FACTORS INFLUENCING MEAT CONSUMPTION AMONG HOUSEHOLDS IN ODEDA LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA: DOES "CHOLESTEROL RISK PERCEPTION" REALLY MATTER?

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ABSTRACT

The study examined the potential roles certain household socioeconomic factors and cholesterol risk perception could play in influencing consumption of beef and other animal meats among households in Odeda Local Government Area, Ogun State. A total of 120 households were selected through a combination of purposive and simple random sampling techniques, with questionnaire administered on the household heads to elicit information. The data collected were analyzed using descriptive statistics and Seemingly Unrelated Regression model. The majority (82.5%) of the household heads had formal education, and spent more than 60% of total meat budget on beef. Whereas household income, household size, sex (female dummy) of the household head, and access up to secondary school education significantly enhanced beef consumption, cholesterol risk perception in beef had a reducing effect. Household size, marital status, and access to tertiary education by the household head significantly influenced consumption of other animal meats while cholesterol risk perception had negative but insignificant influence. Although increased income, and access to education are crucial for raising meat consumption, the somewhat negative effect on consumption attributable to the perceived risk of consuming cholesterol (in meats) holds some implications for policy. Our findings call for renewed attention on the development of livestock sector for the production of low fat/cholesterol meat (particular beef) in order to meet the rising consumer concerns for health risk in foods.

Key words: Animal proteins, consumers, health concerns, income, education

INTRODUCTION

The demand for meat across countries and regions of the world has been rapidly growing with a projected consumption of 36.7 kilogram (kg) per capita per annum for developing countries in 2030 (FAO, 2003). Notwithstanding the progressive rise in meat consumption in many developing countries, the quantity of meat consumed in Nigeria (2 kg per person per year) is still below the ECOWAS regional average of 8 kg per person per year (Bénard *et al.,* 2010; Okello *et al.*, 2014). FAO recommends that 50% of the total daily protein requirement should come from animal products. The level of animal protein consumption from all animal products in Nigeria is still inadequate to meet the recommended consumption level (Inyang *et al.,* 2014; Akerele, 2015). This holds grave

implications for the quality of diets and nutritional wellbeing of people in the country.

Meat is not only an excellent source of high quality animal protein but is also important in providing the daily human requirements for vitamins and iron (Higgs, 2000; Neumann *et al.,* 2002; Pereire and Vicente, 2013). This is perhaps one of the reasons for recommending meat consumption in the food menu plans of people who have to deliver extreme performances (Ohajianya, 2005). Available statistics indicate that more than 25 percent of Nigerians (Khader, 2001; Inyang *et al.,* 2014; Akerele, 2015) experience protein deficiency (Ene-Obony, 1990; Ajayi and Chukwu, 2008) of which low consumption of animal proteins is a contributory factor. Although efforts are being made over the years to address this problem especially from the supply side (Cleaver *et al.,* 2006; Omotor, 2009; Adebayo and Ojo, 2012), there is the need to examine the influence of demand side factors on consumption of animal proteins at the household level.

Changes in income (Inyang *et al.,* 2014), prices (Alimi, 2013; Ogbeide, 2015), and demographic factors (Britton, 2003; Oloyede, 2005; Adetunji and Adepoju, 2011; Amao, 2013) have being identified as some of the demand side factors influencing consumption of animal proteins in the country. In recent times, consumers have begun to be more concerned about their health in relation to food consumption. This has motivated researchers to extend analysis of drivers of food (meat) consumption beyond changes in the traditional economic and demographic factors to some health related concerns. Beyond being a tremendous source of good quality proteins, meat generally is also associated with consumption of saturated fats, contributing to some health issues such as high level of blood cholesterol (Meat Advisory Panel, 2011; Erlinger and Appel, 2003).

Cholesterol is a waxy substance (a type of lipid) produced in the body mainly by the liver (Irish Heart Foundation, 2003; Ma and Shieh, 2006), and can be found in the walls of body cells, from the nervous system to the heart (National Institute of Health, 2005). It is a type of fat-like substance supplied by human diets particularly through consumption of animal products such as animal meats, fish poultry and dairy products (National Heart Foundation of Australia, 2013; American Heart Association, 2015; Schimid *et al.*, 2017). Cholesterol is very crucial for human health, perfuming important functions such as building of the cell membranes, insulation of nerves, and production of certain hormones, among others. It should be noted that although cholesterol can be obtained through diet, human body is also capable of producing enough cholesterol by itself for the normal body functioning without needing to rely on dietary cholesterol (Irish Heart Foundation, 2013). Cholesterol can be both good and bad. High-density lipoprotein (HDL) is good cholesterol and low-density lipoprotein (LDL) is bad cholesterol (National Institute of Health, 2005). When there is too much LDL cholesterol in the in the blood, it is built up in the artery walls, where it can increase the risks of developing cardiovascular disease such as coronary heart disease (CHD) (Meat Advisory Panel, 2011). Consumption of meat, especially red meat (such as beef) has been found to be associated with greater risk of coronary heart disease (CHD) (Snowdon *et al*., 1984; Erlinger and Appel, 2003).

Available empirical studies have shown that beef is the most commonly consumed animal meat in Nigeria (Tibi and Aphunu, 2010; Adetunji and Rauf, 2012; Alimi, 2013). However, increasing awareness about health risks in food has begun to play substantial role in food consumption in recent times. The extent to which this has reflected in meat consumption is less studied empirically in Nigeria. Thus, this study attempts to examine alongside the traditional economic (income) and demographic variables, whether certain noneconomic factors such as perception about fat/cholesterol risk in meat (concerns for health) can play substantial role in influencing meat consumption among households in Nigeria. This study can provide useful information that could guide research and farm to for policy in the Nigeria's food system, especially in relation to animal meat production, marketing and consumption.

METHODOLOGY

Study Area
The study was carried out in Odeda local government area (LGA) of Ogun State, Nigeria. Ogun State is situated within the tropic and covering area of 16,409, 26 square Kilometers. It is bounded in the west by Republic of Benin, south by Lagos State and the Atlantic Ocean, east by Ondo State and in the North by Oyo State. The State has a population 3,751,140 (NPC, 2006). The major ethnic group in Ogun State include Egba, Ijebu, Yewa, Remo, Ikale Egun and Ilaje. The people of Odeda LGA are predominantly farmers engaged in small scale farming. The major food- crop grown in the study area include, among others, cassava, yam, cocoyam, plantain, maize and vegetable while cocoa is the major permanent-crop. The natural vegetation in the study area is rain forest. There is also the presence of herdsmen in the LGA with its attendant implication on beef production and consumption in the study area.

Sampling Procedure and Sample Size
A combination of purposive and simple random sampling approach was used to select 120 households for the study. Purposive sampling technique was used to identify comparatively rural and semi-urban community, and simple random sampling for selecting three rural towns and two semi-urban areas respectively. The three selected rural towns are Odeda, Olodo and Opeji. The sub-urban areas are Obantoko and Osile; and their closeness to Abeokuta, the capital of Ogun state, coupled with the presence of (or proximity to) two tertiary institutions, the Federal University of Agriculture and the Federal College of Education are (features) expected to have some influence on the living conditions of inhabitants, including food (meat) consumption. This stage was followed by a simple random selection of 20 households from each of the relatively rural towns, and 30 households from each of the relatively semi-urban areas to have a fairly equal representation of households across the two (rural/semi-urban) locations. This makes a total of 120 household respondents in all (60 households from the rural and 60 households from the semi-urban locations respectively).

Analytical Techniques
Data was analyzed using the descriptive statistics and Seemingly Unrelated Regression (SUR) model. Descriptive statistics such as frequency distribution

expressed in percentage and presented in Table were used for the socio-economic characteristics of households and other variables, while SUR model (presented below) was used to analysis factors influencing consumption of beef and other animal products. Other animal meats are grouped together to avoid cases of zero consumption expenditure.

Regression Analysis

Seemingly Unrelated Regression (SUR) model was employed for analysis in this study. We conjectured that apart from beef, household may consume other animal products of which drivers of consumption decisions may be responsible. This addressed the possible contemporaneous error correlation within the framework of seemingly unrelated regression (SUR) model specified as.

$$C_{ij} = X_{ij}B_j + e_{ij} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where i= 1, 2; with one (1) standing for equation relating to monthly beef expenditure and 2 for equation on expenditure on other animal products. j=1, 2, …, N. Where j stands for individual household and N is the total number of households (equaling 120 in this study). The error term e_j is assumed to be normally distributed with zero mean and constant variance. C_1= household monthly expenditure on beef in Naira, C_2= household monthly expenditure on other animal proteins in Naira, X is the matrix of explanatory variable u is the error terms

X_1= Age of household head in years

X_2= Sex of household head (1 if male, 0 otherwise)

X_3= Marital status of the household head (married 1, otherwise 0)

X_4= Religion (1 if household head is a Christian, 0 otherwise)

X_5= Primary Education (1 if the highest formal educational attainment of the household head is primary school, 0 otherwise)

X_6= Secondary Education (1 if the highest formal educational attainment of the household is secondary school, 0 otherwise)

X_7= Tertiary Education (1 if the highest formal educational attainment of the household head is tertiary education, 0 otherwise)

X_8= Household size (number of people)

X_9= Household income in Naira

X_{10}= Cholesterol (1 if concerns for cholesterol/fats in meat (cholesterol risk perception) is a major factor influencing meat consumption/purchase, 0 otherwise)

X_{11}= Taste (1 if consideration for taste is an important factor in meat consumption, 0 otherwise)

X_{12}= Nutrition (1 if consideration for nutrition (protein) is as an important factor in meat consumption, 0 otherwise)

X_{13}= Location (1 if household is located in a relatively sub-urban area, 0 if household is located in a rural area)

When all observations/individuals are stacked together, the model for the ith equation can be expressed as $C_i = X_iB_i + e_i$. Stacking on the two equations, the SUR model is represented as:

$$\begin{bmatrix} C_1 \\ C_2 \end{bmatrix} = \begin{bmatrix} X_1 & 0 \\ 0 & X_2 \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \end{bmatrix},$$ and can be represented in a more compact form as

$$C = X\beta + e \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The residual terms are assumed to have zero mean, homoscedastic (σ^2) and independent across individuals. However,

the complexity is that errors are often correlated across equations such that $E(e_{ij}e_{ij}')=\sigma ij'$, and $\sigma_{ij}' \neq 0$ when $j=j'$. For the two-equation systems, $E(\mathbf{ee}')=\sum \otimes \mathbf{I}_{N,}$ where $\sum=(\sigma_{ij})$ is 2 by 2 positive-definite matrix and $\otimes$ is the Kronecker products of the two matrices (Cameron and Trivedi, 2010). We aggregate meat into two categories (beef and other animal meats) for the following reasons. First, all households reported consumption-expenditure on beef for the (one month) period covered by the survey-with beef accounting for more than 60% of the total animal meat budget. Second, expenditure on other meats (chevron, pork, chicken) were summed up to fend off data censoring (missing data) or zero-consumption problems which often lead to computation complexity while modeling discrete-continuous data in a multivariate setting.

Table 1: Distribution of households by demographic characteristics of households and household heads

Variables	Frequency	Percentage
Age		
Less 31	28	23.33
31- 45 years	47	39.17
46-60	38	31.67
above 60	7	5.83
Mean and standard deviation	42 (12.66)	
Sex		
Male	81	67.5
Female	39	32.5
Marital status		
Married	104	86.67
Single	11	9.17
Divorced/Widow	5	4.16
Household size		
1 -3	17	14.17
4-6	75	62.50
7-9	23	19.17
10-12	5	4.17
Mean household size	5 (2.01)	
Educational level		
No formal education	21	17.50
Primary	30	25.00
Secondary	23	19.17
Tertiary	46	38.33
Major occupation		
Traders	28	23.33
Artisans	9	7.50
Civil servants	51	42.50
Farmers	32	26.67
Religion		
Christian	58	48.33
Muslim	51	42.50
Others	11	9.17

Source: Filed Survey 2015   Note: Figures in parentheses are the standard deviations

RESULTS AND DISCUSSION
Socioeconomic characteristics of households and household heads

The results of the socioeconomic characteristics of respondent households are presented in Table 1. It shows that approximately 39% of the household heads are within the age of 31-45 years, indicating that they are still in their economically active age. The mean age of the household heads was 42 years. The majority (67.5%) of the household heads were male and most (86.67%) married. The majority (81.7%) of the households had members between 4 and 9 persons with an average household size of 5 persons. Moreover, the majority (82.5%) of the respondents had formal education. The relatively high level of formal education is expected to induce consumption of animal meats substantially. Most (42.5%) of the consumers were civil servants, 26.7% were farmers while 23.3% were traders.

Household monthly income and expenditure on animal meats

The results in Table 2 showed that the average monthly income was ₦34,777.42. This translates to approximately ₦232 per person per day which is less than 1US Dollar, indicating that an average household in the study area is poor from the standpoint of international income poverty ratings of 1US Dollar per person per day (sources). The results also showed that 38.33% of the households devoted between N2001 and N5000 per month on beef while the majority (68.33%) of them spent less than N2001 per month on other meat sources. The total monthly budget on animal proteins was N6790; of which approximately 61.49% was expended on beef. This suggests that beef is the dominant animal protein source among households in the study area.

Table 2: Distribution of households by monthly income and meat expenditure

Variable	Frequency	Percentage
Monthly income(₦)		
Less than 20001	67	55.83
20001 – 40000	14	11.67
40001 – 60000	13	10.83
Above 60000	26	21.67
Total	120	100.00
Mean income	34777.42 (39715.94)	
Beef expenditure (₦)		
Less 2001	43	35.83
2001-5000	46	38.33
Above 5000	31	25.83
Mean beef expenditure	4175.00 (3161.91)	
Expenditure on other meats (goat meat, mutton, pork) (₦)		
Less than 2001	82	68.33
2001 – 3000	25	20.83
3001 – 4000	13	10.83
Mean Expenditure	2615.00 (2043.26)	

Source: Filed Survey 2015   Note: Figures in parentheses are the standard deviations

Perceived economic and non-economic factors motivating meat purchase/consumption

Presented in Table 3 is the distribution of households by some major economic and non-economic (meat related intrinsic) factors considered/perceived as the most important in meat consumption/purchase. The results showed that larger percentage (43.33%) of the households considered nutritive value of protein in meat as the most important underlying factor motivating them to consume/purchase meat. This is followed by 25% and 23.33%

who considered taste and purchasing power as the most important motivating factors, respectively. Only 8.33% of the households considered cholesterol/fats risk as very important when purchasing meat. Although the percentage of cholesterol/fat sensitive households is comparatively small, it is still an indication of consumers' concerns for health factor in meats. Some of the studies that have noted growing consumers concerns for health (including fat/cholesterol risk) in the meat consumed are McCarthy *et al*. (2003), Wezemael *et al*. (2010) and Schimid *et al*. (2017).

Table 3: Distribution of households by perceived economic and non-economic factors motivating meat purchase/consumption

Variable	Frequency	Percentage
Cholesterol/fat (health) risk	10	8.33
Taste	30	25.00
Nutrition (protein)	52	43.33
Purchasing power (price/income)	28	23.33

Source: Field Survey 2015

Determinants of animal meat consumption

The results of factors influencing consumption of animal meat, as well as the statistical test of the independence of the two estimated models in the SUR model are presented in Table 4. The results established a positive (0.520) correlation between the residual terms of the two regression models The Breusch-Pagan test (which is a Chi-square test) of independence between the two (beef and other animal meats) equations is statistical significant (p<0.01) with Chi-square value of 32.14. This suggests that it is more appropriate to estimate the meat consumption models jointly using SUR rather than separate (independent) estimation through OLS regression. Considering the estimated beef

consumption-expenditure (model 1), the coefficient of multiple determination (R-square) (0.483), indicates that approximately 48% of the observed variation in beef consumption-expenditure is explained by all the explanatory variables in the model. Similarly approximately 22% of the total variation on expenditure on other animal meat is explained by all the explanatory variables. With respect to the result beef consumption-expenditure model (Model 1), the coefficient of sex (male dummy) is negative and statistically significant. This means that households headed by females are much more likely to spend more on beef than male headed households. Whereas Yakaka and Maina (2012), Yakaka *et al.* (2012) and Alimi (2013) found insignificant influence of sex on beef consumption while Gossard and

York (2003) established statistically significant influence. The statistical significance of the coefficient of household size, suggests that an increase in the member of household by one person is likely to substantially raise monthly consumption expenditure on beef. Among studies that have found significant influence of household size on beef consumption in Nigeria include Ekine *et al*. (2012) and Yakaka and Maina (2012). The results suggest that access to education had positive and statistically significant influence on beef consumption. This is in line with Yakaka *et al.* (2012) and Alimi (2013) who found statistically significant influence of education on meat (beef) consumption but contrary to Ogbeide (2015) who found statistically insignificant influence. Income exerted positive and statistically significant influence on beef consumption; implying that increases in household income could stimulate higher consumption of beef. This finding is consistent with some of the previous studies (Ogbeide, 2015; Ekine et al., 2012; and Yakaka and Maina*,* 2012; Akinwumi *et al*., 2011; Alimi, 2013) on meat consumption in the country. The coefficient associated with the income variable is 0.06, implying that an increase in household income by one Naira is expected to increase expenditure on beef by approximately 0.06 Naira (6 kobo). Cholesterol risk perception had negative and statistically significant influence on beef consumption. This finding appears similar to some works (Mannio *et al*., 2000; Schimid *et al*., 2017) that have attributed reduction in beef consumption partly to consumer's perception of health (cholesterol) risks. However, the finding seems contrary to Capps and Schmitz (1991) who found miniscule effect of cholesterol information on beef consumption.

Table 4: Results of factors influencing consumption of beef and other animal meats

Variable	Model 1 (Beef Expenditure)		Model 2 (Expenditure on Other Animal Meat)	
	Coefficient	t-value	Coefficient	t-value
Age of household Head	14.35	0.74	4.01	0.26
Sex (Male dummy)	*-888.07	-1.92	-268.21	-0.72
Marital Status (Single dummy)	-758.70	-0.87	**-1726.04	-2.47
Religion (Christian dummy)	-278.83	-0.55	-421.19	-1.03
Primary School education dummy	*1215.02	1.83	552.05	1.03
Secondary School education dummy	*1460.87	1.91	335.72	0.54
Tertiary education dummy	1427.35	1.43	***2208.82	2.74
Household size	*200.96	1.80	*152.83	1.7
Household income	***0.06	7.07	0.01	0.91
Cholesterol	*-1530.38	-1.76	-541.74	-0.77
Taste	-172.21	-0.28	279.38	0.57
Nutrition	-742.45	-1.32	-129.80	-0.29
Location (semi-urban dummy)	*-1254.45	-1.71	-428.54	-0.72
Constant	1374.52	1.12	1172.68	1.18
R-Square	0.502		0.226	
Chi-Square	120.88		35.10	
P>Chi-square	0.000		0.000	
Correlation Matrix Between Residuals of the two Regression Models				
	Beef		Other Meat	
Beef	1.000			
Other Meats	0.520		1.000	
Chi-square (1) value =32.24			P>Chi-square =0.000	

,*, means that coefficients are statistically at 10%, 5% and 1% respectively.

Results on consumption-expenditure on other meats (Model 2), the table shows that marital status (married dummy) and tertiary education as factors with significant influence on expenditure on other animal meat. This is consistent with previous studies (Inyang et al., 2014; Alimi, 2013; Yakaka et al., 2012; Adetunji and Adepoju, 2011). The coefficient of marital status is negative, implying that a household whose head is married would spend more on other animal products compare to households that is headed by someone who is unmarried. Whereas access to primary and secondary school education have positive and significant influence on consumption of beef, it is educational attainment above secondary school (tertiary education) that had substantial positive influence on

consumption of other meats. Similarly, increase in household size will also increase consumption of other animal meats.

CONCLUSION

Beyond the socioeconomic factors, consumers' concerns for healthiness of diets has become a major issue in food consumption in recent times. In this context, meat consumption, especially beef cannot be ignored because of the relatively high fat content/cholesterol. Consequently, the study examined the potential influence of consumers concerns for fat in meat (cholesterol scare) and some socioeconomic factors on animal meat consumption among households in Odeda Local Government Area of Ogun State. Results showed expenditure on beef

accounted for the largest percent of meat budget. Household income, household size, sex and education of the household heads are socioeconomic factors with strong influence on consumption of animal meats, while perception about cholesterol/fat in meat exerted significant negative influence on beef. There are enormous implications for research and development in terms of livestock production and marketing of animal meat (especially beef) from the standpoint of consumer welfare (health).

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