Middle-East Journal of Scientific Research 4 (4): 297-306, 2009
ISSN 1990-9233

Determinants of Daily Food Calorie Intake among Rural and Low-Income Urban Households in Nigeria

[1]S.I. Orewa and [2]C.O. Iyangbe

[1]Department of Agriculture, Benson Idahosa University, Benin-city, Nigeria
[2]Department of Agricultural Economics and Extension Services,
University of Benin, Benin-City, Nigeria

Abstract: Attempt was made in this study to empirically identify the socio-economic and household characteristics that have major impact on the level of food calorie intakes of rural and low-income urban households in Nigeria. Primary data used for the study were derived from a cross-sectional survey of 90 households (made up of 384 household members) in two Local Government Areas (LGAs) of Edo State in Nigeria. The LGAs were Orhionmwon (representing the Rural Area) and Ikpoba-okha (representing the Low-Income Urban Area). A 48-hour recall method was used in obtaining information on the type and quantity of food each household member consumed the previous day and a day after per meal and per day. The calorie content in each food item consumed was determined and used in estimating the proportion in the total food intake of the household members. To identify the variables that had significant influence on household members daily per capita calorie intake, the Ordinary Least Squares (OLS) multiple regression analysis was carried out. The result of the analysis revealed a significant positive relationship between daily per capita calorie intake and household size, age, education level, sex and salary income earners. On the other hand a negative significant relationship was observed between daily per capita calorie intake and dependency ratio and non-engagement in farming. The study recommends that government should launch a major programme to educate the inhabitants on how to improve their daily diets while also encouraging them to take on occupations or businesses that guarantee a steady and reliable monthly income all year round. It also recommends the participation of urban households in farming.

Key words: Determinants · Calorie intake · Rural and urban households · Nigeria

INTRODUCTION

Six characteristics define the economic landscape of Nigeria. These are the massive land resources, huge population and the prevalence of poverty, hunger, malnutrition and unemployment. The first two characteristics describe the potential the economy has, while the last four describe the reality of our situation. The agriculture sector employs about 70 percent of Nigeria's labour force yet poverty is pervasive and more than half of the population live on less than US$1 per day [1]. A concern for the poor, the hungry and the malnourished has always been a part of the value systems of our society. Yet to go beyond individual voluntary efforts and formulate public policies to solve these problems, it is necessary to understand what factors are responsible for them.

The Presidential Commission on World hunger appointed by then President of the United States in the early 1980's argued that the true hunger problem of our time is chronic undernutrition - the problem of millions of men, women and children who do not get enough to eat [2]. This fact was again re-echoed in year 2005 from the survey conducted by Addo [3] to assess the level of protein - energy malnutrition and undernutrition among Nigerians. According to the report Nigerian children below the age of 18 years, who make up 47% of the nation's population, are still victims of stunting, wasting and under -weight, all of which are evidence of under-nutrition. The report further revealed that only 26.6% of under -5 year old children met their Recommended Daily Allowance (RDA) while 18.5% were severely deficient.

Corresponding Author: S.I. Orewa, Department of Agriculture, Benson Idahosa University, Benin-City, Nigeria

The terms malnutrition and under-nutrition are often used interchangeably but in reality the two terms are not equivalent. According to Srinivasan [2] malnutrition can arise not only from inadequate intakes of food but from intakes of improper and unbalanced diets as well. In other words it is a concept that describes situations of insufficient quantity and quality of food intake. Under-nutrition on the other hand defines a pathological state arising from an intake of an inadequate amount of food and hence of calories, over a considerable period of time with reduced body weight as its principal manifestation [4]. Implicit in this definition is the notion that the chief cause of under-nutrition is the inadequate intake of calories. It is this latter case that this paper is focused on.

Specifically attempt is made to empirically identify the influence of some socio-economic and household characteristics on the level of food calorie intakes of Nigerians using rural and low-income households as a case study. The study also examined the calorie consumption patterns among the inhabitants and the contribution of the various food sources to their daily per capita calorie food intake.

MATERIALS AND METHOD

Sampling and Data Collection: The primary data used for this study were derived from a cross-sectional survey of 90 households selected from two Local Government Areas (LGAs) of Edo State in Nigeria. The two LGAs sampled were Orhionmwon and Ikpoba-okha. The two LGAs are located within the rain forest belt of the tropical region in Nigeria. They are inhabited by people who are predominantly of Bini ethnic group. The area is characterized by excessive fertile soil, which greatly enhances agricultural production, particularly food crop production and raising of livestock. The area has bimodal rainfall pattern with the peaks in May/June and September/October and total annual rainfall of between 100 - 200mm.

The communities in Orhionmwon LGA represent the rural area while those of Ikpoba-okha represent the low-income urban area. The primary occupation of the rural inhabitants (Orhionmwon) is agriculture complemented with hunting, trading, etc, while the low-income urban area (Ikpoba-okha) is inhabited by high, medium and low-income salary earners who are more into agriculture, trading, etc.

The survey data which covered the period July-October, 2005 were collected through personal interviews with the aid of structured questionnaire. A total of 460 individuals from the 90 households were interviewed on their daily food intake using a 48-hour recall method. Out of that number, data from 384 household members were found adequate and used for analysis. Children below the age of one year (10 in number) were excluded from the analysis because they were still breast-fed and breast milk intake could not be quantified. Each household member was asked the food he/she consumed the previous day and a day after. The data collected included type of food and quantity consumed per meal/day. The calorific content in each food item consumed were used in estimating the proportion in the total food intake.

Method of Analysis: Data collected were analysed using descriptive statistics, nutrient calorie estimation, multiple regression analysis, income elasticity estimation and marginal propensity to consume. Frequencies, percentages, means, etc, were used to describe the demographic and socio-economic characteristics of the households and their food intake habit/patterns. The food consumption patterns was analysed by grouping the various food items into 11 groups for convenience as shown in Table 1.

Table 1: Categorization of Food Items Consumed by Respondents (In Groups)

Group	Food Items
Roots	Eba, Fufu, Amala, Lafun, Potatoes, Gari, Cocoyam
Tubers	Yam, Pounded Yam, Porridge
Cereals	Rice, Ogi/Custard, Maize, Bread, Biscuits
Legumes	Beans, Moin-moin, Akara, Melon, Groundnut
Vegetable	Vegetables (leafy and fruit), Pepper
Fats and Oil	Butter, Palm Oil, Vegetable Oil
Fruits	Plantain, Orange, Pawpaw, Banana, Garden Egg
Beverages	Tea/Coffee, Sugar, Bournvita/Milo
Meat	Pomp, Beef, Pork, Sheep Meat, Chicken
Fish	Fishes of all kind
Other Animal Product	Milk, Eggs

Calorie Intake Estimation: Food intake records collected were cooked food except in few cases, where the food needs not to be cooked, before consumption (fruits, gari, etc). The estimate of calorie on per capita daily basis was done using the formula below [5].

$$Ci = \sum_{i=1}^{m} AijBj$$

Where:

C_i = Per capita daily calorie (Kcal) intake level of the ^{3th} individual in the study area

A_i = The weight in grams of the average daily intake of food commodity j by the ¡th individual

Bj = The standardize food energy content of the jth food commodity as the case may be.

Also, the calorie intake status was estimated for each household. This is referred to as the household per capita daily calorie intake. This was done by averaging the weighted sum of the individual's nutrient calorie intake using the male adult equivalent. The male adult equivalent refers to the total calorie requirement of a household divide by the calorie requirement of an adult male. An adult male was considered to be a person aged 20 - 45 years [6].

Multiple Regression Analysis: Ordinary Least Square (OLS) multiple regression analysis was also carried out to identify the variables that had significant effect on the daily per capita calorie intake of household members. The model used is explicitly stated as follows:

$$C = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + \text{-------} + b_8 X_8 + e$$

Where:

C = Per capita daily calorie intake of the household members (Kcal)

b_0 = Constant term

b_1- b_8 = Regression Coefficients.

X_1 = Household Size (no of persons in the household)

X_2 = Age of household members (in years)

X_3 = Educational level (years spent in school by the respondent)

X_4 = Household Dependency ratio

X_5 = Household total monthly income (Naira)

X_6 = Household members sex, dummy (1= male, 2 = female)

X_7 = Household members Income source (1 = salary earner; 2 = Non-salary earner)

X_8 = Engagement in farming / Non - farming (1 = farming; 2 = Non - farming).

e = Error term.

RESULTS AND DISCUSSION

Socio-economic and Demographic Characteristics of Respondents: The socio-economic and demographic characteristics of the sampled population are presented in Tables 2 and 3. As shown in Table 2, 62% of the sampled respondents were male and 38% were female in the study area. As much as 92% and 98% of the respondents from the low-income urban and rural areas respectively were regular residents within the households sampled. The average age of the respondents were 40 and 37 years for the low-income urban and rural areas respectively. These fall within the economically active age group. The illiteracy level was however higher among the rural dwellers. Only 62% of the rural household members sampled had formal education as against 92% of the household members in the low-income urban area. This could have significant influence on the nutritional status of households and members as highlighted by Davis [7].

In traditional African culture the household heads play major role in decisions of the home. In Table 3 the characteristics of the household heads at the two locations studied are presented. The study revealed that 95% of the household heads at both locations were male and were usually residing within the household. Their regular presence in the home is expected to have positive impact on the amount of food intake. The mean age of the household heads was 47 years for the rural area and 50 years for the low-income urban area. The distribution however showed that as much as 43% of the low-income urban household heads were over 60 years old (the retirement age group) as opposed to 15% for the rural household heads. This age distribution pattern could have a significant impact on both calorie and protein intake levels as well as the household expenditure patterns.

As regards educational level, a slightly higher percentage (39.1%) of the household heads in the rural area had no formal education as compared to 20.5% for the low-income urban area. Similarly a slightly lower number of the rural household heads had secondary education and more - 17% for the rural area as compared to 48% for the low-income urban household heads. Given this scenario food security in the rural household may be on the threat level, given the fact that, nutritional value judgement / appreciation is expected to be positively correlated with level of education.

Table 2: Socio-Demographic Characteristics of Respondents in Ikpoba-Okha and Orhionmwon LGAs

	Ikpoba-Okha		Orhionmwon		Aggregate	
Demographic Characteristics	Freq	%	Freq	%	Freq	%
1. Sex:						
(a) Male	141	59.2	146	65.8	287	62.4
(b) Female	97	40.8	76	34.2	173	37.6
Total	238	100	222	100	460	100
2. Relation to:						
a. Household						
b. Wife	51	21.4	49	22.1	100	21.7
c. Children	173	72.7	170	76.6	343	74.6
d. Parent	2	0.8	0	0	2	0.4
e. Close relations	10	4.2	3	1.3	13	2.8
f. Distant relations	3	0.8	0	0	2	0.4
Total	238	100	222	100	460	100
3. Residential Status:						
a. Usually resident	220	92.4	218	98.2	438	95.2
b. Not Usually resident	18	7.6	4	1.8	22	4.8
Total	238	100	222	100	460	100
4. Age:						
a. 0-19	54	22.7	49	22.2	103	22.4
b. 20-39	80	33.6	71	32.0	151	32.8
c. 40-59	86	36.1	73	32.9	159	34.6
d. 60-79	12	5.0	20	9.0	32	6.9
e. 80 +	6	2.5	9	4.0	15	3.3
Mean age	39.6		36.64		38.68	
Total	238	100	222	100	460	100
5. Educational level:						
a. No Formal education	18	7.6	84	37.8	102	22.2
b. Primary education	158	66.4	120	54.1	278	60.4
c. Sec. Sch/model/com.sch.	36	15.1	15	6.8	51	11.13.
d. OND/NCE/BSc/HND	27	11.3	3	1.4	30	2002
						6.5
Total	238	100	222	100	460	100

Source: Field Survey, July -Oct. 2005

Table 3: Household Head Characteristics Ikpoba-Okha and Orhionmwon LGAs

	Ikpoba-Okha		Orhionmwon		Aggregate	
Demographic Characteristics	Freq	%	Freq	%	Freq	%
1. Sex:						
(a) Male	42	95.5	46	100	88	97.8
(b) Female	2	4.6	0	0	2	2.2
2. Residential Status:						
a. Usually resident	43	97.7	46	100	89	98.9
b. Not Usually resident	1	2.3	0	0	1	1.1
3. Age:						
a.< 30	8	18.2	6	13.0	14	15.6
b. 30-39	1	2.3	2	4.4	3	3.3
c. 40-49	8	18.2	20	43.5	28	31.1
d. 50-59	8	18.2	11	23.9	19	21.1
e. 60-79	7	15.9	5	10.9	12	13.3
f. > 70	12	27.3	2	4.4	14	15.6
Mean	50.1		47.3		49.32	

Table 3: Conitued

4. Educational level:						
a. No Formal education	9	20.5	18	39.1	27	30
b. Primary education	14	31.8	20	43.5	34	37.8
c. Sec. Sch/model/com.sch.	10	22.7	6	13.0	16	17.8
d. OND/NCE/BSc/HND	11	25.0	2	4.4	13	14.4
5. Occupation:						
a. Not Farmed	13	29.6	1	2.2	14	15.6
b. Farmed	10	22.7	22	47.8	32	35.6
c. Salary/wage earner	9	20.5	3	6.5	12	13.3
d. Non salary/wage earner	12	27.3	20	43.5	32	35.6
6. Household Size						
a. 1 - 3	5	11.4	5	10.9	10	11.1
b. 4 - 6	26	59.1	30	65.2	56	62.2
c. 7 - 9	10	22.7	10	21.7	20	22.2
d. 10 - 12	3	6.8	1	2.2	4	4.4
Mean age	6.42		5.94		6.23	
Total	44	100	46	100	90	100
7. Type of Household:						
a. One person	1	2.3	0	0	1	10.1
b. Married with no child	15	34.1	0	0	15	16.7
c. Married with children	28	63.6	46	10	74	82.2

Source: Field Survey, July -Oct. 2005

The study also revealed that about 48% of rural household heads as compared to 23% in the low-income urban area are farmers. This situation would expose the rural households to less food security problems relative to the low-income urban households, since they cultivate food crops first and to which they have easy access to for consumption. The household size distribution pattern appeared relatively uniform for both locations. For household type, 64% of household heads in the low-income urban area were married with children while all the rural household heads were married with children. This rural household structure definitely has a greater demand and expectation in meeting the household food security needs.

Food Consumption Pattern among the Low-income Urban Dwellers (Ikpoba-okha) and the Rural Dwellers (Orhionmwon) by Sex and Age: Food consumption patterns refers to the food eating habits, showing what constitutes t he food basket, of an individual or group of people (e.g. household) in a particular location [5]. The breakdown of the food eating habits of the low-income urban and rural dwellers by sex and age in terms of food calorie intake are presented in Tables 4 and 5 respectively. Specifically, the tables show the percentage contribution of each food group to the per capita daily calorie intake of both male and female by age and location. The situation for the low-income urban area is presented in Table 4. The table reveals that there are distinct variations across sex and age, but the general pattern is that roots, cereals, legumes and tubers (in a descending order of proportion) were the main sources of their daily per capita calorie intake. This is however with the exception of the aged (60 years and above) and the school children within 6 - 10 years of age whose sources of calorie (in descending order of proportion) were roots, cereals, tubers and legumes. On the whole the contributions of roots, cereals, legumes and tubers to the per capita daily calorie intake of various age groups and sex ranged between 6 - 64%, 12 - 24%, 8 - 52% and 3 - 17% respectively. The above pattern is fairly consistent with the findings of Aromolaran [8] in his study in Ibadan area of Nigeria which followed this order - roots - 54.02%, cereals-28.46%, legumes -4.25% and tubers -4.86%. For all the consumption patterns (within and among households), the root was dominated by cassava products especially "eba", "amala and lafun"; the cereals mainly rice, the legumes was mainly boiled beans or beans made into "Akara" or "moi - moi", while tubers was mainly yam eaten boiled or pounded. Animal products was dominated by beef and then fish.

For the rural dwellers (Orhionmwon LGA), the percentage contribution of each food group to per capita daily calorie intake also varied across age and gender (Table 5). However, roots and cereals maintained their first and second positions respectively in terms of the level of contribution to daily calorie intake of the rural dwellers. Roots contributed over 50% of the per capita calorie

Table 4: Calorie Consumption Patterns Among Urban Dwellers (Orhionmwon) by Sex and Age Group (percentage)

	Male					Female				
Food Item	<6 yrs	6-10 yrs	11-18yrs	19-59 yrs	>60 yrs	<6 yrs	6-10 yrs	11-18 yrs	19-59 yrs	> 60 yrs
Roots	60.878	12.869	9.4687	9.478	6.3462	5.9865	11.644	11.416	64.384	53.854
Tubers	4.6758	7.9985	4.0356	4.5269	6.4177	2.4986	9.6344	4.151	3.5741	17.242
Cereals	13.64	11.716	18.827	22.413	23.511	18.552	12.586	16.238	16.125	12.119
Legumes	10.295	36.870	34.121	32.236	24.864	52.081	36.714	33.777	7.809	2.0404
Vegetables	1.339	12.300	11.094	7.3521	9.222	7.0634	9.6546	12.608	1.7307	2.4142
Oil	5.8379	0.1367	0.13334	0.1846	0	0.0611	0.3382	0.0279	3.3396	3.0993
Fruits	0.444	0.2742	0.3819	0.3595	0.3637	0	0.1248	0.5102	0.2133	0
Beverages	0.4679	2.3257	5.8299	6.6862	12.604	3.9714	3.328	3.8416	0.2944	0.6348
Meat	0.3635	15.16	13.727	14.868	14.831	9.7862	15.704	16.692	0.5762	5.7531
Fish	1.3572	0.3496	2.3806	1.896	1.8407	0	0.2708	0.7378	1.7409	1.7575
Other animal products	0.7018	0	0	0	0	0	0	0	0.2495	1.0858
Total Calorie per capita daily intake (kcal)	1212.1	1715.3	2550.9	3019.9	3157.2	1023.4	1680.1	2144.2	2519.8	2686.1

Source: Computing from field survey data, July - Oct. 2005

Table 5: Calorie Consumption Patterns Among Rural Dwellers (Orhionmwon) by Sex and Age Group (percentage)

	Male					Female				
Food Item	<6 yrs	6-10 yrs	11-18yrs	19-59 yrs	>60 yrs	<6 yrs	6-10 yrs	11-18 yrs	19-59 yrs	> 60 yrs
Roots	56.838	54.868	57.257	54.107	49.318	48.747	49.758	62.073	54.030	77.655
Tubers	6.74	9.0743	4.2787	6.4813	4.2956	11.082	8.0712	4.671	6.5206	3.9069
Cereals	18.607	20.269	20.679	23.019	29.701	21.616	25.250	16.544	22.760	4.4533
Legumes	6.0652	7.6968	10.240	8.4401	7.8503	7.4497	7.9773	8.4269	7.9817	4.3186
Vegetables	2.9578	2.1299	2.016	2.0957	1.9533	2.7645	2.328	2.3211	2.2646	3.147
Oil	7.612	4.5753	3.4378	3.0875	3.4602	7.1702	5.3022	4.2501	3.6992	3.7822
Fruits	0	0.0562	0.0918	0.2532	0.2088	0	0.0444	0	0.2119	0
Beverages	0	0.3023	0.6172	0.5451	1.0647	0	0.1006	0.4743	0.4907	0.5953
Meat	0.2202	0.1557	0.3096	0.4455	0.0424	0.2630	0.0451	0.0567	0.3080	0
Fish	0.960	0.8431	1.0734	1.4683	2.1054	0.9082	1.1236	1.1825	1.7334	2.1417
Other animal products	0	0.0294	0	0.057	0	0	0	0	0	0
Total Calorie per capita daily intake (kcal)	1327.7	2371.1	2627.3	3388.5	2612.9	1594.9	1931.7	2263.6	2819.9	2284.4

Source: Computing from field survey data, July - Oct. 2005

intake across age and gender among the rural dwellers. This was followed by cereals with an average contribution of 20.29% then tubers and vegetables. Animal products was dominated by fish and then meat in contrast with the observed situation with the low-income urban dwellers.

Calorie Nutrient Status among the Households in Ikpoba-okha and Orhionmwon LGAs: The household is a whole entity having various individuals of different ages and sex. Any adverse impact on any of these individuals will affect the household as a whole. Based on this relationship, the household per capita daily calorie intake was estimated and the result is presented in Table 6. The average household per capita daily calorie intake in the low-income urban area varied from 1,020.32 to as much as 4,956.36kcal with both mean and median (2,066.31 kcal and 2,028.59 kcal respectively) being less than the minimum recommended standard of 2,400 kcal. For the rural area (Orhionmwon LGA), the per capita daily calorie intake ranged from 996.22 kcal to 5,141.39 kcal with a mean of 2,128.16 kcal and median of 1,988.22 kcal, both less than the minimum recommended standard. The factors contributing to this low intakes are examined next.

Estimated Calorie Intake Functions for Ikpoba-okha and Orhionmwon Local Government Areas: The socio-economic and household characteristics (household size, age, education level, etc) earlier identified were fitted to

Table 6: Summary Statistics of Protein Intake of An Average Household in the Low-Income Urban (Ikpoba-okha) and Rural (Orhionmwon) Areas

Variable	Freq.	Standard	Mean	Median	Std Dev.	Min	Max.	Skewness
Study Area								
Per Capita Daily Protein Intake (g)	90	2,400	2097.76	2001.73	836.47	996.22	5,141.39	1.42
Low-Income Urban Area								
Per Capita Daily Protein Intake (g)	44	2,400	2,066.31	2028.59	741.61	1,020.32	4,956.36	1.43
Rural Area								
Per Capita Daily Protein Intake (g)	46	2,400	2,128.16	1,988.22	924.25	996.22	514.39	1.35

Source: Computed from Field Survey Data, July - Oct, 2005

Table 7: Estimated Calorie Intake Functions for Ikpoba-Okha (Lone-Income Urban) Area

	Functional Forms		
Variables	Linear Coefficients	Semi-log Coefficient	Double-log Coefficients
Constant term	1228.17***	592.26	6.66***
	(4.93)	(0.81)	(21.12)
X_1 = Household Size	49.60	254.01	0.17**
	(1.58)	(1.49)	(-2.26)
X_2 = Age of Household members	23.34***	647.36***	0.13***
	(8.72)	(12.72)	(-1.92)
X_3 = Educational Level of Household members	47.61***	7.24	0.02
	(3.95)	(6.34)	(1.91)
X_4 = Household Dependency Ratio	-6.02	-62.10	-0.04
	(0.09)	(-1.01)	(1.48)
X_5 = Household Total Monthly Income	0.0062	61.72	0.26
	(0.60)	(0.90)	(0.44)
X_6 = Household Members Sex	303.45***	371.93**	0.34***
	(3.03)	(4.03)	(3.76)
X_7 = Household Members Income Source	6.23	-59.71	0.05
	(0.05)	(-0.53)	(1.16)
X_8 = Farming/Non- Farming Households	195.19*	206.34**	-0.11**
	(1.73)	(2.03)	(3.76)
n	44	44	44
R^2	0.43	0.54	0.69
R^2	0.41	0.50	0.66
F -value	14.24***	21.20***	31.32***

Source: Field Survey Data, July - Oct. 2005

- Figures in parenthesis are the t-values.

*** Significant at 1% level; ** significant at 5% level

* Significant at 10% level.

the Ordinary Least Square (OLS) multiple regression model. Three functional forms of the consumption model (linear, semi-log and double-log) were estimated. The result for the low-income urban dwellers (Ikpoba-Okha area) is presented in Table 7. Based on the expected sign of the coefficients, statistical judgement and econometric criteria, the double-log (i.e. Cobb-Douglas) function was chosen as the lead equation. All the explanatory variables (X_1 - X_8) in the model combined, explained about 69% of the variation in the daily per capita calorie intake of household members in the area. The F-ratio like the other two models (linear and semi-log) was significant at the 1% level. Apart from household size (X_1) all the explanatory variables carried the expected signs based on economic reasoning. Four variables (X_1, X_2, X_6 and X_8) out of the eight explanatory variables were statistically significant at the 5% level.

Apriori, the expected sign for household size coefficient (b_1) would have been negative implying that with increase in household size the proportion of food (and therefore calories) available to individual household member would decrease hence a negative impact on

Table 8: Calorie Consumption Patterns in Ikpoba-Okha and Orhionmwon LGAs by Location and Sex (percentage)

	Ikpoba-Okha			Orhionmwon			Aggregate		
Food Item	Male	Female	Both sex	Male	Female	Both sex	Male	Female	Both sex
Roots	56.50	62.63	59.61	54.58	54.64	54.61	55.98	58.23	59.6
Tubers	5.88	5.51	5.73	6.62	6.88	6.73	6.27	6.26	6.23
Cereals	20.64	15.02	17.75	22.22	21.69	21.99	20.99	18.69	19.1
Legumes	8.72	8.02	8.44	8.29	7.87	8.11	8.50	7.94	7.6
Vegetables	1.62	1.76	1.66	2.15	2.36	2.22	1.89	2.09	2.11
Oil	3.29	3.83	3.51	3.85	4.41	4.09	3.58	4.15	3.11
Fruits	0.22	0.20	0.21	0.16	0.12	0.15	0.19	0.16	0.10
Beverages	0.39	0.33	0.36	0.50	0.37	0.44	0.44	0.35	0.35
Meat	0.84	0.83	0.84	0.32	0.20	0.27	0.57	0.49	0.45
Fish	1.47	1.63	1.53	1.28	1.47	1.37	1.37	1.54	1.25
Other animal products	0.42	0.25	0.35	0.035	0.00	0.02	0.22	0.11	0.20
Total Calorie per capita daily intake (kcal)	2391.0	2010.75	2200.93	2465.49	2178.90	2322.20	2428.25	2094.83	2261.54

Source: Field survey data, July - Oct. 2005

Table 9: Estimated Calorie Intake Functions for Orhionmwon (Rural) Area

	Functional Forms		
Variables	Linear Coefficients	Semi-log Coefficient	Double-log Coefficients
Constant term	2849.61***	5814.78***	8.73***
	(3.37)	(4.06)	(17.72)
X_1 = Household Size	145.73***	771.89***	0.32***
	(2.81)	(2.75)	(3.34)
X_2 = Age of Household members	28.66***	650.06***	0.65***
	(7.24)	(9.16)	(-5.92)
X_3 = Educational Level of Household members	42.08**	10.58	0.03***
	(2.51)	(0.44)	(-2.87)
X_4 = Household Dependency Ratio	-155.30*	-114.9*	-0.05**
	(-1.86)	(-1.84)	(-2.35)
X_5 = Household Total Monthly Income	0.01	7.72	0.001
	(0.67)	(0.11)	(-0.05)
X_6 = Household Members Sex	215.26	371.50**	0.29***
	(1.56)	(2.43)	(0.17)
X_7 = Household Members Income Source	100.45	118.90	0.09***
	(0.40)	(0.49)	(1.49)
X_8 = Farming/Non- Farming Households	77.78	43.81	0.01
	(0.19)	(0.11)	(1.95)
n	46	46	46
R^2	0.41	0.52	0.70
R^2	0.40	0.49	0.67
F -value	9.36***	12.87***	20.53***

Source: Field Survey Data, July-Oct 2005

-Figures in parenthesis are the t-values.

*** Significant at 1% level; ** significant at 5% level

* Significant at 10% level.

calorie intake level. The observed sign for the coefficient was positive. This could possibly be the case if the increase in household size transmits into an increase in the number of adults earning income or engaged in food production activities.

Age was found to be a significant determinant of daily per capita calorie intake. The relationship was positive indicating that daily per capita calorie intake of household members increased with increase in their age. This fact is confirmed in Table 4, which showed that calorie intake per capita per day for male increased from 1,212.1 kcal for those below the age of 6 years to as much as 3,157.2 kcal for those above 60 years. Similarly for the female it increased from 1,023.4 kcal for those below the age of 6 years to as much as 2,686.1 kcal for those above 60 years of age.

Table 10: Marginal Propensity to Consume Calorie in the Study Area

Location	Household Monthly Income (N)	Average Per Capita Daily Calorie Intake (C_i)	Calorie Intake Regression Coefficient Income (b_5)	MPC_{C_i}*
- Low-income				
- Urbane Area	12,242.66	2,226.65	0.01 (not significant)	**
- Rural Area	7,541.73	2,118.99	0.001 (not significant)	**

Source: Computed from Field Survey data, July - Oct, 2005

* $MPC_{C_i} = b_5 (C_i/X_5)$ for double-log equation.

** The MPC_{C_i} were not computed because the regression coefficients of income (b_5) in the lead equations were not statistically different from zero.

Household members sex also showed a positive and significant relationship with per capita daily calorie intake. The Food and Agriculture Organization (FAO) recommended nutrient intake levels, indicate that, males require more calorie/protein than females [6]. With about 60% of the respondents being male among the sampled population (Table 1) while Table 8 also revealed a higher daily calorie intake by the male sex, the positive sign of that coefficient (b_6) therefore conforms with expectation.

The significant and negative effect of farming (X_8) on the per capita daily calorie intake of the low-income urban household translates to the fact that limited access to farmland may result into low food intakes and therefore a food security problem in the location.

For the rural households (Orhionmwon LGA) the double-log model selected showed that the included explanatory variables (X_1 - X_8) explained about 70% of the variation in per capita daily calorie intake of household members (Table 9). Six out of the eight explanatory variables were significant at the 5% level. Household size and household members age coefficient like the case of the low-income urban area was positive and significant determinant of daily per capita calorie intake of the respondents.

Dependency ratio (X_4) showed a negative relationship with per capita daily calorie intake of household members. This reveals that a significantly larger number of household members in the rural area were not gainfully employed (i.e not earning income); hence there is a heavy dependence on the few income earners within the household. This situation results in an overall reduction in the daily per capita calorie intake of household members in the area. This again confirms the much held view that inspite of the dominance of agriculture in the rural areas of Nigeria, poverty and hunger are still very pervasive [1].

Salary / wage earning coefficient, b_7 (as source of income) was found to exert significant and positive influence on daily per capita calorie intake. This may be attributed to the fact that salaries and wages are surer and more reliable sources of monthly income hence household members are better able to plan out their daily diets. This result suggests that apart from other sources of income, engaging in enterprises or occupation that provides a regular additional and more dependable source of daily or monthly income, is vital towards improving daily per capita calorie intakes of rural households and their inhabitants.

Marginal Propensity to Consume (MPC) in the Study Area: The Marginal Propensity to Consume (MPC) refers to the slope of the estimated consumption function at any point on the curve; that is additional calorie intake as a result of a N1 increase in income. Based on the lead equations from Tables 7 and 9, the MPC of household members in the study area could not be computed because the household total monthly income coefficient (b_5) was not statistically significant at the 5% level for both locations (Table 10).

Similarly computing the income elasticities of daily calorie intake of household members would be meaningless since the regression coefficients for income (b_5) for both locations (rural and low-income urban areas) were not statistically different from zero.

Some Policy Implications:

This study pointed to a number of key issues calling for government urgent interventions:

- The present low per capita daily food calorie intake in both the rural and low-income urban areas in Nigeria visa -vise the FAO recommended minimum of 2,400 Kcal per day. For the rural area (orhionmwon) the per capita daily calorie intake observed was 2,128 kcal while for the low-income urban area (Ikpoba-okha) it was 2,066 Kcal.
- The positive and significant influence of educational level on the daily per capita food intake.

- The limited assess of the urban inhabitants to farmlands and its negative impact on their daily per capita food calorie intake.
- The positive impact of salary earning on food intake of household members in the rural areas.

The policy implications of these findings is that government and other development agencies should launch campaigns to promote improved nutrition of both rural and urban dwellers through formal education (including nutrition education), encourage all year round farming and other economic activities that guarantee regular and steady source of monthly income in order to ensure well planned food budget.

CONCLUSION

Attempt was made by this study to empirically identify the socio-economic and household characteristics that have major influence on the level of food calorie intake of rural and low-income urban inhabitants in Nigeria using Orhionmwon and Ikpoba-okha Local Government Areas (LGAs) in Edo State respectively as case study. Household size, age, educational level, sex and salary earning had positive impact on their daily per capita calorie intake while dependency ratio and none engagement in farming negatively affected it. The study recommends an urgent campaign to be launched to promote formal and nutrition education, encourage all season farming and other economic activities that would ensure regular and steady monthly source of income. Apart from supplementing their present income it would enable them have well planned food diet.

REFERENCES

1. Business Day, 2009. "Food Security and Poverty Alleviation" May 13th 2009, editorial www.businessdayonline.com.
2. Srinivasan, T.N., 1983. "Measuring Malnutrition" *Ceres*, Fao Review on Agriculture and Development. Mar - April, 1983. No 92 Vol 16(2) pp 23-27.
3. Addo, A., 2005. "Improving the Nutrition of the Nigerian Child through Dietary Modifications" Paper presented at a Seminar on Child Nutrition by West Africa Milk Company (Nig) PLC.
4. Ferro-Luzzi, A. and J.V.G.A. Durnin, 1981. "The Assessment of Human Energy Intake and Expenditure: A Critical Review of the Literature". ESN: FAO/WHO/UNU/EPR/81/9 (Rome, FAO, August, 1981).
5. Aromolaran, A.B., 2000. "Food Consumption Pattern and Women Income: Implications for Household Food Security in Nigeria". A Revised Work-in-Progress presented at the AERC Mid-Year Workshop in Nairobi, Kenya, May 27th - June 1st, 2000.
6. FAO / WHO, 1985. "Energy and Protein Requirements". World Health Organization Technical Report Series 724. World Health Organization, pp: 206.
7. Davis, C.G., 2002. "Linkage between Socio-Economic Characteristics, Food Expenditure Patterns and Nutritional Status of Low Income Households: A critical Review. American Journal of Agricultural Economics, 64(5).
8. Aromolaran, A.B., 1987. "The Nigeria Nutritional Problem: A case study of Ibadan and Selected Villages". M.Sc thesis, University of Ibadan, Ibadan, Nigeria.