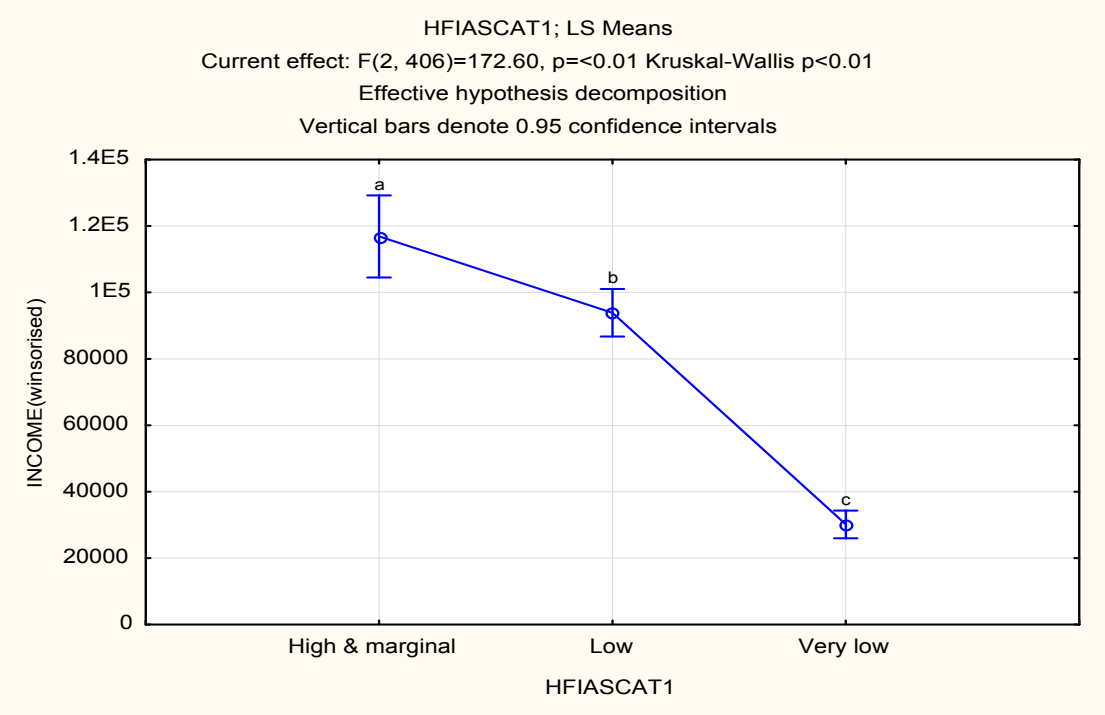
Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Level of Factor	N	csi Mean	csi Std.Dev.	csi Std.Err	csi -95.00%	csi +95.00%
Total		409	54.89242	39.61225	1.958700	51.04202	58.74282
HFIASCAT1	High & marginal	32	3.90625	5.59008	0.988196	1.89081	5.92169
HFIASCAT1	Low	95	20.14737	12.62720	1.295523	17.57508	22.71966
HFIASCAT1	Very low	282	72.38298	34.79000	2.071714	68.30493	76.46103

INCOME(winsorised) | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable INCOME(winsorised) (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

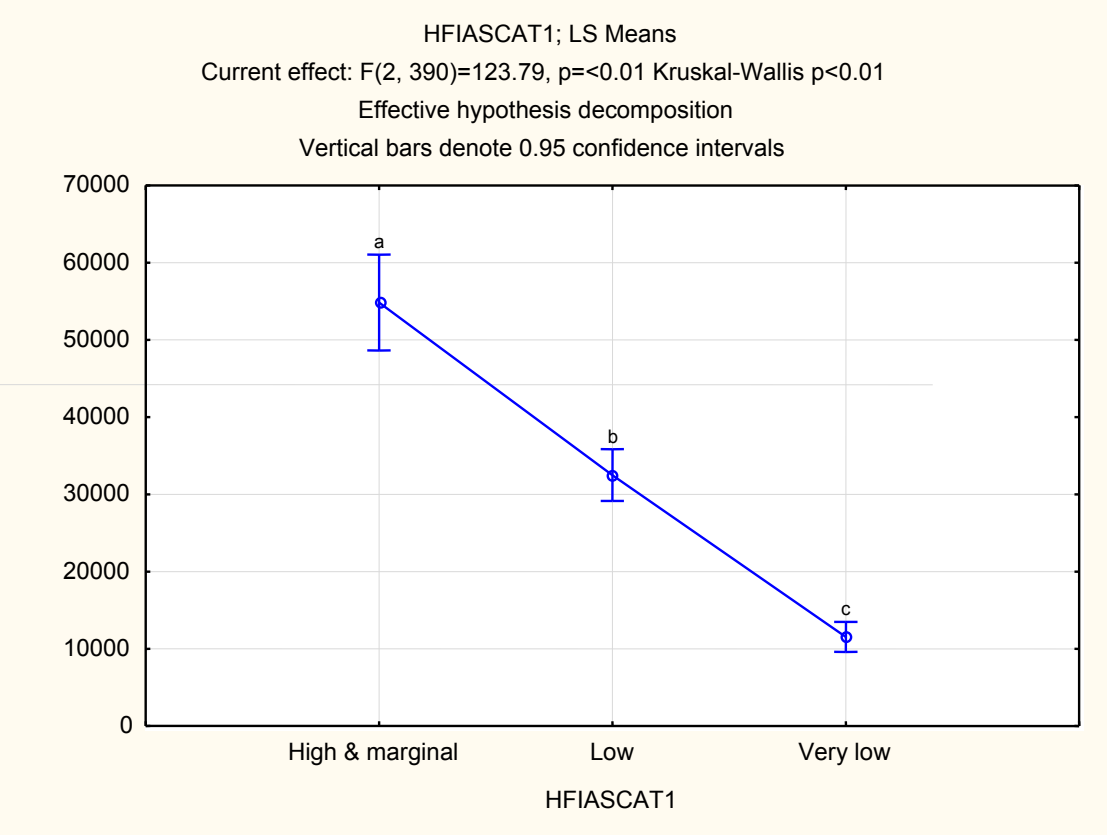
Cell No.	LSD test; variable INCOME(winsorised) (FSNigeria_HH Profiles Taraba FINAL2_15. Probabilities for Post Hoc Tests Error: Between MS = 1263E6, df = 406.00			
	HFIASCAT1	{1} 1169E2	{2} 93874.	{3} 30135
1	High & marg		0.00167	0.0(
2	Lov	0.00167		0.0(
3	Very lc	0.0000(	0.0000(	

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)						
	Level of Factor	N	INCOME(winsorised) Mean	INCOME(winsorised) Std.Dev.	INCOME(winsorised) Std.Err	INCOME(winsorised) -95.00%	INCOME(winsorised) +95.00%
Total		409	51725.0	48222.54	2384.451	47037.7	56412.4
HFIASCAT1	High & marginal	32	116861.3	45259.12	8000.758	100543.7	133179.0
HFIASCAT1	Low	95	93873.8	43828.45	4496.704	84945.5	102802.1
HFIASCAT1	Very low	282	30134.6	30923.60	1841.474	26509.8	33759.5

femaleincome(winsorised) | HFIASCAT1HFIASCAT1; LS Means

femaleincome(winsorised)



LSD test; variable femaleincome(winsorised) (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Cell No.	LSD test; variable femaleincome(winsorised) (FSNigeria_HH Probabilities for Post Hoc Tests Error: Between MS = 2694E5, df = 390.00 HFIASCAT1	{1} 54845.	{2} 32498.	{3} 11552.
1	High & marginal		0.000000	0.00
2	Low	0.000000		0.00
3	Very low	0.000000	0.000000	

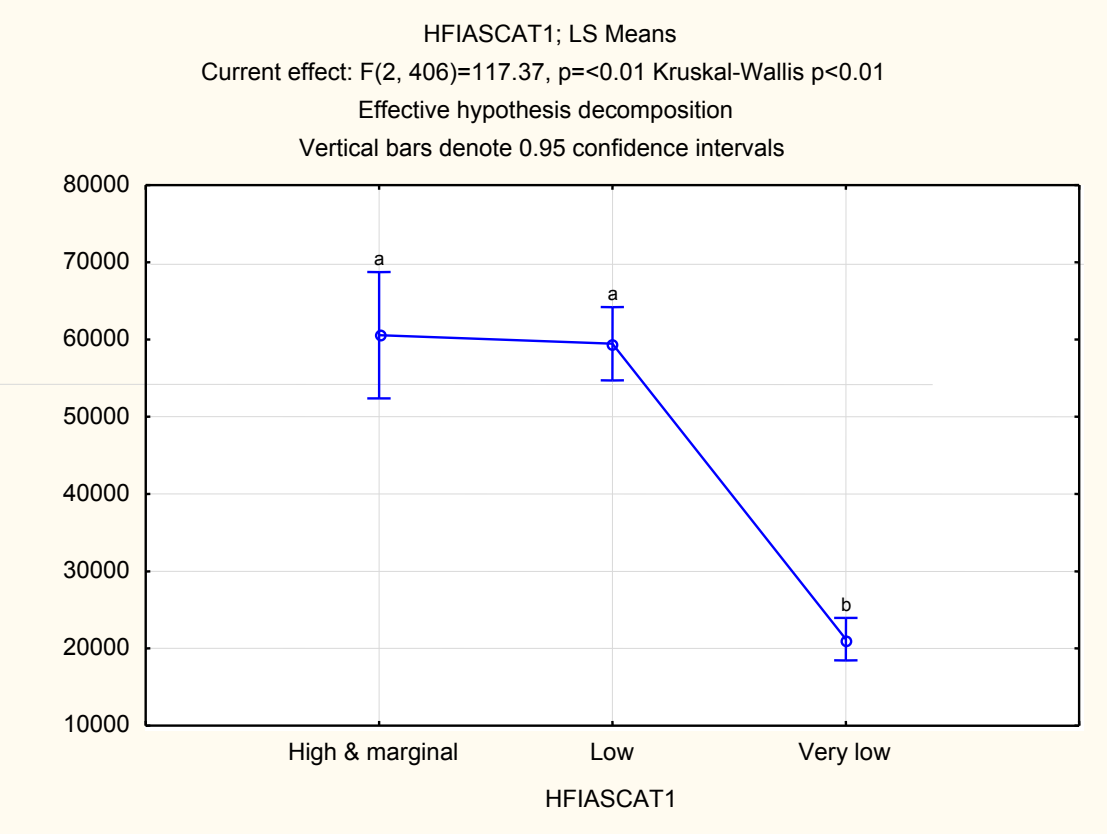
Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw) Level of Factor	N	femaleincome(winsorised) Mean	femaleincome(winsorised) Std.Dev.	femaleincome(winsorised) Std.Err	femaleincome(winsorise -95.00%
Total		393	19482.76	20931.12	1055.835	1740
HFIASCAT1	High & marginal	27	54844.56	11507.25	2214.572	5029
HFIASCAT1	Low	93	32497.69	23354.23	2421.721	2768

totalhhexpenditure(winsorised) | HFIASCAT1

HFIASCAT1; LS Means

totalhhexpenditure(twinsorised)



LSD test; variable totalhhexpenditure(winsorised) (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

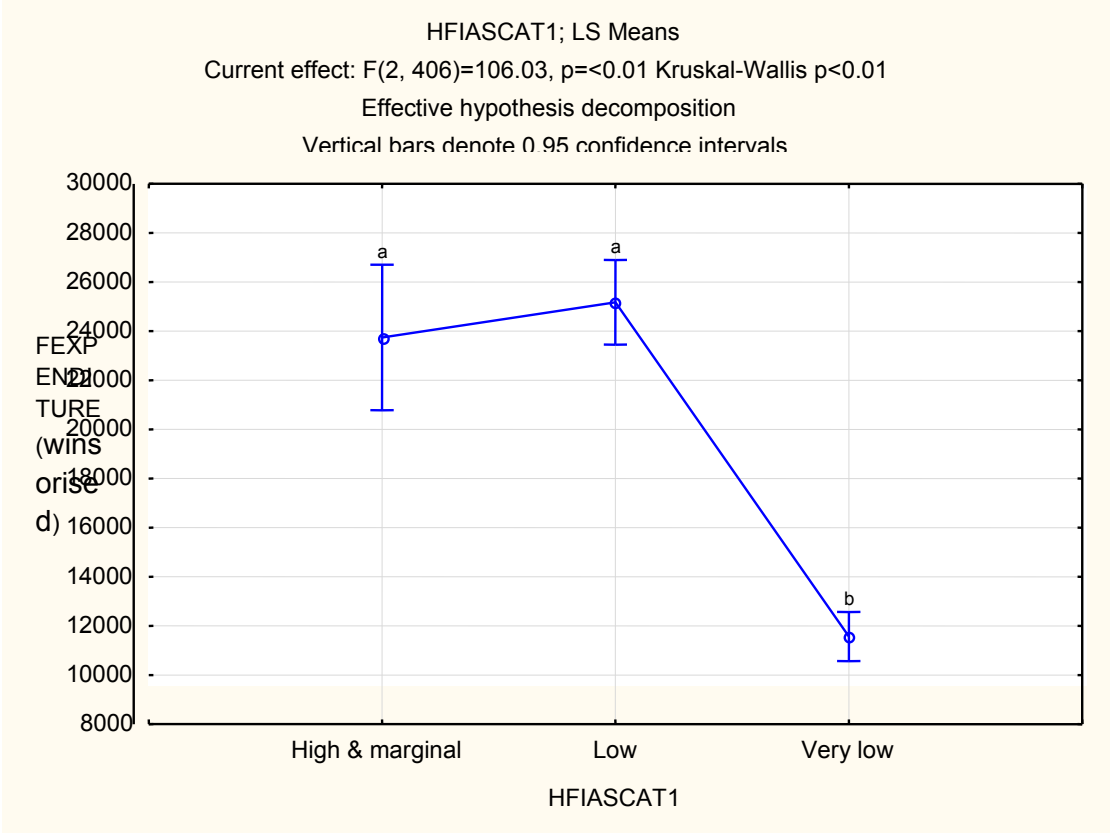
Cell No.	LSD test; variable totalhhexpenditure(trimmed) (FSNigeria_ Probabilities for Post Hoc Tests Error: Between MS = 5539E5, df = 406.00 HFIASCAT1	{1} 60566.	{2} 59456.	{3} 21206.
1	High & marginal		0.817743	0.00
2	Low	0.817743		0.00
3	Very low	0.000000	0.000000	

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw) Level of Factor	N	totalhhexpenditure(winsorised) Mean	totalhhexpenditure(winsorised) Std.Dev.	totalhhexpenditure(winsorised) Std.Err	totalhhexpenditure(w -95.00%
Total		409	33169.92	29494.11	1458.390	
HFIASCAT1	High & marginal	32	60565.59	31641.03	5593.397	
HFIASCAT1	Low	95	59456.29	29344.02	3010.633	
HFIASCAT1	Very low	282	21205.85	20046.15	1193.731	

FEXPENDITURE(winsorised) | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable FEXPENDITURE(winsorised) (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

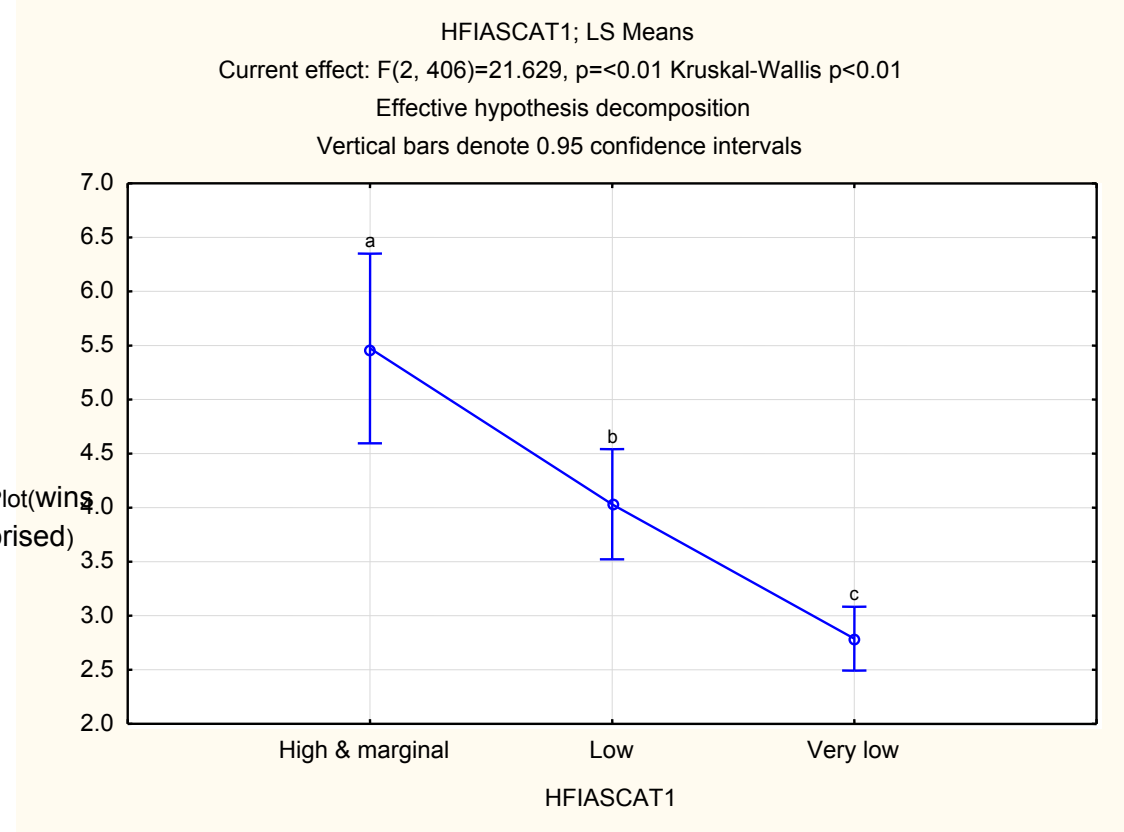
Cell No.	LSD test; variable FEXPENDITURE(winsorised) (FSNigeria_H Probabilities for Post Hoc Tests Error: Between MS = 7272E4, df = 406.00 HFIASCAT1	{1} 23746.	{2} 25176.	{3} 11566.
1	High & marginal		0.412302	0.000000
2	Low	0.412302		0.000000
3	Very low	0.000000	0.000000	

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw) Level of Factor	N	FEXPENDITURE(winsorised) Mean	FEXPENDITURE(winsorised) Std.Dev.	FEXPENDITURE(winsorised) Std.Err	FEXPENDITURE(winsorised) -95.00%	FE
Total		409	15680.41	10495.49	518.969	14660.22	
HFIASCAT1	High & marginal	32	23745.68	9809.54	1734.098	20208.97	
HFIASCAT1	Low	95	25176.10	9022.39	925.678	23338.14	
HFIASCAT1	Very low	282	11566.30	8198.55	488.217	10605.28	

Plot(winsorised) | HFIASCAT1

HFIASCAT1; LS Means



LSD test; variable Plot(winsorised) (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

	LSD test; variable Plot(winsorised) (FSNigeria_HH Profiles Ta Probabilities for Post Hoc Tests Error: Between MS = 6.3794, df = 406.00			
Cell No.	HFIASCAT1	{1} 5.4741	{2} 4.0317	{3} 2.7880
1	High & marginal		0.005453	0.000000
2	Low	0.005453		0.000040
3	Very low	0.000000	0.000040	

Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)

Effect	Descriptive Statistics (FSNigeria_HH Profiles Taraba FINAL2_15Jul14.sav2 in results.stw)						
	Level of Factor	N	Plot(winsorised) Mean	Plot(winsorised) Std.Dev.	Plot(winsorised)	Plot(winsorised) -95.00%	Plot(winsoris +95.00%
Total		409	3.287058	2.650376	0.131053	3.029435	3.544
HFIASCAT1	High & marginal	32	5.474074	4.054011	0.716655	4.012447	6.935
HFIASCAT1	Low	95	4.031714	2.509936	0.257514	3.520414	4.543