



Determinants of Household Food Expenditure: Does Engel Law Hold in Nigeria?

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Article History

Submitted: 20th August, 2022
Revised: 26th September, 2022
Accepted: 30th October, 2022

Keyword

Household food expenditure,
food expenditure, Engel law,
Nigeria

Abstract

The study investigated the determinant of household food expenditure in Nigeria using Nigeria General Household Survey panel component (GHS-Panel) 2018/19 data set. The survey collects a wide range of information from the household about their expenditure, income sources, education, demographic information, credit, remittances, household assets among other information. The findings revealed among others that variables like income, household remittances, access to loan, family size, and healthcare expenditure are all having significant impact on household food expenditure. However, factors like age, gender, and education do not have significant impact on household food expenditure. It was also revealed that families with high income tends to spend lower proportion of their incomes on food, which is consistent with the Engel law. The study conclude that Wagner Law holds in Nigeria and that family with more size spend more on starchy and carbohydrate food than on other class of foods.

Cite as: Salam, N. G., Alase, G. A., Lamidi, S. O., Joseph, T. E (2022). Determinant of household food expenditure: Does Engel law hold in Nigeria. *African Economic and Management Review (AEMR)*, 2(3), 11-17

1. Introduction

Determinants of household expenditure, particularly on basic products like food and clothing, have been of continuing interest to economists for centuries. Modern work starts from the work of Engel (1895 as cited by [Zani, Saediman, Abdullah, Daud, and Yunus, 2019](#)) and his focus on relationships between expenditure on food and income. The nature and patterns of food purchase and consumption reflected, and in different ways, continue to reflect wealth, income, and lifestyle. This is of particular interest in relation to the expenditure patterns of the relatively poor. Studies have thus focused on household expenditure of the poor, both in rich countries and in developing countries. Dominant factors influencing household spending on food in empirical literature include demographic factors (family size),

psychological (lifestyle), economic (income), as well as social and cultural factors ([Kostakis, 2014](#); [Zani et al, 2019](#)). The increasing interest in research is based on the gradual differentiation of the expenditures on food across household groups. Furthermore, it is of high interest that the contemporary consumers' attitude is linked to healthy lifestyle. The idea of the "nutritional footprint" acquires even higher importance, as consumer choice of food spendings determine the mortality ratio of the household and these choices are also influenced by certain factors like income and family size (economic situation) ([Kostakis, 2014](#); [Rahim and Bustanul, 2018](#)).

[Adesina, Agwu, Akin-Olagunju, Yusuf \(2021\)](#) noted that economic and financial crises that cut across the globe particularly in developing

countries have prompted many households to take decisions in minimizing their costs, even for basic needs, such as food quantity and quality. In a period of inflation and unemployment, consumers are more likely to change the composition of their expenditures (Zani et al, 2019; Liu et al., 2013); therefore, there is a strong shift towards consumption for cheaper products with lower nutritional value given the level of income and family size, which should concern everyone particularly because of its detrimental effect on life expectancy.

Most of these studies followed a microeconomic perspective in studying what influences the consumer spending on foods, identifying both socio-economic and psychodemographic variables as key determinants. For instance, several literature postures, starting from Engel work, found a positive relationship between spending on food and income (Zani et al, 2019; Liu et al., 2013; Aristide, Edouard, Ferdinand, Ruranga, Philippe, 2021). Though some empirical result revealed that the relationship is not linear as has been estimated by several literature stances, contrary to the proposition of Engel law (see, Kostakis, 2014; Adesina et al, 2021). Similarly, highly educated households (individuals) tend to have more balanced dietary model that involves spending on several types of foods (Aristide et al, 2021; Nilsson, Backman, Berkje, and Manirih, 2018;). Studies have also identified differences in age preferences, where the consumption pattern between the young and adult individuals play a role (Kostakis, 2014; Rahim and Bustanul, 2018; Aristide et al, 2021).

Employment status, gender, marital status, and residence region also seem to affect the level of expenditures on food across household groups. Employment status, marital status, and gender influence indirectly the level of food expenditures, due to the differences in their roles and preferences within the household. On the other hand, consumers who live in rural places can produce their own primary goods whereas consumers in urban areas have more food consumption choices leading them to have higher food expenditures (Aristide et al, 2021). One of the key determinants of household spending as identified in literature is also the size of the family. As expected, previous studies have estimated that there exists a positive relationship between the size of members in a household and the level of its expenditures on food, establishing a positive relationship between the two variables (Garcia and Grande, 2010).

Recent data from Nigeria Bureau of Statistics and World Bank on household expenditure survey revealed that of the total household expenditures, 56.65% of the household expenditure in 2019 was spent on food, an indication of the country's level of poverty and income distribution (World Bank, 2021).

For instance, in 2020, U.S. consumers spent an average of 8.6 percent of their disposable personal income on food—divided between food at home (5.0 percent) and food away from home (3.6 percent) [USDA, 2021]. Similarly, Eurostat (2020) revealed that 13 percent of household spending are on food in Europe in 2019. This clearly revealed that greater percentage of Nigerians' disposable income is devoted on food, and if we follow the Engel Law, we can argue that most Nigerians are still within the poverty line as the household spend more than half of their income on foods, while leaving other basic needs like shelter, clothing, medical, and education at risk.

What is even alarming from the survey is that majority of the household spending is devoted to starchy and carbohydrate foods, which indicates poor balance diet, further revealing why the life expectancy of Nigerians is low (World Bank, 2021). While several studies, starting from the work of Engel, has investigated the determinant of household spending on food, few has been devoted to Nigeria. Similarly, most studies assumed a linear relationship between food spending and income, whereas Engel law has argued in contrary, which raises concern for most studies. Lastly, most studies within the content of Nigeria used the absolute income rather than share of income in estimating household spending on foods in response to changes in income. This is contrary to the assumption of Engel which further justifies the need for the present study. As such, the present study aims to investigate the determinants of household food spending among Nigerian households.

2. Literature Review

There is growing literature on the subject of food consumption expenditure and factors that determine whether food consumption increases or decreases in line with levels of income, especially as it relates to the Engel's law of consumption. Neagu and Teodoru (2017) tested the validity of Engel's law of consumption dynamics of Romanian consumption after 1990. The authors examined the subject by testing for stationarity of the variables and conducting a regression analysis using the OLS technique. The study found income to be a strong simulating factor of consumption, considering the high level of correlation found between household's income and consumption. Therefore, Engel's law applies in the Romanian economy. The OLS method may not be a sufficient estimation technique with limited number of observations.

Adazula and Kudadze (2017) using data from 1574 households, examined the effect of disaggregated income and other socioeconomic factors on per capita food consumption expenditure of households in Volta, Ghana. The results from the quantile regression and OLS revealed that agriculture and non-agriculture activities, remittances and wages

had positive and significant effect on per capita food consumption expenditure of the selected households.

Bhavna (2018), employing the use of regression method for its analysis, attempted to verify the validity of the Engel's curve for the economy of Orissa in India. The results revealed that Engel's law on food consumption holds in the case of households in Orissa. The study was done on a micro level, which makes it difficult to make inference for the larger economy.

Ozughalu (2018) examined the relationship between poverty and food expenditure in Nigeria by empirically testing for the validity of Engel's law and testing whether or not per capita food expenditure related inversely to poverty in Nigeria. The author used descriptive statistics and logit model and found out that, in general, food expenditure varied directly with poverty, but food expenditure per capita varied inversely with poverty in Nigeria. This implies that the poor spends higher on food, and this validates the Engel's law. The use of logistic regression may not be sufficient because it assumes linearity between the dependent and independent variables.

Chai (2018), using descriptive statistics, reviewed how the composition of final demand tends to evolve as household income grows. He discussed the implications of these trends in demand for the industrial composition of growing economies, and how consumption patterns are linked to a range of demographic and social factors. The results revealed that as households become wealthier, they begin to diversify their spending beyond basic needs. **Zani, et al. (2019)** examined the factors affecting food consumption expenditure among cassava farmers' households in Southeast Sulawesi Province, Indonesia. The authors employed descriptive statistics and multiple regression method. The results revealed that the households spent a very high percentage of their incomes on food expenditure. The sample size used to come to this conclusion is relatively small which may cause the results to be biased.

Jayeola, Ado and Bayat (2020) examined household consumption expenditure shares in Nigeria for food, non-food, health and education at household level. Using the Working-Leser and regression models, the results of the analyses revealed that food expenditure accounts for the largest share of household expenditure in Nigeria which implies that the high poverty level is the leading determinant of food size expenditure. **Nsabimana, Swain, Surrru and Ngabitsize (2020)** using quantile regression, examined the issue of food expenditure elasticities and derived plausible distributions from various households' income levels in Rwanda. The results revealed that there is a statistical significant quadratic association between food budget share and total household expenditure. It also revealed that family size, number of adults in the household and education

of the household heads contribute the most as factors influencing food demand in households.

Tingum and Kuponiyi (2020) investigated the effect of off-farm income on rural household food consumption expenditure in Lesotho. The methodology employed was the OLS technique, which results revealed a positive and significant effect of off-farm income on household food consumption expenditure. Household size, transfers and remittances were also found to be determining factors of household food consumption expenditure, significantly and positively. **Addai (2021)** examined the applicability of the Engel law in the Ghanaian economy using descriptive statistics for its analysis. The results revealed that food is a necessity in Ghana and that 10 percent increase in household expenditure would reduce share of the household budget allocated to food by 0.801. This implies that when households have more money to spend, they would spend less on food consumption. However, the methodology may not be sufficient to draw a sufficient conclusion.

3. Methodology

3.1 Data and Sources

The study employed the Nigeria General Household Survey panel component (GHS-Panel) for the 2018/19 data set. The 2018/19 is the fourth round of the survey with prior rounds conducted in 2010/11, 2012/13, and 2015/16. The data is national and covers approximately 5,000 households, which are also representatives of the six geopolitical zones. It is collected by the Nigeria Bureau of Statistics (NBS) in partnership with the Federal Ministry of Agriculture and Rural Development (FMA&RD), the National Food Reserve Agency (NFRA), the Bill and Melinda Gates Foundation (BMGF) and the World Bank (WB). The survey collects a wide range of information from the household about their expenditure, income sources, education, demographic information, credit, remittances, household assets among other information. The 2018/2019 survey improves on the previous data as it included a disaggregated data on the household expenditure on food at home and food out of home. This is particularly important to see whether greater percentage of the expenses are made on food prepared at home or food out of home (takeaway) which will resolve the gap in knowledge suggested by **Kostakis, (2014)** as an area for further study. For example, in relation to food expenditure by households, no distinction was drawn between food prepared at home and food bought as take-aways, which the present study has resolved. Details of the

data generation process and collection can be accessed in World Bank (2021) website¹.

3.2 Model and Data Analysis

Following the work of **Kostakis (2014)**, and **Aristide et-al (2021)**, the study models the relationship as in equation (1):

$$\log C_i = \alpha + \sum \beta_k \log X_{ki} + \varepsilon_i \quad 1$$

Where C_i = monthly consumption expenditure on food, X_{ki} = vector of independent variables impacting

household monthly expenditure on foods, β represents the vector coefficients; the intercept α represents the expected value of C when the effect of observed variables is equal to zero. The study logged the variables to ensure using Ordinary Least Square (OLS) approach which linear does not cause a loss of information following the suggestion of **Joseph, Obikanu, and Nwolisa (2021)**. Also, logging the variables ensure the model elasticities are estimated rather than unit changes. The detailed regression variables are as presented in table 1.

Table 1: Summary of Hypothesized Variables

Variables	Description	Values/Categories	Expected sign
Food expenditure	Summation of expenditure on food as compared to non-food expenditure	Continuous variable	
Income	Household monthly income	Continuous variable	Positive
Age	Age of the head of household	Continuous variable	Negative
Gender	refers to the sex of the respondents	0=male 1=Female	Positive
Family size	The size of family of the respondents	Continuous variable	Negative
Education	Highest level of education attained	Secondary school or less = 1 or 0 otherwise (SS) BSc (First degree or equivalent) = 1 or 0 otherwise MSc =1 or 0 otherwise	Negative
Remittances	Transfers in US dollars received from other nations	Continuous variable	positive
Loan Access	Household's access to credits	(1=yes, 0=otherwise)	Positive
Health	Health care expenditure (are both complimentary or substitute)	Continuous variable	Could be either

Source: Researchers

Table 2: Summary of hypothesized variables

Variables	Mean (N)	Standard Deviation	Expected sign
Income	22,350	4.78	Positive
Age	41 years	2.89	Negative
Family size	3 members	0.98	Negative
Education	18 (years of schooling)	2.12	Negative
Remittances	48,500	3.45	positive

Source: Researchers (NB: Variables that are continuous form were recoded using interval to make them category before arriving at the result in table 2)

¹

<https://microdata.worldbank.org/index.php/catalog/3557/study-description>

4. Result and Discussion

The data revealed that of the 5,000 heads of household sampled in the Nigeria General Household Survey panel component (GHS-Panel), 74.2 percent of the households have male as the head of the households, while 25.8 percent of the families sampled have females as heads. Similarly, it was discovered that about 38.4 percent of the sampled respondents have secondary school or lower certificates as their highest qualification, 42.9 percent have BSc as their highest qualification, 8.5 percent have MSc or equivalent as the highest qualification, while the remaining 10.2 percent are captured in others. Table 2 presents the detailed demographic information of the household sampled in Nigeria. Another striking revelation found in the descriptive data is that families with age of the family head of below 40 years tends to eat food cooked outside the family compared to those families with the heads of house above 41 years.

4.1 Determinant of Household Spending on Food.

The result as presented in Table 3 revealed among others that household income has a positive relationship with food expenditure, which means that as income rises, the expenditure on food increases but in a lesser proportion to the increase in income. The finding is consistent with several literatures on the issue (Kostakis, 2014; Rahim and Bustanul, 2018; Aristide et al, 2021). Our finding is consistent with theoretical exposition, as seen in the correlation matrix: there is positive correlation between household food expenditure and income, while there

is negative correlation between share of income on food expenditure and food expenditure. The implication is that people with high incomes tend to consume lower proportion of their income, while individuals with low income tends to consume higher proportion of their incomes. This is also consistent with James Dusenbery relative income hypothesis and Keynes absolute income hypothesis as argued by McCormick (2018). Relative income hypothesis states that as income rises, consumption rises but not in the same proportion with the rise in income. Again, Engel was the first to establish that this relationship holds for food consumption, when he argued that developing countries spend greater percentage of their income on food compared to developed countries.

Our findings also revealed a positive and significant relationship between remittances a family received and food consumption expenditure, given that the p-value is 0.000. A possible explanation is that remittances received by the head of the house are treated as income and as such increase their consumption bundle by shifting their budget constraint forward in a typical demand function. Access to loan, though positive but not significant at 5 percent level, the study does not have sufficient evidence to conclude whether the access to loan plays an important role on household food consumption. This contrasts with the findings of Aristide et al (2021) who found strong positive evidence to suggest that access to loan improves household food consumption.

Table 3: Regression Result

Variables	Coefficient	Standard Error	P-Value	Remark
Economic Factors				
Income	0.67***	0.143	0.002	Significant
Remittances	0.35***	0.056	0.000	Significant
Loan Access	0.21*	0.110	0.063	Not Significant
Demographic Factors				
Age	0.04	0.128	0.274	Not Significant
Gender	0.01	0.342	0.438	Not Significant
Family size	0.52***	0.045	0.000	Significant
Education	0.34*	0.231	0.085	Not Significant
Psychological Factors				
Health	-0.43**	0.125	0.012	Significant
Correlation Matrix				
Food Exp. and income	0.48			
Food Exp. And share of income	-0.51			

NB: *** indicates significance at 1 percent, ** indicates significance at 5 percent and * indicates significance at 10 percent.

On the demographic variables, it was revealed that only family size plays a significant role on the household food consumption. Specifically, it was revealed that a one percent rise in family size will increase the household food expenditure by 52 percent which is consistent with the earlier literature views (see [Kostakis, 2014](#); [Zani et al, 2019](#); [Aristide et al, 2021](#)). The finding is consistent with both empirical studies and basic apriori expectation (intuition) that large family will spend more on food as compared to small families. Years of schooling is another demographic variable that impact household expenditure, though our result revealed that education impacts on household food expenditure is only significant at 10 percent level of significance. The other two variables examined are found not significant at either 5 or 10 percent level of significance.

Lastly, our study revealed that healthcare expenditure has negative impact on food expenditure and is significant at 5 percent level of significance. This is consistent with the findings of [Aristide et al \(2021\)](#) in terms of significance but contrary to the work of Aristide et al in terms of the sign. Our finding revealed a negative relationship, and one possible explanation to the relationship is that both food and healthcare spending are substitutes to each other, rather than compliments. In other words, if a consumer spends more on food, the family will have less to spend on healthcare, depending on the family level of income and savings attitude. Another possible explanation is that a family who spends more on food, specially to achieve proper diet, will likely spend less on healthcare, as the family will naturally enjoy good health.

In general, the study can conclude that the three measures of the household food expenditure determinants have significant impact on food expenditure in Nigeria.

4.2 Hypothesis Testing.

The four hypothesis of the study includes:

1. H_0 : Economic factors like income does not impact household food expenditure.
2. H_0 : Demographic factors like family size does not impact household food expenditure.
3. H_0 : Health factors like healthcare expenditure does not impact household food expenditure.
4. H_0 : Wagner law of food expenditure does not hold in Nigeria.

The first hypothesis is rejected since the p-value of both income and remittances are significant at 5 percent level of significance. The study therefore concludes that economic factors like income surely has significant impact on household food expenditure. Similarly, given that family size and education have significant impacts on household food expenditure, we reject the null hypothesis, and conclude that demographic factors have significant impact on

household consumption. The third hypothesis is also rejected since healthcare expenditure of the household have significant impact on food expenditure.

Lastly, the fourth hypothesis is also rejected, since the Engel Law which states that as income of the household increases, lower proportion of the income is devoted to food consumption also holds in Nigeria. As seen, the share of income on food expenditure is falling as household income is rising.

5. Conclusion and Recommendation

The study has investigated the determinants of household expenditure on food in Nigeria. The study finds among others that more families have male heads of households than female heads as expected. Secondly, families with young heads of households are more likely to eat outside their homes as compared with families with older heads of households.

Specifically, it was revealed that variables like income, household remittances, access to loan, family size and healthcare expenditure are all having significant impact on household food expenditure. However, factors like age, gender, and education do not have significant impact on household food expenditure. It was also revealed that families with high income tends to spend lower proportion of their incomes on food, which is consistent with the Engel law. This study therefore concludes that income, family size, and other variables have significant impact on household food expenditure, and this is consistent with the earlier literature postulations.

The study recommends that government should make adequate policies to improve the incomes of the households to increase their balance-diet intakes, thereby reducing the share of household incomes going into food expenditure that is currently above 50 percent.

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