

## Determinants of Household Demand for Wholesome Food in Oshodi/Isolo Local Government Area of Lagos State, Nigeria

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Available online at: [www.isroset.org](http://www.isroset.org)

Received: 03/Feb/2021, Accepted: 09/Feb/2021, Online: 31/Mar/2021

**Abstract**-Fruit and vegetable consumption are essential sources of vital nutrients for the body's micronutrient requirements. However, inadequate consumption of fruit and vegetables are often associated with cardiovascular diseases and respiratory diseases. Hence, this study investigates the determinants of household demand for wholesome food in Oshodi/Isolo local government area of Lagos State, Nigeria. With the aid of a well-structured questionnaire, the study employed the quadratic almost ideal demand system (QUAIDS) model and a two stage sampling technique to gather information from 180 households, however, only 109 households had relevant and complete information that was used for this study. The result showed that the mean expenditure for wholesome food was ₦16633.1 and the wholesome food budget share for fruits and vegetables were 0.602148 and 0.397852, respectively. The total food budget share of protein was 0.268489 including animal protein meat and fish and also dairy products was almost equal to that of fruits (0.163025) and vegetables (0.107714) combined, which shows a poor nutritional or health status. The study revealed that income and educational status of household head, income and educational status of spouse, prices of food groups as well as household budget were the major determinants of wholesome food. Also, the study found that there is no substitution effect between wholesome food and other food groups, but a complementary relationship. Wholesome food own price elasticities for both Marshallian (-0.1960) and Hicksain (-0.0474) were negative which suggested that a fall in price will increase the demand of wholesome food. The study recommended the need for a better working environment and better employment opportunities, so people can have more resources in terms of income to have a higher demand level of wholesome foods.

**Keywords:** household demand, wholesome foods, budget share, quadratic almost ideal demand system.

### I. INTRODUCTION

Fruits and vegetables are referred to as wholesome food, which are organically grown and help the body stay healthy. Fruit and vegetable consumption are essential sources of vital nutrients for the body's micro nutrient requirements [1]. Appropriate consumption of fruits and vegetables protects the body against malnutrition and non-communicable diseases (NCDs) such as; cancer osteoporosis, heart disease, scurvy, diabetics, and stroke. However, changing lifestyles, increasing demand of processed foods, and rapid urbanization led to shift in dietary patterns [2]. Consumption of fruits and vegetables are not only rich in vitamins, minerals, and dietary fibre, but are also low in calorie required for the normal functioning of human body [3]. Consumption of at least of 400g of fruits and vegetables per day, per person or an equivalent of 146kg of fruits and vegetables per year per person are the minimum dietary requirement recommended. However, global consumption of fruits and vegetables below this threshold is linked to an increased incidence of cancers as well as some cardiovascular diseases [4]. Rest of the paper is organized as follows; section I contains the introduction, section II contain related work on the determinants of household demand for

wholesome food, section III and IV contain methodology, results and discussions while section V concludes research work with future directions.

### II. RELATED WORK

There have been many studies carried out on determinants of household food demand. However, very few studies have been carried out on determinants of fruits and vegetable household demand. In Greece, [5] studied the determinants of households' food consumption. The study engaged the ordinary least square (OLS) and logit regression model and found that independent variables of demographic and socioeconomic traits such as income, gender, age, marital status, place of residence and status of employment had significant influence on household food expenditures. Similarly, in Nigeria, [6] used quadratic almost ideal demand system model to examined the determinants of household demand for fruits and vegetables from 259 households. The study found that households' mean per capita monthly consumption was far below the World Health Organization (WHO) recommendation of 400g/capita/day while own price, gender, household size and years of education were the

significant factors that influenced the demand of fruits and vegetables.

Researchers from Harvard School of Public Health (HSPH) opined that healthy food (rich in fruits, vegetables, fish and nut) on the average is \$1.50/day more expensive than the unhealthy food (processed foods, meats and refined grains). In spite of this, Nigeria who is the largest consumer of vegetable in sub-Saharan Africa with about 61.31g/capita/day is still far below the daily dietary recommendation and lower than the WHO recommendation of 400g/day [7]. In response, Nigeria put in place series of agricultural programmes and policies to increase wholesome food demand. However, these actions achieved limited successes as the proportions of wholesome food insecure and malnourish household in the country is increasing and calls for concern. Therefore, this study seeks to identify the factors responsible for household demand for wholesome food.

### III. METHODOLOGY

#### Study Area

This study area is Oshodi/Isolo local government of Lagos state. The state is the smallest geographically in the country but the state with the highest population density and located in southwestern geopolitical zone of Nigeria. It is bordered in the south by the Atlantic Ocean. The state has an approximate land mass of 3,577 km<sup>2</sup>. Lagoons and creeks constitute about 0.2 of this land mass.

#### Sampling procedure

A two-stage sampling procedure was employed to gather primary information from 180 households; the first stage involved random selection of 3 communities (Isolo, Okota, and Oke-Afa/Ejigbo) out of the eleven identified communities in the study area. The second stage involve selection of 60 households in each from the three selected communities. In total 180 households were enumerated, however, only 109 households had relevant and complete information and was used for this study. Household demographic and socioeconomic information gathered include; gender, marital status, level of education, primary occupation, monthly income age, and household size,

#### Model specification

Budget share index was used to estimate the expenditure share of each of the food groups considered. Following [8] it is estimated as follows:

$$w_r = \sum_{i=1}^n \frac{x_{ri}}{x_i} \quad 1$$

Where:  $w_r$  = budget share on each food group consumed by the  $i^{th}$  household

$x_{ri}$  = expenditure on each food group by the  $i^{th}$  household (₦)

$x_i$  = total expenditure on all the food groups captured (carbohydrates, protein, fat and oil, fruits and vegetables)

$i = 1, 2, 3 \dots n$

The ordinary least square (OLS) model was engaged to examine the determinants of household demand for various food groups

#### Ordinary Least Square Regression

$$y_i = f(x) \quad 2$$

$$y_i = \beta_0 + \beta_1 X_i + \epsilon_i \quad [9]$$

Where  $y_i$  is the determinant of household demand for various food groups;  $x_i$  is the vectors of demographic and socio-economic variables and  $\epsilon_i$  is the residual term.

The expenditure and price elasticities were derived using QUAIDS model, following [8], the expenditure elasticities is estimated as follows;

$$e_i = u_i / w_i + 1 \quad 3$$

The Uncompensated or Marshallian price elasticities are given;

$$e_{ij}^u = \mu / w_i - \delta_{ij} \quad 4$$

Where  $\delta_{ij}$  is the kronecker delta, which is equal to one when  $i = j$ , otherwise  $\delta_{ij} = 0$ .

$$\text{Using the Slutsky equation; } e_{ij}^c = e_{ij}^u + w_j e_i \quad 5$$

The compensated or hicksain price elasticities can be calculated and used to assess the symmetry and negativity conditions by examining the matrix with elements  $w_i [e_{ij}^c]$ , which should be symmetric and negative semi-definite in the usual way

$w_i$  = dependent variable, expenditure share of all foods groups,  $X_i$  = explanatory variable

$P_1$  = price of carbohydrates,  $P_2$  = price of protein,  $P_3$  = price of fat and oil,  $P_4$  = price of fruits

$P_5$  = price of vegetables

### IV. RESULT AND DISCUSSION

#### Socio-economic Characteristics of Households

The result presented in Table 1 showed that majority of the household were male headed, married, had tertiary education, within the productive age, and worked at a private firm. The mean income was ₦146,238.5/month and the mean household size was 4. Similarly, on the average, a person spent about ₦1152.4 (\$2.88) per day which was just a little above poverty line (\$1.2), therefore households earning less than mean income showed higher vulnerability to poverty, food insecurity and would consider fruits and vegetable a luxury.

Table 1: Socio-economic Characteristics

Variable		Percentage
Gender of household head	Male	72.48
	Female	27.52
Marital status of household head	married monogamous	73.39
	married polygamy	0.92
	never married	22.02
	Divorced	0.92
	Widow	2.75
Educational level of household head	Vocational	12.84
	Primary	0.92
	Secondary	11.93
	Tertiary	74.31
Primary Occupation of household head	Farming	0.92
	civil service	18.35
	Trading	35.78
	Private	42.20
	Artisans	2.75
Monthly income of household head	<100000	45.87
	100001-200000	37.61
	200001-300000	11.93
	300001-400000	1.83
	400001 and above	2.75
Age of household head	<25	4.59
	25-65	83.49
	Above 65	11.93
Household size	1-3	32.11
	4-6	57.80
	7-9	10.09

Source: field survey 2020

### Budget Share of Different Food Groups

Table 2 showed that the budget share of protein including animal protein; meat, fish and dairy products is almost equal to that of fruits and vegetables, which showed a poor nutritional status. The budget share of carbohydrates was the highest which showed a very high consumption of carbohydrates in all its including pastries, bread, noodles and cereals. Also, the result revealed that more was spent on fruits than vegetables almost twice the amount, this means that there was a lot of preference for fruits than vegetables among households. The average quantity of carbohydrate was 109.9621kg/week which is by far the highest among all the food groups with an average price of ₦213.9649 kg/week, this shows that an average individual consumption of carbohydrate is very high and makes for about 50% of total consumption.

Table 2: Budget Share of Different Food Groups

Food Groups	Budget Share	Average Quantity (kg)	Average Price (kg/₦)
Carbohydrates	0.3830	109.9621	213.9649
Protein	0.2685	22.5073	732.8681
Fat and oil	0.0778	50.5044	94.6432
Fruits	0.1630	27.6519	362.2022
Vegetables	0.1077	17.9685	368.2847
Total	1	228.59419	1771.96308

Source: field survey 2020

### Determinants of Household Demand for Fruits, Vegetables and Wholesome Food

The result of the determinants of household demand was presented in Table 3. The adjusted R<sup>2</sup> for fruits, vegetables and wholesome were 0.7947, 0.5992, and 0.7816, respectively. Thus, the independent variables explained about 79.45%, 59.92% and 78.16% of total variability observed in the dependent variable. The major determinants of fruits were level of spouse education (p<0.05), price of carbohydrates (p<0.01), price of protein (p<0.01), price of fat and oil (p<0.05), price of fruits (p<0.01), price of vegetables (p<0.01), and total food expenditure (p<0.10). On the other hand, age of household head (p<0.10), level of spouse education (p<0.05), income of household head (p<0.05), price of carbohydrates (p<0.01), price of fruits (p<0.01), price of vegetables (p<0.01), and total food expenditure (p<0.10) were the major determinants for vegetable. Lastly, the determinants of joint household demand for wholesome food (fruit and vegetable) were income of household head (p<0.05), educational status of household head (p<0.10), spouse educational status (p<0.01), income of spouse (p<0.05), price of carbohydrates (p<0.01), price of protein (p<0.01), price of fat and oil (p<0.10), price of fruits (p<0.01), and total food expenditure p<0.01).

Table 3: Determinants of Household Demand for Fruits, Vegetables and Wholesome Food

Variable	Fruits	Vegetable	Wholesome
Constant	.1015 (.0673)	.1479*** (0.445)	.2494*** (.0752)
Age of HH	-.0098	-.0152*	-.0250

Gender of HH	(.0162) .0136 (.0194)	(.0078) .0041 (.0125)	(.0148) .0177 (.0220)
Household size	.0030 (.00039)	-.0015 (.0023)	.0014 (.0042)
Income of HH	1.37e-07 (1.00e-07)	1.42e-07** (5.46e-08)	2.79e-07** (1.04e-07)
Marital status of HH	.0051 (.0071)	.0040 (.0053)	.0091 (0.0071)
Educational status of HH	-.0107 (.0077)	-.0070 (.0043)	-.0177* (.0089)
Primary Occupation of HH	.0119 (.0102)	-.0070 (.0057)	.0052 (.0100)
Spouse Education	.0150** (.0064)	.0093** (.0041)	.0243*** (.0064)
Spouse Income	-3.35e-07 (2.13e-07)	-2.09e-07 (1.19e-07)	-5.44e-07** (2.27e-07)
Ln price carbohydrate	-.1318*** (.0317)	-.0413*** (.0131)	-.1731*** (.0329)
Ln price Protein	-.0383*** (.0081)	-.0041 (.0024)	-.0424*** (.0089)
Ln price fat and oil	-.0113** (.0046)	.0033 (.0020)	-.0080* (.0046)
Ln price fruit	.0509*** (.0088)	-.0113*** (.0035)	.0396*** (.0094)
Ln price vegetable	-.0213*** (.0066)	.0296*** (.0050)	.0084 (.0071)
Ln price food expenditure	.1348*** (.0332)	.0259* (.0154)	.1606*** (.0330)
R <sup>2</sup>	0.8232	0.6549	0.8120
adjusted R <sup>2</sup>	0.7947	0.5992	0.7816

Source: *Field survey 2020* HH = Household head; Ln = Natural logarithm; \*\*\*, \*\*, \* = level of significance at 1%, 5%, and 10% respectively; Standard errors are in parenthesis.

### Expenditure Elasticity

The result of the expenditure elasticity of various food groups presented in Table 4 revealed that the elasticity of the various food groups were all positive, which showed that they are normal goods, for carbohydrates (0.9721) was very close to unity therefore a percentage increase in income would lead to almost or the same proportionate increase in expenditure of carbohydrate. Whereas, for protein and fat and oil, a percentage increase in income would lead to 1.40% and 1.6% increase in the expenditure for protein and fat and oil, hence income elastic. Contrarily, for wholesome food, a percentage increase in income would lead to 0.52% increase in the expenditure for wholesome food, hence income inelastic.

Table 4: Expenditure Elasticity of Various Food Groups

Food groups	Expenditure elasticity
Carbohydrates	0.9721
Protein	1.4044
Fat and oil	1.6007
Wholesome food	.5204

Source: *Field survey 2020*

### Marshallian/Uncompensated Elasticity

Table 5 presented the estimated Marshallian/uncompensated own and cross price elasticity. The result showed that own price elasticity for carbohydrates, protein, fat and oil and wholesome food (-0.4208, -0.4619, -0.0526 and -0.1960) were negative and less than one in absolute values hence inelastic indicating that there was an inverse relationship between price and quantity demand which was consistent with economic theory. They are all had no close substitute, and so for increase in price, there would be a less than proportionate decrease in expenditure.

Table 5: Estimated Marshallian/Uncompensated Own and Cross Price Elasticity

Prices	Carbohydrates	Protein	Fat and oil	Wholesome food
Carbohydrates	-0.4208	-0.1952	-0.0881	-0.2680
Protein	-0.4700	-0.4619	-0.1195	-0.3530
Fat and oil	-0.6590	-0.4070	-0.0526	-0.4822
Wholesome food	-0.1963	-0.0828	-0.0453	-0.1960

Source: *Field survey 2020*

### Hicksain/Compensated

Estimated hicksain/compensated own and cross price elasticity is presented in Table 6. The result revealed that own price elasticity of the food groups were less than unity and negative indicating an inelastic demand and inverse relationship between price and quantity demanded. An increase in the price would lead to -0.04371, -0.1168, and -0.4735 decrease in the quantity demanded for carbohydrates, protein and wholesome food, respectively. Contrarily, fat and oil showed a positive relation (0.0766) showing that an increase in price of fat and oil would increase the demand for fat and oil. The cross price elasticities of carbohydrate and demand of protein was

0.0437, implied that the opportunity substitution was very low, with fat and oil showed a complementary relationship, and with wholesome food was a very low opportunity of substitution (0.0096). The cross-price elasticities of protein and carbohydrates (0.0749) also indicates substitution but the opportunity very low, with fat and oil (-0.0061) showed complementary effect and substitution with wholesome food (0.4808). Therefore, Carbohydrates and protein are substitute for each other, fat and oil does not have any substitute among the food groups and carbohydrates and protein can both be substituted for wholesome foods.

Table 6: Estimated Hicksain/Compensated Own and Cross price elasticity

Prices	Carbohydrates	Protein	Fat and oil	Wholesome food
Carbohydrates	-.0437	.0437	-.0096	.0096
Protein	.0749	-.1169	-.0061	.0481
Fat and oil	-.0380	-.0137	.0766	-.0250
Wholesome food	.0056	.0451	-.0033	-.0474

Source: *Field survey 2020*

## V. CONCLUSION AND RECOMMENDATION

The study assessed the determinants of household demand for wholesome food in Oshodi/Isolo local government area of Lagos state, Nigeria. The result revealed that majority of the respondents were married monogamous, had tertiary education, and private salary earners. Carbohydrates had the highest budget share allocation of all food groups. The determinants for household demand for wholesome food were age, income, level of spouse education, prices of food groups and total food expenditure. It was also realized that there is no substitution effect between wholesome food and other food groups and that a fall in price will increase the demand of wholesome food. The study found that demand for fruits and vegetables was low in the study area and recommended that government, non-government organization should better working environment and better employment opportunities, so people can have more resources in terms of income to pursue higher education and thereby increase demand for wholesome foods

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