Determinants of Households' Food Demand in Nigeria

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Abstract: Food crisis in Nigeria has been on the rise with the worsening effect on food security situation in the country. Studies have focused on state sectoral or zonal investigation of households' food demand in Nigeria. However, investigation of households' food demand has received little attention at the National level, necessitating this study. Cross sectional data obtained from the Nigerian Living Standard Survey (NLSS) of 2004 by National Bureau of Statistics was employed. A total of 18,861 households units with relevant variables of interest were used. Prices of different food groups were obtained from Prices of Selected food Items (2004) by NBS. Data used were households' socio-economic characteristics; prices, quantity purchased and expenditure on different food groups (staple (STP), animal protein (AP), fats and oils (FT), fruits (FR) and vegetables (VG)). Data were analyzed using descriptive statistics and Quadratic Almost Ideal Demand System (QUAIDS) models at p=0.05. The mean age and house size were 47.4±5.35 and 4.85±2.90. Staple was the mostly consumed food group with highest expenditure of N10, 599.6, while fruits is least consumed with lowest expenditure of N374.Older respondents and households with higher income consume less of fats in Nigeria. Expenditure elasticities (Ey) of all the food groups, with the exception of fats and fruits are less than unity. Income smoothening and stability of food prices is an option in ensuring adequate food demand.
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Problem Statement

The global food crisis ("silent Tsunami" or the "perfect storm") affects 2 billion people in the world, of which currently 850 million people face extreme hunger and 25,000 people die each day from starvation. Of the 37 most affected countries, 21 are in Africa. More than 95% of chronically undernourished people live in developing countries (ECOSOC 2008). According to FAO (2008), food consumption in kcal/person/day in Nigeria increased from 2370 in 1990-1992 to 2560 in 1995-1997 and finally 2600 in 2003-2005, with percentage of undernourished population decreasing from 15**%,** in 1990-1992 to 10% in 1995-1997 and finally to 9 percent in 2003-2005. In absolute terms, though there was a decrease in undernourished population in Nigeria from 14.7 million in 1990-1992 to 10.8 million in 1995-1997, this figure increased to 12.5 million people in 2003-2005. Also, according to Olarinde and Kuponiyi 2005, households 'consumption of carbohydrate/starchy food is significantly higher (N3, 465.13) than of protein and vitamins (N750.54 and N191.43) respectively. In Nigeria, majority of people within the country is food-insecure because of high prevailing poverty level and poor performance of the Nigerian agricultural system (Oyefara, 2005). Thus, majority of Nigerians are poor, lack physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs.

A number studies such as (Tsegai and Kormawa,(2002); Okoruwa and Adebayo,(2006)), have examined households food demand either at state, regional or zonal levels, there has however been a dearth of food demand analysis at the national level as this will reveal zonal disparities of households food demand in Nigeria. This study will also be different from that of Akinleye (2007), by examining determinants of households' food demand taking into consideration the different food groups.

From analytical perspective, Many studies (Blanciforti and Green 1983); Abdulai et al, 1999 and Akinleye, 2007) had used Almost Ideal Demand System (AIDS) model in analysing the demand for food with few exploring the Quadratic Almost Ideal Demand System (QUAIDS). Though, Obayelu et al, (2009) used QUAIDS to analyse households' demand for food groups using regional (north central) data obtained from primary source, this study will differentiate itself from theirs, with the analysis of households' food demand for selected food groups using aggregated national data comprising all the zones and sectors. QUAIDS is however preferred to AIDS because it has a property of nonlinear Engel function which is more appropriate to household data (Bank et al, 1997). It also allows more flexibility which is a significant development, especially if the

estimated model is intended for simulation and forecasting purposes. It also provides a unified framework for analyzing the combined effects of changes in prices, income and demographic composition on household food demand in a systematic fashion.

Objectives of the Study

The main objective of this study is to examine the determinants of food among households in Nigeria.

The specific objectives are to:

1. Profile the zonal disparity in households' expenditure on food in Nigeria
2. examine determinants of households' food demand in Nigeria.
3. analyse households responsiveness to food demand with changes in price and income

Justification of the Study

In Nigeria, over 40% of the estimated population is under nourished (Olayemi, 1996). As a result of various forms of deprivation of basic amenities of life, the productivity of most households is reduced and their ability to utilize food to their maximum benefit is hampered. The resultant effect of these problems being faced by these households is that most of them are not having enough to subsist on, the year round. They are therefore closely identified with poverty and food insufficiency. (Olarinde and Kuponiyi, 2005). To achieve the Millennium Development Goals of halving the proportion of hungry people by 2015, it was projected that 22 million people must achieve food security every year. It is however worthy of note to examine households' demand for different food groups as this would throw more light on the food consumption/expenditure pattern of households in the country.

Based on aforementioned, profiling households' food expenditure in Nigeria will allow zonal comparisons of households' expenditure pattern on food. This will however reveal the more vulnerable zone(s) with the attending food demand/consumption smoothening and income enhancing strategies that will be adopted for the vulnerable region(s).

Also determining households' food demand provides information on the specific factors influencing demand for food, with appropriate food policy intervention measures that could be adopted with the ultimate aim of achieving households' food security.

Methodology

3.1 Description of Data Collection Procedure

This study made use of secondary data collected during the 2003/2004 Nigeria Living Standard Survey (NLSS) by National Bureau of Statistics (NBS).

The sample design was a 2-stage stratified sampling. The first stage involved the random selection of 120 housing units from the Enumerations Areas (EAs) in each state and the FCT. The second stage was the selection of 5 households from each Enumeration Areas making a total number of 600 households randomly selected and interviewed in each state and 300 households in the FCT. In all, a total number of 21,900 households were sampled across the country (NBS, 2005) of which a total of 18,861 households were used for the final analysis.

Methods of Data Analysis

Descriptive statistics such as, frequency percentage and expenditure share was used to determine the households' socio-economic characteristics and expenditure on food groups' i.e. staples, animal protein, fats and oil; fruits and vegetables. Quadratic Almost Ideal Demand System (QUAIDS) model was used to determine the factors determining households' food demand in Nigeria.

Quadratic Almost Ideal Demand System (QUAIDS) derived by Banks et al, (1996 and 1997) was used to describe consumer behaviour. It is a rank three budget share system that is quadratic in the logarithm of total expenditure. It has the attractive property of allowing goods to have the characteristics of luxuries at low levels of total expenditure, say, and necessities at higher levels. The QUAIDS which is derived from a generalisation of the PIGLOG preferences starts from an indirect utility function of the form:

$$\ln V = \left\{ \left[\frac{\ln m - \ln a(p)}{b(p)} \right]^{-1} + \lambda(p) \right\}^{-1} \qquad (5)$$

Where the term [In m - *In a(p)]/b(p)* is the indirect utility function of the PIGLOG demand system (i.e., a system with budget shares linear in log total expenditure), *m* indicates household income, and a(p), *b(p)* and λ*(p)* are functions of the vector of prices *p.* To ensure the homogeneity property of the indirect utility function, it is required that

a(p) is homogenous of degree one in p, and *b(p)* and λ*(p)* homogenous of degree zero in *p.* The In *a(p)* given in equation (5) has the usual translog form:

$$\ln a(p) = \alpha_o + \sum_j \alpha_j \ln p_j + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j \quad \text{---------- (6)}$$

and *b(p)* is the simple Cobb-Douglas price aggregator defined as

$$b(p) = \prod_{i=1}^{n} p_i^{\beta_i} \quad \text{---------- (7)}$$

λ*(p)* is defined as

$$\lambda(p) = \sum_{i=1}^{n} \lambda_i \ln p_i \quad \text{Where} \quad \sum_i \lambda_i = o \quad \text{---------- (8)}$$

By applying Roy's identity to the indirect utility function, the budget shares in the QUAIDS is given as

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{m}{a(p)}\right] + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}^2 \quad \text{---------- (9)}$$

As shown in equation (9), Banks et al (1997) and Abdullahi et al, (2001), show that the coefficients of the quadratic term in these demand functions must depend on price. This however goes contrary to the quadratic extension of the AIDS model in Blundell, et al (1993) where the quadratic term is price independent. In order to ensure theoretical consistency and to reduce the number of parameters to be estimated, additivity, homogeneity and symmetry restrictions are normally imposed. A sufficient condition for the expenditure shares to be homogenous of degree zero in prices is: $\sum_i^n \gamma_{ij} = 0, \forall i.$ Symmetric changes in compensated demand functions can be imposed by setting $\lambda_{ij} = \gamma_{ji,} \forall i \neq j.$ Additivity requires $\sum_{i=1}^{n} \alpha_i = 1$ and $\sum_{i=1}^{n} \beta_i = 0$ .These conditions are trivially satisfied for a model with *n* goods when the estimation is carried out on a subset of n - 1 independent equations. The parameters of the dropped equation are then computed from the restrictions and the estimated parameters of the *n* - 1 expenditure shares. Following the works of Banks et al, (1996 and 1997), demographic effects were included to influence preferences through the intercept in equation (9), as

$$\alpha_i = \rho_{io} + \sum_{j=1}^{s} \rho_{ij} d_j \quad \text{---------- (10)}$$

Where *dj* is the *jth* demographic variable of which there are *S.* This translating approach is used to include the demographic variables because of its simplicity (Pollak and Wales, 1978).

Therefore, from equation 9 and 10

Ij = food groups; αi, λ β γ are parameters to be estimated

Wi = Average budget share of item i by the household

αi = Average value of budget share in the absence of price and income effects.

β = parameters that determine whether goods are luxuries or necessities

γ_{ij} = Effects on the budget of item i of 1% change in the prices of items in group j

Pj = price of item j

d_j = Vectors of socioeconomic and demographic variables.

Ui = error term.

The budget share of individual food group was calculated as

$W_{GI} = (P_{GI.} q_{GI}) / X_G$ - budget share of the ith good in group G, relative to total expenditure in group G; G – Specific group with G = 1,2,3……, N

P_{GI} and q_{GI} - the price and quantity of ith good in group G

$W_G = \frac{X_G}{X}$ - The budget share of group G ---------- (11)

$X_G = \sum P_{Gi} q_{Gi}$ - total expenditure in group G ---------- (12)

X = Total expenditure of the food groups

The state prices of the food items categorized into different food groups were obtained from prices of selected food items obtained from National Bureau of Statistics. Socio economic and demographic variables to be used are:

Socio-economic characteristics
Age = Age of household head (years)
Gender = Gender of household head (1 = mal e, 0 = female)
Maritalstat = Marital status (1= married, 0 otherwise)
HH size = Household Size
Income = Household income (N)

Physical capital
Ownland = Land ownership ((1= Own land, 0 otherwise)
Houseown = House ownership (1= Own house, 0 otherwise)
Housingtype = Housing type (1= concrete/cement, 0 otherwise)
Renthh = Expenditure on rent= (₦)
Nfdfqtot = Expenditure on frequently consumed non-food items = (₦)
Nfdinfqtot = Expenditure on infrequently consumed non-food items= (₦)
Tasset = Total asset (₦)

Social capital variables
Creditamount = Amount of credit obtained (₦)
Commmemb = Membership of social organization (1= Yes, 0 otherwise)
Remittance = Household remittance (₦)

Human capital variables
Pryoccup = Primary occupation of household head (1= Farming, 0 otherwise)
Everattend = ever attended school (1= yes, 0 otherwise)
Edtexp = Expenditure on education (₦)

Regional dummies
Rural = (1= rural, 0 otherwise)

Zonal dummies
North East = (1= North East, 0 otherwise)
North West = (1= North West, 0 otherwise)
North-central = (1= North-central, 0 otherwise)
South east = (1= South east, 0 otherwise)
South west = (1= South west, 0 otherwise)

Prices of food groups
Pstaple = Price of staples/grain equivalent (₦)
PAP = Price of Animal protein/grain equivalent (₦)
Pfruit = Price of fats and oil/grain equivalent (₦)
Pfats = Price of fruits/grain equivalent (₦)
Pveg = Price of vegetables/grain equivalent (₦)

The formulae for the elasticities in the QUAIDS are given by Banks et al, (1997). They are obtained by first differentiating equation (11) with respect to ln m and ln pj, respectively, to obtain:

$$\mu_i = \frac{\partial w_i}{\partial \ln m} = \frac{2\lambda_i}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\} \quad (13)$$

$$\mu_{ij} = \frac{\partial w_i}{\partial \ln p_j} = \gamma_{ij} - \mu_i\left(\alpha_j + \sum_k \gamma_{jk} \ln P_k\right) - \frac{\lambda_i \beta_j}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}^2 \quad (14)$$

The expenditure elasticities are then derived as

$$e_i = \mu_i / w_i + 1. \quad (15)$$

The uncompensated or Marshallian price elasticities are given by $e_{ij}^u = \mu / w_i - \delta_{ij}$ where δ_{ij} is the kronecker delta, which is equal to one when $i = j$, otherwise $\delta_{ij} = 0$. Using the Slutsky equation, $e_{ij}^c = e_{ij}^u + w_j e_i$, the compensated or Hicksian price elasticities can be calculated and used to assess the symmetry and negativity conditions by examining the matrix with elements $w_i\left[e_{ij}^c\right]$, which should be symmetric and negative semi-definite in the usual way.

Results

Table 1: Socio economic Characteristics of Households in Nigeria

Variables	Frequency	Percentage
Sector		
Rural	14,361	76.14
Urban	4,500	23.86
Zone		
South-South	2,854	15.13
South-East	2,681	14.21
South-West	2,993	15.87
North-Central	3,331	17.66
North-East	3,202	16.98
North-West	3,800	20.15
Age		
<40	7193	38.13
41-60	8350	44.27
>60	3318	17.60
Mean	47.40	
Standard Deviation	5.3469	
Gender		
Male	16,166	85.71
Female	2,695	14.29
Marital Status		
Married	14,730	78.09
Single	1,169	6.20
Divorced	238	1.26
Separated	583	3.10
Widowed	2,141	11.35
Household Size		
1-5	12316	65.30
6-10	5683	30.13
>10	862	4.57
Mean	4.85	
Standard Deviation	2.904	
Adult Equivalent		
>2	4189	22.20
2-4	7597	40.28
4-6	4614	24.46
>6	2461	13.05
Mean	3.70	
Standard Deviation	2.199	
Educational Level		
No formal Education	9,181	48.67
Primary	3070	16.28
Secondary	4409	23.38
Tertiary	2201	11.67
Religion		
Christianity	9,651	51.17
Islam	8,570	45.44
Traditional	593	3.14
Others	47	0.25

Households' Socio economic Characteristics

As shown in table 1, 76.14% of total respondents sampled were from rural sector, while 23.86% were from urban. Profile of respondents across geopolitical zones revealed that North western

zone had the highest of 20.15%, followed by North-central and North-eastern zones. The southern divide (South-west, South-south and South-east) however followed the trend in descending order with South Eastern having the least of 14.21%. Also, 85.71% of the households sampled were headed by male with 24.29% been headed by female. Respondents' age distribution shows that majority of the sampled population (44.27%) were within the age range of 41-60, closely followed by age group <40 (38.13%). Mean age of 47.4 shows that the respondents are still in their active age range. Above 78% of the sampled respondents were married, while others were single, separated, divorced or widowed. Majority of the respondents (65.30%) had 1-5 household members. The mean household size of 5 indicates that the sample population had a moderate household size. Households' adult equivalent also revealed that households' within 2-4 adult equivalent range (40.28%) are most prominent, while the range of >6 is the least (13.05%). Also, 51.17% of the households were Christians, while 45.44% were Muslims.

Table 2 : Households' Expenditure on Food Groups in Nigeria

Food Groups	Data Density	Yearly Expenditure per adult equivalent (N)	yearly Expenditure Share (N)
esS Staples	0.99 (18748)	10,599.6	0.49
Animal protein	0.89 (16835)	4,850.607	0.20
Fats	0.93 (17506)	3,653.383	0.17
Fruits	0.34 (6,502)	374.842	0.03
Vegetables	0.90 (16,977)	2,370.108	0.11
Others	0.69 (13,131)	1,363.348	0.07

Expenditure of Households on Food Groups in Nigeria

As shown in the table 2, data density shows the proportion of the total population that consumes a particular food group. Staples recorded the highest density of 99%, followed by fats, vegetables, and animal protein. Proportion of population that consumes fruits was the least (34%). Similarly, respondents' expenditures per adult equivalent on a particular food group was found to be highest for staples (N10, 599.6), followed by animal protein and fats. Fruits however recorded the least of N374.842. Also, about 49% of households' total food expenditure is on staples, while that of animal protein and fats are 20% and 17% respectively. Expenditure share on fruits however constitutes 3% of the households' total food expenditure.

Table 3: Households' Expenditure on Food Groups in South Southern Zone

Food Groups	Data Density 2,854	Yearly Expenditure per adult equivalent (N)	yearly Expenditure Share (N)
esS Staples	0.995(2841)	12,868.13	0.434
Animal protein	0.984(2808)	8,642.036	0.265
Fats	0.984(2808)	4,333.399	0.15
Fruits	0.446(1274)	560.6353	0.037
Vegetables	0.971(2772)	2,510.521	0.083
Others	0.845(2414)	2,018.57	0.073

Table 4: Households' Expenditure on Food Groups in South Eastern Zone

Food Groups	Data Density 2,681	Yearly Expenditure per adult equivalent (N)	Yearly Expenditure Share (N)
esS Staples	0.999 (2678)	15,498.5	0.456
Animal protein	0.986(2643)	7,386.16	0.219
Fats	0.993(2661)	4,995.645	0.150
Fruits	0.570(1530)	1,082.789	0.043
Vegetables	0.982(2634)	3,278.07	0.097
Others	0.869(2331)	2,093.746	0.069

Table 5: Households' Expenditure on Food Groups in South Western Zone

Food Groups	Data Density 2,993	Yearly Expenditure per adult equivalent (N)	yearly Expenditure Share (N)
esS Staples	0.996(2982)	12,073.22	0.495
Animal protein	0.875(2619)	5,402.555	0.213
Fats	0.889(2660)	4,321.779	0.174
Fruits	0.243(728)	267.419	0.031
Vegetables	0.870(2603)	2,878.184	0.118
Others	0.676(2025)	1,688.692	0.008

Table 6: Households' Expenditure on Food Groups in North-Central Zone

Food Groups	Data Density 3,331	Yearly Expenditure per adult equivalent (N)	yearly Expenditure Share (N)
esS Staples	0.993(3308)	8,943.37	0.611
Animal protein	0.714(2379)	2,782.113	0.179
Fats	0.745(2483)	2,568.738	0.178
Fruits	0.272(907)	195.127	0.039
Vegetables	0.702(2339)	1,837.603	0.116
Others	0.556(1851)	868.666	0.070

Table 7: Households' Expenditure on Food Groups in North-Eastern Zone

Food Groups	Data Density 3,202	Yearly Expenditure per adult equivalent (N)	yearly Expenditure Share (N)
Staples	0.993(3178)	7,010.659	0.430
Animal protein	0.937(3001)	12,413.84	0.200
Fats	0.989(3165)	3,344.532	0.194
Fruits	0.365(1170)	200.2082	0.030
Vegetables	0.960(3075)	2,064.716	0.130
Others	0.737(2360)	998.067	0.080

Table 8: Households' Expenditure on Food Groups in North-Western Zone

Food Groups	Data Density 3,800	Yearly Expenditure per adult equivalent (N)	yearly Expenditure Share (N)
esS Staples	0.990(3761)	8,754.804	0.494
Animal protein	0.891(3385)	2,861.679	0.173
Fats	0.981(3729)	3,062.005	0.198
Fruits	0.235(893)	125.1247	0.024
Vegetables	0.935(3554)	1,947.996	0.114
Others	0.566(2150)	841.1022	0.090

Households' Expenditure on Food Groups by Zone

Households living in South- southern zone also consume staples the most with expenditure per adult equivalent and expenditure share of N12,868.13 and 0.434 respectively (table 3), while fruits is the least consumed food group with expenditure per adult equivalent and expenditure share of N560.63and 0.037 respectively.

The trend is also the same for South-eastern households with highest expenditure per adult equivalent and expenditure share of N15,498.5 and 0.456 on staples and least on fruits (N1,082.789 and 0.043) respectively, as shown in table 4.

In South-western zone however, the three mostly consumed food groups are staples, animal protein and fats, with households' expenditure per adult equivalent and expenditure share of staples being the highest of N12, 073.22 and 0.495 respectively. The least consumed food group however is fruits with expenditure per adult equivalent and expenditure share of N267.419 and 0.031 respectively (table 5).

As shown in table 6, the three mostly consumed food groups in North-central are staples, animal protein and fats, with staples leading the pack with expenditure per adult equivalent and expenditure share of N8,943.37 and 0.611 respectively.

Households in this zone however consume less of fruits with per adult equivalent expenditure and expenditure share of N195.127 and 0.039 respectively.

However in North-Eastern zone, households consumed more of staples, animal protein and fats (table 7). As expected, staples are the mostly consumed food group with expenditure per adult equivalent and expenditure share of N7, 010.65 and 0.430 respectively. Fruit was however the least consumed food groups (N200.20).

Lastly, more of staples, fats and animal protein are consumed by North-western households, with staples recording the highest expenditure per adult equivalent and expenditure share of N8, 754.80 and 0.494 respectively. Fruits however recorded the least expenditure per capita and expenditure share of N125.12 and 0.024 respectively as depicted in table 8.

Across zones, the proportion of total expenditure spent on staple is highest in North-central zone (0.611); though households' per adult equivalent expenditure on staple is highest in South-eastern zone. This implies that major share of food expenditure of North-central households is on staple.

It is however evident that, households across sectors and zones mostly demand for staple than any other food groups as evident in their respective expenditures per adult equivalent and expenditure shares on staples.

Table 9: Households' Consumption of Food Groups in Nigeria

Qty of food per Adq (grain equivalent)	
POOLED	164.276
ZONES	**Qty of food per Adq (grain equivalent)**
South-south	181.304
South-East	231.427
South-West	195.958
North-central	133.934
North-east	120.2332
North-west	142.8665

Table 10: Households' Expenditure on Non-Food Items in Nigeria

Non-Food Items	**Data Density**	**Minimum (N)**	**Maximum (N)**	**Mean (N)**	**Standard Deviation (N)**
Education	0.40(7593)	.982801	165800.9	4089.056	8904.733
Health	0.56(10529)	1.06383	2903333	9879.866	43927.98
Rent	1.00 (18861)	142.1801	214918	4331.13	5688.628
Frequent Non-food	0.90 (16950)	4.219653	426,128.3	5,634.276	12,321.93
Infrequent Non-Food	0.70 (13235)	.1567398	2033035	4569.656	20077.17

Table 11: Households' Expenditure on Non-Food Items across Zones

Non- Food Items (N)	**South-South**	**South-east**	**South-west**	**North-central**	**North-east**	**North-East**
Education	5475.718	3689.803	6752.824	3242.284	1843.785	1436.453
Health	11495.44	16398.56	10516.71	9090.693	6531.82	5021.121
Rent	5161.065	5171.623	7106.415	3963.184	2846.639	2502.326
Frequent Non-food	8785.828	6283.187	8499.135	4784.486	4784.486	3082.746
Infrequent Non-Food	5022.256	4529.355	7617.962	4054.854	3947.777	3076.871

Across sectors however, South-east zone recorded the highest food consumption, with north-eastern zone consuming the least representing 66% of that of south-eastern zone (table 9).

Table 10 shows households' expenditure o non-food items. The profile revealed that households expended most on health and least on education. Also in table11, expenditure of households on non-food items across zones revealed that highest households' expenditure is on health with the least being on education across the northern divide. North-central households however spend the most on education and health (N3, 242.28 and N9, 090.69). Households residing in the north-west zone spend the least on education and health (N1, 436.45 and N3, 021.12) across the northern divide. Highest expenditure on education in the northern divide recorded by households in the north-central zone however represents 88% of the least expenditure in the southern divide (N3689.80 in south-east) and 48% of the highest expenditure on education, which is N6,752.82 in South-west.

Table 12: Households' Expenditure on Food and Non-Food Items across Zones

	Food		Non-Food	
Zones	**Yearly Expenditure per adult equivalent (N)**	**yearly Expenditure Share (N)**	**Yearly Expenditure per adult equivalent (N)**	**yearly Expenditure Share (N)**
Pooled data	23,211.89	0.59	19,762.64	0.41
South-South	30,933.3	0.59	27,026.79	0.41
South East	34,334.91	0.60	28,101.8	0.40
South-West	26,631.85	0.50	28,127.05	0.50
North-Central	17,195.62	0.55	15,825.78	0.45
North-East	16,746.99	0.61	13,589.93	0.39
North-West	17,592.71	0.67	10,487.61	0.33

Table 12 shows that households in Nigeria spend more on food (N 23,211.89) than non-food items (19,762.64), with 59% of the total expenditure being on food and 41% on non-food items. Zonal classification of food and non food households' expenditure as depicted in table 23 revealed that highest households' expenditure per adult equivalent on food (N34,334.91) was noticed in South-eastern zone while, South-western zone recorded the highest expenditure per adult equivalent on non-food items(28,127.05). North-East zone however recorded the least expenditure on food (N16, 746.99), with North-western zone consuming the least of non food items (N10, 487.61).

Also, expenditure share is higher on food items (59% for South-south, 60% for South-east, 50% for South-west, 55% for Nor-central, 61% for North-East and 67% for North-west respectively) than on non food items(41% for South-south, 40% for South-east, 50% for South-west, 45% for North-central, 39% for North-east and 33% for North-west, respectively) in all the six zones.

However, expenditure share gap between food and non-food items is most prominent in North-central zone (0.67 and 0.33), and least prominent in South-western zone (0.5 and 0.5 respectively).

Table 13: Determinants of Households' Food Demand in Nigeria

Variable	**Staple**	**Animal protein**	**Fruit**	**Fat**
Price Coefficients				
Pstaple	0.593906 (4.43)***			
PAP	0.1603491(30.15)***	0.207301(2.22)**		
Pfruit	0.0048708 (3.10)***	-0.0046285(-3.04)**	0.0091237 (5.89)***	
Pfats	-0.222232 (-22.19)***	-0.1786606 (-18.23)***	-0.0068055 (-4.06)***	0.4097978 (197.34)***
Households' Characteristics				
HH size	0.007006 (1.60)	-0.00159 (-0.59)	-0.00055 (-1.77)*	-0.00418 (-0.99)
Ctry-adq	-0.01970 (-3.34)***	-0.01511 (-4.18)***	-0.00093 (-2.22)**	0.036159 (6.38)***
South-South				
South-East	0.004356 (0.66)	-0.01260 (-3.11)***	0.001117 (2.36)**	0.005740 (0.91)
South-west	0.042 (4.34)***	-0.01509 (-2.55)**	0.000062 (0.09)	-0.02919 (-3.20)***
North-central	0.058627 (6.01)***	-0.02660 (-4.54)***	-0.00102 (-1.47)	-0.03139 (-3.39)***
North-east	0.024160 (2.27)**	0.00204 (-0.32)	-0.00014 (-0.18)	-0.02347 (-2.25)**
North-west	0.061936 (5.84)***	-0.02350 (-3.73)***	-0.00096 (-1.28)	-0.03817 (-3.75)***
Edtexp	-1.04e-6 (-10.62)***	-5.28e-7 (-8.80)***	-6.01e-8 (-8.65)***	1.678e-6 (17.84)***
Hltexp	-8.37e-7 (-13.79)***	-4.13e-7 (-11.11)***	-5.63e-8 (-13.08)***	1.353e-6 (23.21)***
Renthh	-7.9e-7 (-5.31)***	-5.22e-7 (-5.72)***	-6.17e-8 (-5.85)***	1.424e-6 (9.96)***
Nfdfqtot	-9.61e-7 (-13.02)***	-3.97e-7 (-8.78)***	-5.85e-8 (-11.18)***	1.465e-6 (20.64)***
Nfdinfqtot	-7.88e-7 (-14.36)***	-4.56e-7 (-13.56)***	-5.71e-8 (-14.66)***	1.346e-6 (25.53)***
Age	0.000343 (1.89)*	0.00044 (0.40)	0.000014 (1.09)	-0.00039 (-2.25)***
Texp	7.836e-7 (14.44)***	4.551e-7 (13.68)***	5.67e-8 (14.73)***	-1.34e-6 (-25.69)***
Ownland	0.021654 (3.88)***	-0.02239 (-6.54)***	0.000942 (2.37)**	-0.00086 (-0.16)
Remittance	-2.11e-8 (-0.12)	-2.64e-8 (-0.25)	-4.8e-9 (-0.40)	4.849e-8 (0.30)

Rural	0.000974 (0.16)	0.000413 (0.11)	0.000335 (0.77)	-0.00177 (-0.30)
Gender	-0.00552 (-0.72)	0.006009 (1.28)	0.000057 (0.11)	0.000965 (0.13)
Maritalstat	-0.00948 (-1.34)	-0.01234 (-2.84)***	-0.00165 (-3.28)***	0.024060 (3.53)***
Pryoccup	-0.00502 (-0.87)	-0.01860 (-5.26)***	0.000322 (0.79)	0.022861 (4.14)***
Everattend	0.005357 (0.98)	0.008959 (2.67)***	0.000275 (0.71)	-0.01481 (-2.81)***
Houseown	0.013024 (2.21)	0.000451 (0.13)	0.000047 (0.11)	-0.01279 (-2.26)**
Housingtype	0.005734 (1.08)	0.000824 (0.25)	-0.00024 (-0.63)	-0.00622 (-1.22)
Tasset	-9.32e-8 (-0.70)	-5.15e-8 (-0.63)	3.918e-9 (0.41)	1.372e-7 (1.07)
Commmemb	-0.01022 (-2.28)**	-0.00017 (-0.06)	0.000031 (0.10)	0.009956 (2.31)**
Creditamount	1.306e-7 (0.67)	-1.05e-7 (-0.87)	-7.93e-9 (-0.57)	-1.51e-8 (-0.08)
Constant	1.013963 (15.17)***	0.814475 (19.74)***	0.059324 (12.42)***	-0.94663 (-14.69)***
R^2	0.15331	0.21900	0.10758	0.28816
Adjusted R^2	0.14499	0.21132	0.09881	0.28116
Prob> F	0.0001	0.0001	0.0001	0.0001
Root MSE	0.12259	0.07528	0.00873	0.11812

Households' Food Demand in Nigeria

Tables 13, presents the factors influencing households' food demand in Nigeria using Quadratic Almost Ideal Demand System (QUAIDS) model. The food groups estimated include staples, animal protein, fats and oil; fruits and vegetables. In order to avoid problem of singularity and additivity in the model, a share equation that is, vegetable was deleted from each demand model, thereby necessitating the estimation of four food demand models as systems of linear equations. The demand model was found to be significant at $p<0.01$. The R^2 values are 15.33%, 21.19%, 10.75% and 28.81% for staples, animal protein, fruits and fat respectively in Nigeria.

Factors influencing households' demand for staple in Nigeria as shown in table 23 were: prices of staple, animal proteins, fruits and fats; South-western, North-central, and North-western zones; expenditures on education, health and rent at $p<0.01$. Others include expenditures on frequent and infrequent non-food items; adult equivalent and household size. At $p<0.05$, North-eastern zone, house ownership and community membership were significant. Age and house ownership were however significant at $p<0.1$.

Households' budget share on staples increases with increase in prices of staple, animal protein and fruits; while it decreases with increase in price of fats. The demand for staple was also higher in South-western, North-central, North-eastern and North-western zones relative to South-southern zone. Respondents that are older, own land and house; and possess higher income consume more of staples (Omonona et al, 2008). The reverse is however the case for households that incur more expenses on non-food items (education, health, rents, frequent and infrequent), Akinleye, 2007. Also, households that have higher proportion of adult household members and that also belong to community based organization demand less of staples.

The demand for animal protein was also determined by price of fats; South-eastern, North-central, and North-western zones; expenditure on non-food items (education, health, rent, frequent and infrequent) at $p<0.01$. Prices of animal protein and fruits; adult equivalent, marital status, primary occupation, school attendance and income are also significant at one percent. South-western zone is however significant at 5 percent.

Demand for animal protein increases with increase in price of animal protein and decreases with increase in prices of fats and fruits. Households demand for animal protein was found to be lower in South-eastern, South-western, North-central, and North-western zones relative to South-southern zone. Likewise, households that spend more on non-food items (education, health, rents, frequent and infrequent) consume less of animal protein, Akinleye, (2007). In similar vein, households that are farmers, married, (Obayelu et al, 2009) own land and have higher proportion of adult members demand less of animal protein. Preference for animal protein was however noticed in households that have attended school and possess higher income (Okoruwa et al, 2008).

Households' demand for fruits is influenced by prices of fruits and fats; expenditures on non-food (education, health, rents, frequent and infrequent) items; marital status and income at one percent. South-eastern zone, land ownership and adult equivalent are however significant at 5 percent. Household size is significant at 10 percent.

Households' demand for fruits is increased by increase in price of fruits and decrease in price of fats. Households that incur more expenses on non-food (education, health, rents, frequent and infrequent) items tend to consume less of fruits, so do households that are married with large household size (Obayelu et al, 2009) and higher proportion of adult members. The demand for fruits however increases with increase in respondents that reside in South-east zone, own land and belong to higher income group (Abdullahi, 2001).

Factors determining households' demand for fats are: price of fats, South-western, North-central, and North-western zones; expenditure on non-food (education, health, rents, frequent and infrequent) items at $p<0.01$. Others include marital status, primary occupation, and income. At 5 percent however, North-eastern zone, age, school attendance, house ownership and community membership are the determinants. Demand for fats is less in South-western, North-central, North-eastern and North-western zones relative to South-southern zone. Also, respondents that are older, own house, possess higher income (Abdullahi, 2001) and have attended school consume less of fats. Increased households' expenditures on non-food (education, health, rents, frequent and infrequent) items favour households' demand for fats, so do respondents that are farmers, married and those that belong to community based organization.

Table 14: Price and Income Elasticity Estimates in Nigeria
(Marshallian/Uncompensated)

	PSTP	PAP	PFR	PFT	PVG	INCOME	
STP	-1.52305	0.12379	-0.00776	-1.95517	-0.02966	0.84720	
AP	-0.75435	-1.71387	-0.06978	-4.83987	-0.02774	0.93596	
FR	-92.71023	-44.37974	-0.88420	-184.7706	-2.73622	1.45190	
FT	-1.13822	-0.68698	-0.03422	-1.46682	-0.02618	1.11866	
VG	-33.92873	-15.24449	-1.02503	-65.95073	-1.14176	0.88621	

(Hicksian/Compensated)

	PSTP	PAP	PFR	P FT	PVG	
STP	-1.21829	0.24760	-0.00397	-1.54678	-0.02320	
AP	-0.41766	-1.57710	-0.06559	-4.38869	-0.02060	
FR	-92.18793	-44.16756	-0.87777	-184.0707	-2.72516	
FT	-0.73581	-0.52351	-0.02921	0.92758	-0.01765	
VG	-33.60993	-15.11498	-1.02107	-65.52354	-1.13501	

Elasticity Estimates of Food Groups in Nigeria

Table 14 reports the uncompensated and compensated price elasticities, as well as income (expenditure) elasticity in Nigeria using QUAIDS specification. It was observed that expenditure elasticities for all the food groups are positive (Okoruwa et al, 2008; Abdullahi, 2001 and Obayelu, 2009) ranging from 0.84 - 1.45. However, all the food groups, except fats and fruits are normal goods having values less than unity. That is, as income increases, the proportion of income expended on these food groups decreases. However, fats and fruits are luxury goods, having elasticity greater than 1. Compensated and uncompensated own price elasticities, as shown in the diagonal matrix are also negative with the exception of fats in the Marshallian elasticity table, thereby satisfying the negativity property of own price effects. This indicates that an inverse relationship exists between price and demand of such food groups. However, uncompensated own price elasticities of the food groups reveal that all are elastic (with absolute values greater than unity), with the exception of fruit with own price elasticity of -0.88. The implication of this is that, a percentage increase in the prices of all the food groups will lead to more than one percent decrease in their demand, with the exception of fruit. The Hicksian/compensated own price elasticity also followed similar trend with staples, animal protein and vegetables being elastic and negative. Fruits and fats were however found to be inelastic with values of -0.87 and 0.92 respectively.

Furthermore, the uncompensated cross price elasticity of staple revealed that all food groups with negative values are complementary goods to staple except animal protein. The values are -0.007, -1.95 and -0.02 for fruits, fats and vegetables respectively. Likewise, all food groups were found to be complementing animal protein, fats, fruits and vegetables in Nigeria as indicated by the negative signs. Similar trend was also observed for compensated cross price elasticities, with the food groups complementing one another, except the existence of cross price substitution between staple and animal protein.

Conclusion

The study has attempted to x-ray food demand of households in Nigeria. The study made use of 2004 Nigerian Living Standard Survey, comprising of 18,861 households. Households' budget share and expenditure per adult equivalent on food were found to be highest for staples in the pooled data and across the 6 geopolitical zones.

Households' expenditure per adult equivalent and expenditure share on food is also higher than non-food in all the zones except South-west as shown in

table 12. This however indicates that majority of households spend most of their income on food in Nigeria. In the pooled data, results of uncompensated own price elasticity of food revealed that all food groups with the exception of fruits are elastic, though with negative signs; while fruits and fats are inelastic under compensated own price elasticity. The negative signs of all the elastic food groups however indicate more than one percent decrease in demand for the food groups at one percent increase in their prices. The income (expenditure elasticity) results revealed that staples, animal protein and vegetables were considered to be normal goods, while fruits and fats are luxuries.

The regression analysis also revealed that households in the northern divide consume less of animal protein relative to South-south zone. On the other hand, residents that are older, have higher income level and have attended school consume less of fats.

POLICY RECOMMENDATIONS

- Policy option that will smooth households' income and ensure stability of food prices should be implemented to ensure households' access to sufficient and nutritious food in Nigeria.
- There should also be adequate sensitization of northern residents on the nutritional benefits of animal protein consumption.

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