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DETERMINANTS OF FRUITS AND VEGETABLES CONSUMPTION AMONG LOW-INCOME EARNING HOUSEHOLDS IN IBADAN METROPOLIS

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ABSTRACT

Improving the consumption of fruits and vegetables (FVs) in the cities is germane to increasing the nutrition of low-income households. In view of this, this study examined the socio-economic factors influencing FVs consumption behaviour of metropolitan low-income earning households in Ibadan. Using a multistage sampling, one hundred and six (106) respondents were sampled across three LGAs in Ibadan metropolis. With a structured questionnaire, array of information about households' socio-economic characteristics and consumption behaviour were elicited and further analyzed by descriptive and regression analyses. Majority (67%) of the FVs consuming household heads were young, married and were averagely 38 years old. Average household size was 5 persons. Fruits accounted for 6% and vegetables covered 11% of the monthly household food budget. Schools, hospitals, and mass media were the main source of awareness about FVs consumption. Prices of FVs were perceived to be affordable by the households and were reported to be consumed on daily basis. Major FVs reportedly consumed regularly among the households were: oranges, banana, mango, watermelon, amaranth, waterleaf, moringa, and bitter leaf. Household size, major occupation, taste and preference, and fruit price influenced fruit consumption, while the determinants of vegetables' consumption were education level, household size, income, taste and preference, and vegetable price. It is concluded that low-income households in Ibadan metropolis have rigid fruits and vegetables consumption behaviour. It is therefore necessary that socio-economic attributes and consumption behaviour of low-income households should be given priority in the design of interventions on fruits and vegetables' consumption in Nigeria.

Keywords: food system, food policy, income per capita, consumption expenditure, urban, cosmopolitan city, household economic status.

DOI

INTRODUCTION

Fruits and Vegetables (FVs), relevant and crucial constituents of healthy diets, need to be consumed daily in adequate quantities to reduce the risk for chronic diseases and maintenance of a healthy body weight. FVs are edible parts of crops that possess immense nutritional values and are important sources of macro and micro-elements (Dijkxhoorn et al, 2021; Raaijmakers et al., 2018). Their consumption on a regular basis is associated with a vast series of health ben-

efits including diseases control, increased food digestion and better functioning of the whole system (Herath, 2019; WHO, 2018; Perera and Madhujith, 2012). There are scientific evidences that diets lacking in FVs is a major independent risk factor for Non-Communicable Diseases (NCDs) especially in the developing economies (Dijkxhoorn et al, 2021; WHO, 2018). Literature has it that NCDs account for more global mortality, morbidity and disability than communicable diseases (WHO, 2018; Perera and Madhujith, 2012) and low and middle-income countries accounted for 80% of the global deaths due to NCDs (Ziaei et al., 2020; WHO, 2018). For instance, retrospective data by Alikor and Nwafor (2018) reported that between the years 2013 and 2017, NCDs constituted 57.7% of chronic illness in the University of Port-Harcourt Teaching Hospital (UPTH). Similarly, Schneider *et al.* (2007) established that low fruit and vegetable intake alone accounted for 3.2% of the total deaths in South Africa in the year 2000. This evinced the importance of FVs in the balancing of household diets among low-income earning households in the developing economies. Therefore, increasing FVs consumption could be important to improving the nutrition of many people and congruently save significant lives in Nigeria.

Fruits such as banana, watermelon, citrus, chewer-chop, apple, grape, pear, lemon and vegetables such as tomatoes, pepper, eggplant, lettuce, cucumber, garlic, carrot, green vegetables, and cabbage are undoubtedly common in the household food basket of Nigerians. The level of consumption varies across the region, and mostly determined by price and variety (Dijkxhoorn et al., 2021), while other attributes such as taste and preference are adduced to consumption among the less price sensitive individuals (Ohen et al., 2014). In recent times, certain vegetables such as underutilized and indigenous vegetables have received increased attentions due to intensive awareness from all tiers of Governments, NGOs, and Research Institutions in Nigeria and beyond. Some of the recent efforts were the credit policy by the Bank of Industry (BoI) that aimed at encouraging agro-allied industries to obtain loans for large production and processing of fruits and vegetables; televised programmes on the nutritional and health benefits of fruits and vegetables and the proposed Federal Government School Feeding Programme as well as the ongoing Nigeria-Canada Vegetable Programme (NICANVEG) on the indigenous and endangered vegetable varieties sponsored by Agricultural Development Research Centre (ADRC). These FVs promotion initiatives among others, aimed at meeting consumer's needs and preferences, increasing consumer awareness of the benefits of diets essentially rich in FVs, diversifying production, understand consumer expectations in taste, texture, price convenience, quality and safety attributes (Ndie, 2013). Therefore, promoting the consumption of FVs for health reasons also implies a need to improve the supply and distribution systems to ensure their safety and qualities. With these increasing efforts on FVs consumption, it is evident that FVs intake in Nigerian cities can be enhanced and households' nutritional needs can also be significantly improved.

FVs consumption in Nigeria is reportedly below the WHO recommendation (Olatona et al., 2018; Ohen et al., 2014; Banwat et al., 2012). Large population groups including the children and adolescents were mostly deficient of the adequate intake (Ziaei et al., 2020; Ilesanmi et al., 2014). On daily basis,

average household consumes 61.31g/capita of FVs amounting to approximately 100 naira in Nigerian monetary term (Dijkxhoorn et al, 2021; Kamga et al., 2013). On weekly basis, 12.4% and 16.3% of the population consumes leafy vegetable and non-leafy vegetables, respectively at least once or twice per week (Raaijmakers et al., 2018; Maziya-Dixon et al., 2004). The fundamental reasons for low consumption particularly among the urban low and middle class households are the poor dietary awareness, seasonality, high price, and limited year-round availability, food safety issues, affordability, and adoption of modern/western lifestyles (Herath, 2019; Raaijmakers et al., 2018; Hollinger and Staatz, 2015; Banwat et al., 2012; Ibrahim, 2011). In most Nigerian households, total food budget share allocated to FVs ranged from 4.5-16% and weekly expenditures were as low as ₦14 and ₦21 respectively, which is the least among the staples (Maziya -Dixon et al., 2004; Ruel et al., 2004).

Ample studies have shown that FVs consumption varies across income groups, regional locations and tribes as well as within the household domains (Dijkxhoorn et al, 2021; Raaijmakers et al., 2018; Ogundari and Arifalo, 2013). Regionally, southwestern States were reportedly lowest in FVs intake (Ogundari and Arifalo, 2013), and recorded reasonable cases of NCDs (Ogunmola and Oladosu, 2014; MICS, 2011). Literature has also established that age cohort, income group, education and gender differentials were important drivers of households' FVs consumption patterns (Raaijmakers et al., 2018; WHO, 2018). Therefore, relationship between household socio-economic status and FVs intake behaviour is empirically plausible.

In urban and peri-urban communities, FVs consumption is reportedly influenced by age group and income status (Olatona et al., 2018; Raaijmakers et al., 2018; FRAC, 2013; Hollinger and Staatz, 2015). This is because low-income households substitute energy rich food for those rich in vitamin among which fruits and vegetables are essentials (Raaijmakers et al., 2018; FRAC, 2013). Also, there are form preferences, and processed fruits are mostly preferred to fresh fruits (Raaijmakers et al., 2018; Adebamiji and Omotola, 2009). Importantly, the urban households prefer processed to fresh fruits but spend insignificant share of the household food expenditure on FVs consumption (Raaijmakers et al., 2018; Ohen *et al*., 2014; Adebamiji and Omotola, 2009).

There are several studies on FVs consumption in Nigeria with emphases on age cohort, social class and income group (Dijkxhoorn et al, 2021; Olatona et al., 2018; Raaijmakers et al., 2018; Hollinger and Staatz, 2015; Ilesanmi et al., 2014; Ohen et al., 2014; Ndie et al., 2013; Banwat et al., 2012; Adenegan and Adeoye, 2011; Ibrahim, 2011; Adeoye et al., 2009), however, the situation among the low-income earners in the cities has not been clearly established (Raaijmakers et al., 2018; FRAC, 2013). Given the importance of fruits and vegetables to human survival, this study therefore investigates the determinants of FVs consumption behaviour among low income earning households in the metropolitan city of Ibadan, with a view to describing households' socio-economic characteristics; profiling households' consumption behaviour; identifying policies for stimulating consumption; and evaluating the socio-economic factors affecting FVs consumption among metropolitan households in Ibadan.

MATERIALS AND METHODS

Ibadan, the largest city in Nigeria is also the third largest metropolitan area by population in Nigeria after Lagos and Kano with an estimated metropolis population of over 3.6 million covering a total area of 2,551.5 square miles (Profipelajar, 2021). A city located in southwestern Nigeria within latitude 7.44N and longitude 3.90E; Ibadan is a prominent transit point between the coastal region and the area to the north. This city is inhabited majorly by the Yorubas, most of whom are professionals, artisans, farmers, and traders of several consumer goods in which fruits and vegetables constitute a relatively fair portion. Given its metropolitan nature, it is needless to say the city boasts of a considerable population of other Nigerian ethnic groups as characteristics of an urban area. With its strategic location on the an operational railway line connecting Lagos to Kano, the city is a major centre for trade in conventional and non-conventional fruits and vegetables. According to Profipelajar (2021), Ibadan is the third cheapest Nigerian city to live after Ikot-ekpene and Aba. Therefore, the low-income households in Ibadan are expected to have fair purchasing potentials to consume adequate fruits and vegetables.

Sampling technique

The study used a multistage sampling procedure to elicit arrays of information from 106 households. The first stage involved a purposive selection of three (3) Local Government Areas (LGAs) out of the eleven (11) LGAs in the city (Table 1) due mainly to dense population of the low-income residents in the area. At the second stage, a stratification of each of the LGAs into residential and non-residential areas was done. The third stage involved proportionate sampling of households from the residential LGAs category according to their respective sizes. A snowball sampling method was then employed to sample households from Ososami, Oke-Ado, Imalefalfia, Sango, Mokola, Bodija, Nalende, Dugbe, Onireke, Orita Challenge, New Garage, Odo-ona Elewe in keeping with the Oyo State households' information record and a total of 120 respondents were so sampled (Table 1), however, only 106 respondents contained sufficient information for analysis.

Table 1: Distribution of respondents by LGAs

LGA	Communities	Number of households
Ibadan South West	Oke-Ado, Ososami, Imalefalfia, Odo-ona Elewe, New Garage and Orita Challenge	60
Ibadan Northwest	Onireke, Dugbe, Nalende, Mokola	40
Ibadan North	Bodija and Sango	20

Data analysis and specification of econometric model

The study adopted descriptive and stepwise regression methods to analyse data collected. Descriptive statistics described the socio-economic characteristics of the FVs consuming households such as age, household size, education level, and marital status (Table 2); and profile the consumption pattern of fruits and vegetables in Ibadan metropolis while the stepwise regression analysis was used to capture the socio-economic factors affecting household consumption of FVs among the respondent.

The lead equation for multiple regression was a semi-log, given as:

$$\text{Ln}FRUIT_i = \sum_{i=1}^{11} \beta_0 + \beta_i X_i + \mu_i \quad \text{.....(i)} \quad \text{(fruits)}$$

$$\text{Ln}VEG_i = \sum_{i=1}^{11} a_0 + a_i m_i + e_i \quad \text{.....(ii)} \quad \text{(vegetables)}$$

Where

X_i =vector of ith household's socio-economic features affecting fruits consumption; a_0, = constant term in the fruits equation; a_i =coefficients of dependent variables (X) in the fruit model; μ = disturbance error for fruits equation; m_i =vector of ith household's socio-economic features affecting vegetables consumption; β_0 = constant term in the vegetables equation, β_i =coefficients of dependent variables in the vegetables model; e=disturbance error for vegetables equation ; Ln=natural log.

RESULTS AND DISCUSSION

Socio-economic characteristics of FVs consuming Households

Approximately 53% of the respondents were male while 47% were female (Table 3). This provides equal opportunities for both genders to give information about households' FVs consumption. Similarly, high representation of female genders among the household heads implies woman headship of the households' majority. This finding is in conformity with Bamwat et al. (2012) and Layade and Adeoye (2014) that female headed households have a better practice of fruits and vegetable consumption than their male counterparts.

Table 2: Type and nature of the variables employed in the econometric models

Variable name	Label	Variable options/measurement (data type)	Expected sign
Dependent variables			
FRUIT	household monthly consumption expenditure on fruits	Naira (continuous)	+/-
VEG	Household monthly consumption expenditure on vegetables	Naira (continuous)	+/-
Independent variables			
SEX	Sex of HH head	1=male, 0=female (dummy)	+
MARSTAT	Marital status of the household (HH) head	1= single, 2=married, 3 =divorced, 4=separated (discrete)	+/-
AGE	Age of the HH head	Number of years (continuous)	+/-
CAP_INCOME	Household per capita income	Naira (continuous)	+
EDU	Years HH head spent in acquiring formal education	Number of years (continuous)	+
HHSZ	Household size	Number of household members (Count)	-
PRICE	average unit price of fruits/ vegetables	Naira (continuous variable)	-
AVAIL	Availability of fruits/ vegetables	1= if availability affects fruits/ vegetables consumption, 0=otherwise (dummy)	+
TASTE	Fruits/vegetables taste	1=if taste determines fruits/ vegetables consumption, 0=otherwise (dummy)	+
OCCUPATE	Primary occupation of the HH head	Categorical (1=civil service, 2=trading, 3=private firm; 4=artisanal. ***Reference category : civil service***	+/-
G_AWARE	Awareness of government sensitization programme on fruits/ vegetables consumption	1=aware, 0= otherwise, (dummy)	+

The mean age of the household head was 38 years, suggesting a young, active, ebullient and supposed economically viable household headship. The majority (68%) of the respondents were married (Table 3), reflecting a group of homily lifestyle's men and women with marital responsibilities wherefore highly inclined to making FVs intake decisions with the interest of the respective household members keenly considered. The finding is similar to that obtained by Raaijmakers et al. (2018) and Oyedele et al. (2014). In terms of education attainment, less than one-quarter (23%) and approximately half (49%) of the households head completed secondary and tertiary (OND/ HND) educations respectively. If the level of education of the household head were used as the only measure of literacy, then, a larger percentage of the households should be more accessible and receptive to information about FVs consumption. Given the high level of literacy observed in the study area, written and mass media publicity methods might

be useful channels for sensitizing households about adequate fruits and vegetables consumption.

More than 40% of the respondents were involved in trading (Table 3), 25% worked as private contract labour, gardeners, and cleaners in the private firms, 18% were self-employed in various artisanal works such as driving, carpentry, hairdressing, brick layering, barbing and dry cleaning while about 13% worked in the civil service. On the average, FVs consuming households earned approximately ₦31,600 per month. With reference to education status, low-income households' earning capacity is below the expected average income which possibly suggested the existence of underemployment or disguised employment in the study area. The respondents demonstrated small household characteristics of the demographic distribution pattern associated with urban households. Average household size was 5 members . Overall, more than 80% have less than 8 members per household. This possibly emphasized existence of a medium household size among the low-income earners, despite the urbanization level, and the expected demographic set up in the study area. The result agrees with finding by Raaijmakers et al. (2018) in the Lagos and Ibadan cities in Nigeria.

Households varied in their awareness level of nutritional benefits accrued to FVs consumption, however, majority of the respondents were aware (75%) that FVs have nutritional benefits. This awareness was obtained mainly from the School (71%), hospital (53%), mass media (47%), friends and families (48%), as well as workshops and seminars (39%). It is quite notable that there is a continuous sensitization on the nutritional and health benefits of FVs in the schools and hospitals which suggests that there are ongoing efforts to encourage adequate FVs intake in the cities. This result is similar to the finding of Okafor (2012) that 52% of the FVs consumers obtained information on their consumption benefits from the hospitals. Similarly, more than half of the respondents, (69%) asserted that dietary awareness of the nutritional benefits of FVs enhanced their personal rate of consumption. The benefits highlighted included improved nourishment and good health (34%), body weigh enhancements (19%), disease prevention and cure (17%), food digestion (16%), taste and hunger satisfaction (14%).

Table 3: Socio-economic characteristics of FVS consuming households

Variable	Frequency	Percentage	Mean
Sex			
Male	56	52.8	
Female	50	47.2	
Total	106	100.0	
Age in years			
21-30	39	36.8	
31-40	32	30.2	
41-50	19	17.9	38
51-60	06	5.7	
Above 60	10	9.4	

Marital status			
Single	30	28.3	
Married	72	67.9	
Divorced	02	1.9	
Widowed	02	1.9	
Education level			
No formal education	08	7.5	
Adult school	02	1.9	
Primary school	04	3.8	
Did not complete secondary school	08	7.5	
Secondary school	24	22.6	
Did not complete tertiary education	08	7.5	
Tertiary school (OND/HND)	52	49.2	
Primary occupation			
Trading	46	43.4	
Private firm	26	24.5	
Artisanal	20	18.9	
Civil service	14	13.2	
Average monthly income (₦)			
≤10,000	14	13.2	
10,100- 20,000	16	15.1	
20,100-30,000	21	19.8	31,608.70
30,100- 40,000	35	33.0	
40,100-50,000	15	14.2	
> 50,000	05	4.7	
Household size			
1-3	20	18.8	
4-6	69	65.1	5.0
7-9	17	16.1	
Awareness of the nutritional benefits of FVs consumption			
Aware	79	75.0	
Not aware	27	25.0	
Information source of the benefits			
Schools	29	28.6	
Hospitals	22	21.5	
Social and mass media	20	18.6	
Friends and families	19	18.2	
Workshops and seminars	16	15.1	
Does awareness affect consumption?			
Yes	33	31.0	
No	73	69.0	
Total	106	100.0	
Benefits of FVs consumption			
Improved health	36	33.9	
Enhanced body growth	21	19.4	
Prevention/cure of diseases	18	17.2	
Food digestion enhancement	16	15.6	
Taste and hunger satisfaction	15	13.9	

Source: Author's field survey, 2017

Households FVs consumption behaviour

Fruits such as Citrus (22%), banana/ plantain (18%), mango (17%), watermelon (15%) pineapple (11%) and pawpaw (10%), and vegetables such as Amaranth (30%), waterleaf (29%), moringa (21%) cochorus (10%) and bitter leaf (10%) were common in the households' food basket (Figure 1). Fruits were mostly consumed weekly (19%), and fortnightly (42%) while vegetables consumption were 42% on daily basis and 29% 2-3 times weekly (Table 4). This shows that more than two-third of the households in the study area consumed vegetable frequently, owning possibly to the local meal requirements as well as the continuous nutritional awareness and good health rewards of vegetables intake. This report is in compliance with the findings of Raaijmakers et al. (2018); Ohen et al. (2014). In term of preference forms for fruits and vegetables among households, 43% and 69% of the households had preference for certain fruits and vegetables respectively. About 80% preferred fresh to processed fruits (13%) while 89% preferred fresh to processed vegetables. Preference for fresh fruits were due mainly to the sweetness (32%), personal interest/convenience (23%) and availability (14%) while fresh vegetables were preferred because of their availability (39%), sweetness and taste (25%). However, fruits and vegetables such as pears, apples, and cucumbers were not consumed frequently among the households (Table 4). This is in conformity with findings from a study conducted among the undergraduate Students by Herath (2019) and Adebamiji and Omotola (2009) that more than 60% of Students preferred fresh to processed fruits, but disagreed with the findings of Raaijmakers et al. (2018) and Adenegan and Adeoye (2011). Rather than the selling price, uncertainties about food safety and health risk were said to reinforce households' dislike for processed fruits intake.

Apart from the two fruity vegetables reportedly ubiquitously consumed by every household; tomatoes and okra, vast majority (70%) of the respondents had preference for leafy vegetables (Figure 2). Amaranth was preferred by 30%, waterleaf (29%), moringa (21%), bitterleaf (20%), and cochorus (10%). However, it should be noted that exotic vegetables were not important in the households' food basket. This study agreed with Dijkxhoorn et al. (2021) that Nigerian people usually consume conventional vegetables but disagreed with the finding of Raaijmakers et al. (2018) who reported prevalence of exotic vegetables among the urban consumers in Lagos. With this, continuous efforts to stimulate increase production of processed fruits and vegetables among the agro-allied companies might not really attain the desired goal of increased national health and enhanced family nutrition if the low-income earners do not share substantially in these nutritional improvements.

In terms of fruit consumption decision making, report shows that most often, the mother decided the quantity of FVs consumed in the household (42%), 24% said father made such decision, while 11% opined it was the children's responsibility. Unlike the fruits, most times, decision to consume vegetables is taken by mothers (75%), followed by fathers (18%). This result is a representation of a typical African society where most of the household decisions are taken by the mother. This suggests that having adequate knowledge of the nutritional importance of FVs among the married women can improve household FVs intake. Fruits are reportedly purchased in the neighbourhood (55%), rural

market (21%), street hawkers (17%), urban and local markets (3.8%) and as well obtained from personal farms/garden (3%). For vegetable, majority of the households bought from the neighbouring market (42%), followed by the local/urban market (16%), street hawkers (12%), and rural market (11%). About 42% opined that fruits were very cheap, 13% each agreed that they were relatively cheap and of good value for money, 20% opined that they were expensive while 11% said they were very expensive. This means that household majority perceived market prices of fruits and vegetables affordable, suggesting price to be no barrier to FVs consumption.

The mean monthly expenditure on FVs was ₦5,504, amounting to 17.4% of the food budget share (Table 5). The report is in agreement with the finding of Adebamiji and Omotola (2009) who reported a similar share of food budget expended on fruits consumption among Bowen University Students. Given an average monthly income of ₦31,681, it was also discovered that households spent average of ₦1,855, amounting to 5.8% of the total food budget on fruits intake while ₦3,649 accounting for 11.5% was expended on vegetables consumption. More importantly, per capita expenditure on fruits and vegetables were ₦350 and ₦674 monthly respectively. This finding is in line with the result obtained by Ruel *et al.* (2004) that a range of 3-13% and 4.5-16% of the total household expenditure and food budget respectively were allocated to fruits and vegetables among the individuals in Sub-Sahara Africa.

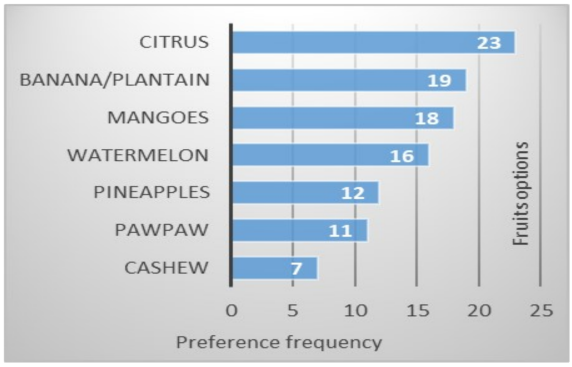

Figure1: Household preference for fruits

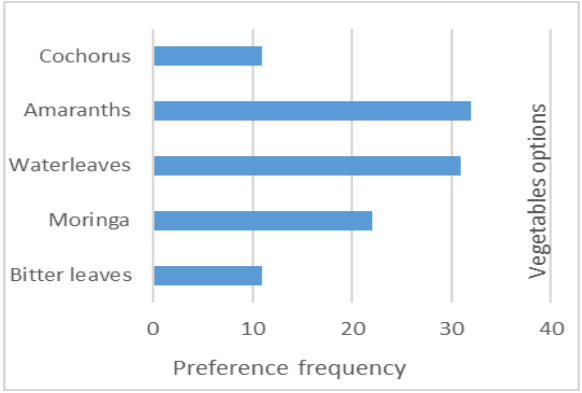

Figure 2: Household preference for vegetables

Table 4 : **Consumption behaviour of FVs consuming Households**

Variable	Fruits		Vegetables	
	Frequency	Percentage	Frequency	Percentage
Consumption frequency				
Daily	8	7.5	45	42.5
2-3 times weekly	12	11.3	31	29.2
Weekly	20	18.9	12	11.3
Fortnightly	51	48.1	12	11.3
2-3 times monthly	15	14.2	04	3.8
Monthly	Nil	Nil	02	1.9
Preference				
Yes	47	44.3	73	69.8
No	59	55.7	32	30.2
Preferred forms				
Fresh	86	80.6	94	88.7
Processed	14	13.0	8	7.6
Fresh and processed	6	6.4	4	3.8
Reasons for preference				
High nutritional values	6	6.1	17	16.0
Sweetness and good taste	34	32.0	27	25.5
Personal interest/convenience	46	43.5	21	19.8
Availability	15	14.3	41	38.7
Affordable Price	4	4.1	5	16.0
Household decision maker of FVs consumption				
Father	25	24.1	19	18.0
Mother	44	42.0	80	75.0
Children	12	11.3	4	4.0
Any of the household member	24	22.6	3	3.0
Sources of FVs				
Neighbourhood	58	55.0	40	42.4
Rural market	22	21.0	10	10.6
Street hawkers	18	17.0	12	12.72
Local/urban market	4	3.8	15	15.9
Personal farm/garden	3	3.2	23	24.38
Market price perception				
Very Cheap	40	42.4	13	12.5
Relatively cheap	13	12.6	19	18.2
Good value for money	14	13.4	24	22.6
Expensive	21	20.3	33	31.0
Very expensive	12	11.3	17	15.7

Table 5: Household monthly Expenditure on Fruits and Vegetables consumption

Category	Fruits	Vegetables	FVs
Expenditure (₦)	1,855	3,649	5,504
Per capita expenditure (₦)	350	674	917
Food Budget share (%)	5.85	11.52	17.4

Source: Author's computation

Policies to stimulate FVs consumption

Only 18% of the FVs consuming households were aware of government sensitization programmes and policies to influence adequate FVs intake while 82% did not (Table 6). This was unexpected because of the households' level of exposure to various sources of information about FVs consumption benefits in the study area. In order to improve consumption, 58% suggested that modern storage facilities should be provided for the people handling FVs items so as to maintain quality and attractiveness at sale. About 15% suggested empowerment of the household to increase their earning capacity and 10% also encouraged improved sensitization via audio-visual methods of audience targeting while 11% solicited supports for the FVs producing firms. From the ongoing, it becomes obvious that households believe that improved access to modern storage facilities will enhance the quality and quantity of FVs available to the metropolitan households. These submissions agreed with the findings of Herath (2019) among the undergraduate students in Sri Lanka.

Table 6: Policies to stimulate fruits and vegetables consumption

Variable	Frequency	Percentage
Awareness of sensitization programme		
Yes	19	18.2
No	87	81.8
Total	**106**	**100.0**
How to household FVs consumption		
Provide modern facilities to the marketer	62	58.4
Create more jobs	16	15.3
create awareness through audio-vision mechanism	10	9.7
Support FVs producing firms	11	10.7
Increase household income	6.3	5.9
Total	**106**	**100.0**

Effects of socio-economic factors on the households' per capita expenditures of fruits and vegetables

Regression models were statistically significant (Table 7). Serially, fruits and vegetables had 0.80 and 0.48 coefficients of determination (R^2) and Durbin-Watson (DW) values of 2.37 and 2.01, respectively. This implied that the socio-economic variables included in the model had capacity to explain about 80% and 48% of the total variability in the households' monthly per capita expenditures on fruits and vegetables, respectively. The DW revealed that there were no serial correlations among the identified variables. The F-values for fruits and vegetables models (34.24 and 7.73) respectively were significant at $p<0.01$, confirming the appropriateness of the specified models.

Factors affecting fruits consumption

It was observed that the coefficient of price was positive and that of household size, primary occupation, and taste and preference were negative but significant. Household size, fruit price, taste and preference were significant at $p<0.01$, while primary occupation was significant at $p<0.1$. This implies that a 1% increase in the household size will correspondingly result to about 55% decrease in natural log of monthly per capita expenditure on fruit consumption. It can therefore be adduced that households with many members spend less on fruit consumption per head than households consisting of few members. Similarly, households are more liable to experience about 5.2% and 6.8 decline in the natural log of per capita expenditure on fruits alone if the primary occupation are trading and artisanal rather than civil service. This is because petty trading and unskilled or semi-skilled self employment dominate the primary occupations of the low-income households in the study area, thus, improving the quality of jobs and the monthly take home of low-income household heads, meaning possibly, increasing the proportion of expendable income on monthly fruits intake. However, the negative relationship could also mean that many household heads whose primary occupation is trading and artisanal may not likely consider fruits intake a top priority during income raise. In this case, increasing such households' income could mean increasing funds for other household needs of higher importance than fruits. On the other hand, a change in the households' tastes and preferences for fruits (probably from fresh to processed fruit juice) would yield a corresponding 48% decrease in the natural log of monthly per capita expenditure on fruit among the consuming households. Processed fruits, according to the respondents, are not affordable to the majority of the households. Fresh fruits, unlike the processed form, are available in divisible quantities. This should be an encouragement to the households to get desired fruits quantities in accordance with the households' purchasing power. In contrast, a marginal rise in the price of fruits will result to 56% increase in the natural log of monthly per capita expenditure on fruits intake. The result showed that market price of fruits had a positive correlation with natural log of households' per capita expenditure on fruits. In other words, high fruits price is an incentive to raising the share of per capita food expenditure on fruits consumption. With the rising inflation in Nigeria, it may be necessary that households raise per capita expenditure on fruits in Ibadan metropolis to meet WHO fruit dietary requirement.

Factors affecting vegetables consumption

Five factors significantly influenced the share

of the monthly per capita expenditure on vegetables: education level, household size, household income, taste and preference, as well as vegetable price (Table 7). These variables were significant at $p<0.01$ for the household size and vegetable price; $p<0.05$ for education level; and $p<0.1$ for the household income and taste and preference. In agreement with the a *priori* expectation, number of years household head spent acquiring formal education was strongly associated with vegetables consumption. The finding discovered 28% marginal rise in the natural log of household per capita expenditure on vegetables intake as a result of a unit improvement in level of education attained by the household head. This implies that households that have access to improved education are more liable to allocating increased proportion of their disposable income to vegetable intake than the less educated households. The result agreed with findings of Herath (2019) and Ziaei (2020) that there is a positive correlation between education status and vegetables consumption. Similarly, household size was positive and significant at $p<0.01$. The result showed that increasing the members of the household by 1% will correspondingly result to 82% increase in the natural log of households' monthly per capita expenditure on vegetables consumption. By implication, large households spend more on vegetable consumption than small households. This assertion is supported by Dong and Lin (2009) whose findings identified strong positive relationship between household size and vegetables consumption.

Moreover, in compliance to the a *priori* expectation, household income had a positive coefficient and statistically significant at $p<0.1$. Given a unit increase in the households' monthly per capita income, natural log of the monthly per capita expenditure on vegetable will increase by 18%. This positive relationship between households' per capita income and per capita expenditure agreed with a macro analysis report by Marie et al. (2004) that there is a general positive trend of increasing consumption of fruits and vegetables as gross domestic product per capita goes up, but the trend is not fully linear.

Taste and preference for vegetable was also found negative but significant at $p<0.1$. A unit effort by the low-income households to change taste and preferences for certain vegetable consumption would yield a corresponding decline of 44% in the natural log of household per capita expenditure on vegetable consumption. This suggests that fresh vegetables are preferred to the processed ones. In agreement with Ogundari and Arifalo, (2013), processed vegetables are not so important in the food basket of the most Nigerian households.

Lastly, vegetable price significantly affected vegetable consumption but positive. Contrary to the a *priori* expectation, the result showed that a percentage rise in price of vegetable would generate about 44% increase in the natural log of households' monthly per capita expenditure on vegetable consumption. This result contradicted findings of Dong and Lin, (2009) as well as the general law of demand. This indicates that change in the vegetable price does not necessary affect the quantity of vegetable consumed but household expenditure on vegetables.

It can therefore be inferred that low-income households in Ibadan metropolis have rigid vegetable consumption behaviour, and changes in disposable income and vegetable price play a negligible role in vegetables consumption.

Table 7: Stepwise Regression analysis of the influence of households' socio-economic characteristics on FVs consumption expenditure

Variable	Fruits	Vegetables
Constant	3.538(1.055)***	2.872 (1.510)***
Age of household head	0.472 (0.314)	0.652 (0.454)
Sex	0.146 (0.214)	-0.258 (0.263)
Marital status	-0.270 (0.220)	-0.111 (0.305)
Years of education	0.083 (0.103)	0.279** (0.141)
Household size	-0.550* (0.131)	-0.812* (0.189)
Primary occupation		
Trading	-0.052 (0.026)***	-0.0163 (0.027)
Private firm	0.164 (0.218)	0.216 (0.235)
Artisanal	-0.068(0.264)***	-0.310 (0.229)
Log of household per capita income	0.036 (0.077)	0.183*** (0.101)
Awareness of Government sensitization programmes	0.188 (0.213)	-0.123 (0.301)
Availability	-0.014 (0.174)	-0.188 (0.2480
Taste and preference	-0.480(0.144)*	-0.444 (0.203)***
Log of Price	0.563 (0.038)*	0.044 (0.159)*
R-square	0.805	0.481
Adjusted R-square	0.782	0.418
F-statistics	34.244	7.731
Durbin-Watson statistics	2.374	2.011

N:B-*,** and *** are P values significance at 0.01, 0.05, 0.1 levels ( ) standard error

CONCLUSIONS

This study discovered that:

- consumption of fruits and vegetables are below the recommended level among the low-income households in Ibadan metropolis;
- there is a reasonable knowledge of the dietary and nutritional benefits of FVs consumption among the households, however, households exhibit variant degree of awareness;
- Few varieties of fruit and vegetable types are common in the food basket of Nigerian' low income earning households;
- households reportedly have strong taste for local and indigenous fresh FVs, however, consumption of exotic fruits and vegetables remained uncommon;
- fruits intake was determined by household size, primary occupation, market price, taste and preference while vegetables consumption was determined by

education level, per capita household income, market price, and taste and preference. Therefore, low-income households in Ibadan metropolis have rigid fruits and vegetables consumption behaviour.

RECOMMENDATIONS

From the foregoing, it is imperative that:
more efforts is directed towards providing awareness about fruits and vegetable consumption at the household level.

additional work is needed on dietary and nutritional awareness of FVs intake among the teeming population of the city dwellers.
community targeted programmes such as on-street publicities, the use of bill boards, seminars and symposia should be revisited and frequently used.

in the design of intervention on fruit and vegetables, it would be necessary to give priority to the social economic attributes and consumption behaviour of households.

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