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Drivers of Vegetable Consumption in Urban Nigeria: Food Choice Motives, Knowledge, and Self-Efficacy

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Abstract: Objective: This study aimed to provide insights into vegetable consumption behavior of urban Nigerian consumers across different Socio-Economic Classes (SEC), their main food choice motives, and the associations of these motives and other drivers with vegetable consumption. **Methods:** An online survey was conducted in which 1220 women from Lagos ($N = 808$) and Ibadan ($N = 412$) metropolis from different SEC participated. **Results:** On average, respondents reported to consume 2.6 portions of vegetables per day. Most vegetables were bought at open and traditional markets, were bought fresh rather than processed, and were consumed cooked. Respondents from the second richest and upper middle SEC consumed most vegetables () and higher SEC consumed a larger variety of vegetables compared to those from lower classes. Respondents who reported to have a higher knowledge of vegetable consumption, had a higher belief in one's own ability to prepare vegetables (self-efficacy), and those that valued the food motive Mood and Health more, reported a higher vegetable intake. **Conclusions:** Vegetable consumption in the studied cities in Nigeria was below recommendations. Increasing knowledge and self-efficacy might be a way to increase consumption, especially in combination with interventions in the food environment and product design focused on the motives Health and Mood, and considering the importance of differences between SEC.

Keywords: vegetable consumption; food choice motives; knowledge; self-efficacy; socio-economic classes; food environment; Nigeria

1. Introduction

Globally more people live in urban than in rural areas and by 2050, 66% of the world's population is projected to be urban. It is expected that more than half of this growth will occur in Africa, whereby Nigeria will stand out [1–3].

Urbanization, in combination with economic and social development, leads to a change in dietary patterns and nutrient intake: This process is called 'nutrition transition' [4], and contributes to increasing health burdens and Non-Communicable Diseases (NCDs) worldwide and especially in developing countries [5]. It is shown that when income rises the consumption of foods associated with a high-quality diet increases (including fruit, vegetables and milk). However, the consumption of products associated with a low quality diet (e.g., fast food, sugar-sweetened beverages) increases even more strongly. When income rises, the budget share of vegetables in total food expenditures declines [6]. With its large and quickly expanding urban population with rapidly accumulating wealth and rapid changes in food habits, Nigeria will face new, multiple and different challenges regarding food security and food systems, health burdens and NCDs [7,8]. While the nutrition transition is still

in an early stage in Nigeria [9,10], an increase in the incidence of obesity and related NCDs is already observed in urban and rural areas in Nigeria [10,11].

This study aims to contribute to sustainable healthy eating patterns in urban areas in Low- and Middle-Income Countries (LMICs), in this case urban Nigeria. For this, insights into the underlying determinants of healthy food choices is essential, in the broader context of the food environment. Insights into the motives and barriers that consumer experience, as well as the relation between drivers of behavior, and food purchase and consumption behavior, provides insights into the opportunities and threats for changing the diet.

Within the present study, we focus on vegetable consumption behavior, as vegetable consumption is a commonly recommended element in a balanced and healthy eating pattern. An adequate consumption of vegetables could lead to significant improvements in public health, as it reduces the risk of the development of chronic diseases (e.g., heart diseases, high blood pressure, diabetes and obesity), several cancers and prevents or alleviates several micronutrient deficiencies (e.g., References [12–14]).

Despite its importance the daily consumption of vegetables is insufficient in Nigeria [15–18]. Reliable data on food intake in populations in developing countries (including Nigeria) are scarce and limited, meaning that the mentioned numbers may deviate from actual consumption [6]. In the latest national survey 12.4% of the households reported to consume leafy vegetables, and 16.3% consumed non-leafy vegetables, at least once or twice per week. In urban areas, 11.1% of the households indicated to consume at least once or twice a week leafy vegetables and 16.6% indicated to consume non-leafy vegetables at the same frequency [15].

Several potential barriers to increasing vegetable consumption in urban areas of Nigeria are observed in the literature. Limited year-round availability, affordability, need for convenience, food safety issues and the attraction to the modern or Western lifestyles are mentioned as constraints for healthy food choices by urban middle class consumers in Lagos [19]. Next, cultural beliefs and taboos, and religious beliefs are also found to influence the food choices of consumers [20]. Regarding the vegetable availability, this is region- and season-dependent, and products are mostly eaten fresh, since storage possibilities are few and substantial losses occur due to inadequate preservation and transport. Also at the national level, the availability of vegetables is insufficient to meet the recommended levels of intake [21]. For lower Social Economic Classes (SEC), the affordability of vegetables is problematic due to low purchasing power of households, and necessities to prioritize energy-dense foods which are generally cheaper. Across all urban consumers, including the lower SEC, constraints in the time available for shopping and preparation of food appears to drive consumers towards increased consumption outside the home. Convenient foods are typically high in fat and carbohydrates, and low in vegetables and other nutrient-dense foods. Those seeking to shift to healthier, but convenient alternatives, such as fish, fresh fruits and vegetables, are faced with the increasingly expensive costs of nutritious foods relative to the fast-food alternatives.

Motivation represents the individual's willingness to change behavior [22]. The motivational factors determining an individual's intention are the attitude towards and social norms regarding the behavior [23]. Consumers have different motivations for choosing different types of food products. These so-called food choice motives (FCM) are consumers' motives, reasons or motivations for choosing or eating food products and provide valuable insight into the underlying consumer drivers [24]. They are associated with intake of food products, including vegetable intake [25,26]. Individuals are motivated to behave when they can discern that their self-interest will be served. As such, self-interest is a strong component of motivation [27]. Steptoe and colleagues (1995) developed an instrument to assess the impact of different reasons for making food choices, the Food Choice Questionnaire (FCQ) [24]. This multidimensional scale consists of 36 items, representing both health and non-health related food characteristics, classified into nine different motivational dimensions, measuring the importance of Health, Mood, Sensory appeal, Natural content, Weight control, Familiarity, Price and Ethical concern in food choice. Despite its relevance, the FCQ is mostly applied in high income countries, and to a limited extent in LMIC. The FCQ was applied in one African country, namely

Cape Verde [28]. In this study the identified motives slightly differed with the motives found in the study by Steptoe et al. (1995). The most important motive was Well-being (combination of health and mood), followed by Sensory appeal, Nutritional aspects and diet (combination of nutrition and weight control), Natural content and Price [28].

A well-known model to describe why consumers perform certain behaviors and how these behaviors can be changed is the Motivation—Opportunity—Ability (MOA) model [22]. In this model, people need the motivation and the environmental or contextual opportunity to eat healthily. On top of the motivation and opportunity people need to be able to conduct the intended behavior and therefore ability is the third factor in the MOA model. Ability refers to skills and knowledge to perform behaviors. On the one hand, this refers to more practical skills and knowledge that are needed, such as cooking techniques for preparing vegetables, knowledge on recommended vegetable intake, etc. Subjective knowledge, someone's own perception of his/her level of knowledge has been related to the acceptation and evaluation of products [29]. In LMICs subjective knowledge has been related to food safety [30,31]. Another central concept in the ability literature is self-efficacy or perceived behavior control. This is the belief that someone has the capability to perform a certain behavior [32]. It is specific to a certain behavior, for example someone can be confident about being able to limit his or her intake of sugary drinks, but not to have adequate amounts of fruit intake. Self-efficacy is assumed to reflect true personal abilities and skills and therefore relate to behavior [33], and an important predictor of health behavior change [34]. In the Theory of Planned Behavior for example, perceived behavior control is related to both intention and behavior (e.g., Reference [23]). However, in LMICs some studies applied the self-efficacy scale in domains related to computer use, job search and HIV, but very limited to healthy eating or the consumption of fruits and vegetables.

One of the most relevant socio-demographic variables that influence food choice and consumption is SEC. SEC relates to the persons' position in society and is operationalized in various ways, including income, occupational level, educational level or wealth (assets) [35–37]. Research conducted in high income countries has found that SEC influence food choice and intake. More precisely, it was found that low SEC consumers are more likely to have a less healthy diet and consume less fruit, vegetables and fibers compared to high SEC consumers [38,39]. A study conducted in Uruguay confirmed the influence of income level on the underlying FCM and barriers to the adoption of healthy eating between low and middle SEC. It was found that low SEC respondents described their choices as mainly driven by economic factors and physical needs (e.g., satiety), whereas product-related characteristics (i.e., convenience) were mainly determined for middle SEC respondents [40].

The Present Study

To summarize, current obesity rates and micro-nutrient deficiencies in LMICs underline the need for dietary changes and even more when considering development in urbanization and nutritional transition. Nigeria is one of the countries for which this is particularly true. Motives and the ability to change are important drivers of consumer behavior, but little is known about the importance of these determinants in LMICs in general and in Nigeria in particular.

With this study, we aimed to get more insights regarding the vegetable consumption behavior of urban Nigerians across different SEC, their main FCM, and the associations of these motives and other drivers with vegetable consumption. Specific objectives were to first to describe the local vegetable situation, vegetable intake and purchase behavior; second, to describe the importance of the different FCM for the urban Nigerian consumer; third, to determine the association between motivation and ability (subjective knowledge and self-efficacy) with vegetable intake, and fourth, to investigate differences in vegetable consumption and determinants of consumption across the different SEC. Additionally to the results of this study, implications will be discussed in the food system perspective as consumer and consumer choices cannot be considered separately from the food environment, i.e., the context in which food choices are made. This food environment in turn consists of a large number of chains and actors and is a dynamic system in which influences and trade-offs occur.

2. Materials and Methods

2.1. Study Design and Respondents

Data were collected through an online survey in Lagos and Ibadan, Nigeria. The International research agency IPSOS located in Lagos, Nigeria, collected the data in November 2016. The questionnaire was administered by a trained interviewer using a structured interview reading out loud the questions from the questionnaire on a mobile device, and if applicable supported by show cards. Show cards were developed and used to present the included vegetable answering scales visually to the respondent. The show cards with vegetables were used to have a shared perception of vegetables and the show cards with answering categories were used so that respondents did not have to memorize them. Respondents were recruited across different districts in Lagos and Ibadan, and were only included if they were the key decision makers in the purchase of groceries within their household and when they were one of the persons that bought the groceries. Respondents freely participated and received an incentive after finishing the questionnaire. A pretest of the questionnaire was conducted before the start of the fieldwork.

In total, 1220 female respondents were included in the study. The average age of the sample was 32.4 years (range 18–55). The demographics of the respondents are shown in Table 1.

Table 1. Demographic characteristics of the study sample (*N* = 1220 females).

		N =	%/Mean
City	Lagos	808	66.2
	Ibadan	412	33.8
Average age (range 18–55)			32.42
Family status	Married/living with partner	896	73.4
	Single	315	25.8
	Divorced	9	0.7
People living in the household	One	41	3.4
	Two	84	6.9
	Three	260	21.3
	Four	385	31.6
	Five	277	22.7
	Six	107	8.8
	Seven or more	66	5.4
Children living in the household	Yes	902	73.9
	No	278	22.8
Income level (monthly net income)	Below N10,000	31	2.5
	N10,001–N20,000	100	8.2
	N20,001–N30,000	117	9.6
	N30,001–N40,000	161	13.2
	N40,001–N50,000	232	19.0
	N50,001–N60,000	145	11.9
	N60,001–N80,000	120	9.8
	N80,001–N100,000	75	6.1
	N100,001–N120,000	35	2.9
	Above N120,001	44	3.6
	Don't know/Refuse	160	13.1
Employment Status	Work full-time	208	17.0
	Work part-time	100	8.2
	Work informally (e.g., seamstress at home)	15	1.2
	Unemployed	144	11.8
	Retired	4	0.3
	Student (not employed)	105	8.6
	Housewife (not employed)	41	3.4
	Self-employed	603	49.4
Ethnicity	Hausa	23	19.9
	Ibo	221	18.1
	Yoruba	919	75.3
	Others	57	4.7

Table 1. *Cont.*

		N =	*%/Mean*
Religion	Muslim	317	26.0
	Christian	901	73.9
	Others	2	0.1
Socio-Economic Class, based on assets [1]	A—Richest	56	4.6
	B—2nd Richest	105	8.6
	C1—Middle class	129	10.6
	C2—Middle class	246	20.2
	D—2nd Poorest	684	56.1
Key decision maker for grocery shopping	Yes, I am the key decision maker	886	72.6
	Yes, I am one of the key decision makers within our household	334	27.4
Buying groceries	Yes, I am buying groceries for our household	940	77.0
	Yes, I am one of the persons within our household that buys groceries for our household	280	23.0

[1] Respondents were allocated to the different socio-economic classes by their assets, such as ownership of durable, facilities (cooking, water, sanitary), housing and are, educational level, and occupation.

2.2. Measures

2.2.1. Vegetable Buying and Consumption Behavior

To examine the *buying behavior*, questions related to the following topics were included: (i) The form in which vegetables were bought (fresh, dried, canned and frozen), and (ii) buying place (market, street vendor, convenience or small grocery store, and supermarket). The consumption pattern of different types of vegetables (e.g., tomatoes, onions, cucumber, carrots, okra) was explored by asking the consumption frequency with the following categories to choose from: Never, less than once a month, monthly, weekly and daily.

To estimate the respondents' usual *vegetable intake*, the standardized Food Frequency Questionnaire (FFQ), developed and validated by Van Assema et al. (2002) was applied. This FFQ measures usual fruit and vegetable intake. FFQs are considered a suitable tool to rank individuals according to their usual consumption of foods or food categories [41]. As we aimed to identify and rank the SEC on their usual vegetable consumption behavior, the FFQ fitted the best whereas it is less suitable for establishing the level of intake of a population. Respondents indicated their usual consumption frequency (number of days per week) and usual consumption amount of both cooked and raw vegetables (number of servings in spoons). These data were converted in three steps to determine total vegetable intake: Converting intake levels into meaningful data (into portion sizes), multiplying the intake frequency by portion sizes, and adding together the subgroups raw and heated vegetables [42].

2.2.2. Socio-Psychological Determinants

To measure the underlying *food choice motives* the Food Choice Questionnaire (FCQ) developed by Steptoe et al. (1995) was used. The FCQ consists of 36 items, representing both health and non-health related food characteristics. Each item was introduced by the affirmative sentence "It is important to you that the food you eat on a typical day . . . " followed by each motive, and evaluated by the respondent on a 7-point Likert scale, going from 1 = not important at all to 7 = extremely important. An Exploratory and Confirmatory Factor Analysis (EFA and CFA) were conducted to determine the underlying structure of the questionnaire. The EFA indicated four factors based on the scree plot of the EigenValue, and eight factors based on an EigenValue of above 1.0., with a total explained the variance of 57.4%. These results differ from the nine factors presented by Steptoe et al. (1995). CFA was conducted with nine factors (fixed). The output did not reveal the pattern mix "Rotation failed to converge in 25 iterations (convergence = 0.004)". Iterations of 35 were needed to conduct the CFA with nine factors. This output revealed that the factor "Convenience" would be split into

"Convenience-preparing" and "Convenience-buying". After examining the results, the eight-factor solution was chosen, as the four-factor structure did not provide a clear pattern. All items loaded 0.30 or more on one of the factors. Regarding the sample size of this study, this is enough to have practical significance [43]. Five of the items that loaded more than 0.30 on more than one factor have been deleted. These items were "Looks nice", "Can be bought in shops close to where I live or work", "Is easily available in shops and supermarkets", "Has a pleasant texture", and "Is like the food I ate when I was a child". Next one factor was deleted, as it only included one item "Is high in fibre and roughage". The items factor loading and Cronbach's α of the remaining items are shown in Table 2.

Table 2. Factor loading and Cronbach's α for Food Choice Questionnaire (FCQ).

Factor	Item	Factor Loading	Cronbach's α
Mood	Keeps me awake/alert	0.783	0.83
	Cheers me up	0.713	
	Helps me relax	0.638	
	Helps me to cope with life	0.613	
	Is good for my skin/teeth/hair/nails etc.	0.514	
	Makes me feel good	0.495	
	Helps me to cope with stress	0.486	
	Is packaged in an environmentally friendly way	0.404	
	Smells nice	0.403	
Convenience	Is easy to prepare	0.850	0.87
	Can be cooked very simply	0.825	
	Takes no time to prepare	0.803	
Ethical concern	Comes from countries I approve politically	0.887	N.A [1]
	Has the country of origin clearly marked	0.880	
Natural Content and Weight Control	Is low in fat	−0.735	0.83
	Is low in calories	−0.646	
	Helps me control my weight	−0.637	
	Contains no artificial ingredients	−0.606	
	Contains natural ingredients	−0.575	
	Contains no additives	−0.551	
Price	Is not expensive	0.846	0.73
	Is cheap	0.809	
	Is good value for money	0.597	
Familiar	Is familiar	0.790	N.A [1]
	Is what I usually eat	0.776	
Health	Contains a lot of vitamins and minerals	0.752	0.69
	Keeps me healthy	0.719	
	Is nutritious	0.716	
	Is high in protein	0.512	

[1] As the factor consists of two items it was not possible to calculate the Cronbach's α.

The respondents' own perception of their knowledge about vegetables was measured with the three item-scale *subjective knowledge* scale developed by Aertsens and colleagues (2011) [44]. The scale included the following three items: "In comparison with an average person you know a lot about vegetables", "You know a lot about how to judge the quality of vegetables", and "People who know you, consider you as an expert in the field of vegetables". Answers were given on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The Cronbach's α in this sample was 0.83.

The respondents' beliefs in their own ability to prepare and increase their vegetable consumption (*self-efficacy*) was measured with the following nine items: "You know how to prepare all vegetables", "You have a cook who prepares the vegetables for you", "You can distinguish vegetables of good quality from vegetables with a low quality", "You like all kind of vegetables", "You lack cooking skills to make all kind of vegetables", "You feel stressed when you have to prepare all kind of vegetables", "A lot of vegetables are difficult to cook", "You are too busy to make meals with vegetables", and "You do not believe that vegetables are health". Answers were given on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. After recoding the negatively formulated items,

EFA indicated two-factor structure, based on the scree plot of the EigenValue, with a total explained the variance of 53.3%. After examining the results, it was decided to use one factor structure, as one factor included all the recorded items. The following items were deleted as this would increase the Cronbach's α: "You have a cook who prepared the vegetables for you" (from α0.56 to α0.71) and "You like all kinds of vegetables" (from α0.71 to α0.72). The final scale consists of seven items, with a Cronbach's α of 0.72.

3. Results

3.1. Vegetable Buying and Consumption Behavior

The vast majority (97.7%) of the respondents indicated to buy their vegetables; only 2.3% of the sample ($n = 28$) indicated to both buy *and* grow their own vegetables, and no one relied only on self-grown vegetables. 99.8% of the respondents indicated to buy fresh vegetables for their household. Fresh vegetables were most often bought at open markets (58.0%), followed by street vendors (19.6%) and convenience stores/small grocery stores (19.2%). Supermarkets were the least likely outlet for vegetables (3.2%). Similar results were found for canned, dried and frozen vegetables, although frozen and canned vegetables were bought relatively more in supermarkets and convenience stores.

All respondents indicated to consume vegetables with on average 17.8 portions per week, 2.55 portions a day. Looking at the average consumption per week, the respondents indicated to consume 12.9 ($SD = 8.0$) of cooked and 4.9 ($SD = 5.8$) of raw vegetables. One portion (serving spoon) equals 50 g. Cooked vegetables were consumed on a daily basis by 44.3% of the respondents whereas for raw vegetables this was 6.5%. Almost all respondents consumed fresh vegetables (99.8%) and a majority consumed canned vegetables (58.9%), whereas dried and especially frozen vegetables were consumed by a smaller percentage of the population (35.8% and 13.3% respectively). Tomatoes, onions, small sweet peppers, hot peppers, carrots and green leafy vegetables were the most frequently consumed types of vegetables (consumed by >90% of the respondents). Also, bell peppers, cucumber, okra, baby corn, cabbage, green beans, and garden egg were consumed by a large majority (>70%) of the respondents. Lettuce was consumed by 43.9% and pumpkin by 33.1% of the respondents. Other vegetables (i.e., broccoli, beet roots, karalla, and zucchini) were consumed only by a minority of the sample (<10%).

Significant differences regarding vegetable consumption were found between the different SEC for both heated ($F(4, 1219) = 3.1$, $p < 0.01$) and raw vegetables ($F(4, 1219) = 11.9$, $p < 0.001$). Post-hoc analyses showed that respondents from the second richest and upper middle class (SEC B and C1) consumed more vegetables compared to the poor (SEC C2 and D) which was mostly attributable to the consumption of raw vegetables (see Table 3). The rich and upper middle class (SEC A, B and C1) were also more likely to consume frozen and canned vegetables than the poor (SEC C2 and D), and they consumed a greater variety of vegetables, since they consume more often the less traditional vegetable species.

3.2. Socio-Psychological Determinants

Regarding the FCM, overall the motive Health was considered the most important (M = 6.36). The motives Mood, Natural, Price, Convenience and Familiar all scored high, more specifically between 5.91 and 5.31 on average (see Table 3). Ethical concerns were considered the least important motive. The mean scores for subjective knowledge were M = 5.66, and self-efficacy was M = 5.58.

Significant differences were found between the SEC regarding the FCM Price, Mood, and Familiar. Price was considered less important in the middle and highest SEC compared to the lower SEC. Familiar and Mood were most important for the middle and less important for the highest SEC. Next, small, but significant, differences were found between the SEC groups in perceived knowledge. The middle-class group reported that they had a higher knowledge of vegetable consumption compared to the lower SEC.

Table 3. Vegetable consumption and the different socio-economic classes.

		Total	A	B	C1	C2	D	F(4, 1219)
Vegetable intake [1]								
Total vegetable intake	Mean	17.81	20.21 [ab]	21.15 [a]	21.62 [a]	16.71 [b]	16.78 [b]	9.08 ***
	SD	11.14	13.73	15.6	13.07	10.30	4	
Intake heated vegetables	Mean	12.90	13.45	14.40	14.50	12.21	12.57	3.05 **
	SD	8.00	9.37	9.32	9.35	7.55	7.49	
Intake raw vegetables [1]	Mean	4.91	6.76 [abd]	6.75 [ab]	7.12 [ab]	4.50 [ade]	4.21 [e]	11.89 ***
	SD	5.82	6.623	8.86	6.39	5.58	4.89	
Food Choice Motives [2]								
Health	Mean	6.36	6.35	6.46	6.40	6.30	6.35	2227
	SD	0.50	0.39	0.46	0.48	0.51	0.52	
Mood	Mean	5.86	5.61 [c]	6.01 [a]	5.93 [ab]	5.86 [b]	5.85 [b]	4311 **
	SD	0.63	0.77	0.58	0.64	0.56	0.64	
Natural content and	Mean	5.78	5.76	5.96	5.84	5.77	5.75	1682
Weight control	SD	0.80	0.66	0.75	0.78	0.76	0.84	
Price	Mean	5.69	5.38 [c]	5.69 [ab]	5.52 [bc]	5.64 [ab]	5.77 [a]	4318 **
	SD	0.89	0.84	0.95	0.90	0.90	0.87	
Convenience	Mean	5.63	5.94	5.69	5.77	5.58	5.59	2173
	SD	1.09	0.65	1.16	0.98	1.07	1.14	
Familiar	Mean	5.61	5.32 [d]	5.78 [ab]	5.79 [a]	5.54 [cd]	5.60 [bc]	3.495 **
	SD	0.96	0.99	0.90	0.87	0.98	0.97	
Ethical concern	Mean	4.24	4.04	4.48	4.29	4.33	4.18	1291
	SD	1.59	1.60	1.56	1.70	1.53	1.59	
Subjective knowledge [3]	Mean	5.66	5.91 [ab]	5.76 [ab]	5.87 [a]	5.57 [b]	5.62 [b]	2375 *
	SD	1.19	1.04	1.07	1.16	1.26	1.19	
Self-efficacy [3]	Mean	5.58	5.34	5.72	5.67	5.56	5.57	2195
	SD	0.85	0.85	0.92	0.89	0.90	0.81	

[1]: Number of self-reported vegetable portions per week. [2]: 7-point Likert scale is applied ranging from 1 = not important at all to 7 = extremely important. [3]: 7-point Likert scale is applied ranging from 1 = strongly disagree to 7 = strongly agree. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. [abcde] different letters indicate a significant difference between clusters.

3.3. Determinants of Vegetable Consumption

Respondents who reported to have a higher knowledge of vegetable consumption, who valued the food motive Mood and Health more, and who also had a higher self-efficacy reported a higher vegetable intake. These associations were found after controlling for the positive relation between a higher household size and a higher SEC status with vegetable intake. Age did not have an additional association with vegetable intake. Although significant, the associations however were weak and in total only 15.3% of the variance in food intake was explained by the variables (see Table 4).

Table 4. Results stepwise regression analysis on the drivers of vegetable intake.

	Standardized Beta Coefficients	*t*-Value	*p*-Value	R^2 Change
First step				
(Constant)		13.181	0.000	
Household size	0.093	3.298	0.001	
SEC A [1]	0.058	2.023	0.043	0.038, F(5, 1214) = 9.50,
SEC B [1]	0.110	3.813	0.000	$p < 0.001$
SEC C1 [1]	0.132	4.546	0.000	
SEC C2 [1]	−0.002	−0.057	0.955	
Second step [2]				
Mood	0.316	8.608	0.000	
Convenience	0.043	1.349	0.177	
Ethical concern	−0.023	−0.782	0.434	
Natural content and weight control	−0.006	−0.154	0.877	0.114, F(9, 1205) = 17.99,
Price	−0.049	−1.573	0.116	$p < 0.001$
Familiar	0.038	1.305	0.192	
Health	−0.083	−2.480	0.013	
Knowledge	0.085	2.883	0.004	
Self−efficacy	0.077	2.455	0.014	

[1] Socio-economic status (SEC) as a dummy variable with the lowest SEC (D) as the reference. [2] Beta's are reported for the step when the variable was introduced.

4. Discussion

4.1. Summary of the Main Results

This study provided insights into the vegetable consumption behavior of urban Nigerians across different SEC. And it adds insights to the existing literature as it identified the main FCM of urban Nigerians, and the associations of these motives and other drivers with vegetable consumption.

On average, the total consumption of vegetables was 2.55 portions per day whereas it is recommended to eat at least 4 portions (200 g). Vegetables were considered a standard element of meals, but a limited variety of vegetables was commonly consumed, both in terms of types of vegetables eaten, degree of processing (i.e., mostly fresh), and outlets (i.e., mostly traditional open markets). The respondents in the higher SEC consumed a greater variety of vegetables, especially the ones that are considered exotic (e.g., broccoli, cauliflower) and they also ate more raw vegetables. Regarding the drivers of vegetable consumption, we found support for the importance of motives and ability variables. Respondents who reported a higher knowledge of vegetables and who had a higher belief in ones' own ability to prepare vegetables (self-efficacy) reported a higher vegetable intake. Also, those who valued the FCM Mood and Health more, reported a higher vegetable intake. Health was considered the most important FCM by the respondents, followed by Mood, Natural, Price, Convenience and Familiar while Ethical concern was considered least important. Implications of these findings will be considered in detail below.

4.2. Implications of the Main Results

The average vegetable consumption was below recommended levels. This is in accordance with our expectations, as previous research revealed a low average vegetable consumption (e.g., References [15–17]). Reliable information on vegetable consumption in Nigeria is scarce and the available data reveals a large range in the estimated consumption amount of vegetables from 59 g to 170 g [16,17]. This large range might be due to the influence of seasonality or due to different definitions of vegetables in different studies (e.g., green leafy vegetables only versus all vegetables). Only one study explicitly mentioned in its discussion that tomatoes, onions and peppers were excluded, because of their ubiquitous use in the preparation of most of the soups in the Nigerian culture [18]. The results of our pilot study showed that respondents have different interpretations of what they consider as vegetables. For example, tomatoes and onions were considered spices, rather than vegetables, whereas spinach or other leafy green vegetables were considered vegetables. Overall, this result indicates that it is of great importance to define and categorize the term vegetables in surveys. However, it should be taken into account that it is of great importance to tailor the applied questionnaire or instrument as much as possible to the local perceptions and definitions of vegetables. On the other hand, in data collection it is also of great importance that the used definition of vegetables is clearly marked. In our study we tried to overcome this challenge, by showing a clear explanation our definition of vegetables by including pictures of the vegetables that were seen at the open local markets and in supermarkets and other outlets during a previous trip. Regardless of how vegetables are defined in this survey, results indicate that vegetable consumption should be increased across all the SEC.

The limited variety of vegetable intake should be considered in interventions, especially for the low SEC groups and at the same time might provide opportunities, for example in terms of processed vegetables (i.e., dried vegetables). In the dry season, dried vegetables might be a good suggestion as the availability of fresh vegetables is lower and prices are higher [17]. Moreover, future research could focus on the specific motives to buy fresh or processed vegetables, the selection for the more traditional or exotic ones, and the specific motives to purchase vegetables at a specific outlet (e.g., open market, supermarket or small convenience store), this to get more insights into ways to increase variety. More specifically, we found that richer and upper middle-class respondents consumed more vegetables and especially more raw vegetables, a larger variety of vegetables, and more canned vegetables compared those respondents that were in the poorer SEC groups. This indicates that there are opportunities to

increase the intake of a more varied vegetable basket and preparing and processing methods. On the other hand, it is unclear what the motives and barriers are behind those SEC differences. Do consumers from lower SEC have different attitudes and beliefs, or does the availability or accessibility differs, or both? These research questions might be of interest in future research.

When looking at the FCM, it was shown that the motives Health, Mood, Natural and Weight control were considered the most important motives in making food choices. Ethical concern was considered least important. The order of importance of the FCM was broadly in line with other studies that used the original FCQ (e.g., Reference [45,46]), with the exception that the Nigerian consumer considered the motive Familiar as more important than the European consumer (M = 5.31 versus M = 2.85) [45]. Food consumption practices in Nigeria are found to be influenced by many social-cultural factors, including cultural traditions, food beliefs or religious circumstances [47]. Future interventions and product design should consider Health and other motives important to consumers. To stimulate vegetable consumption the motives Health and Mood should be integrated into an intervention or product design as they are related to vegetable consumption. For example, the motive Health could be further operationalized in mentioning the health benefits of vegetables.

Next, it is important to realize that the revealed eight-factor structure in this study is not in correspondence with the nine-factor structure presented by Steptoe et al. (1995). This result is in line with other studies in LMICs that applied the FCQ [46]. Therefore, a good comparison of the most and least important FCM between countries and over time is not possible as the results of the CFA and EFA differs between the original FCQ and the ones that are conducted in the developing countries. This due to the fact that some other studies added extra items or conducted a different statistical test. A review by Cunha et al. (2018) showed that several studies have shown the invariance of the FCQ across cultures, while others present the need for adaptations of the FCQ [46]. Also, for Nigeria, the original FCQ might not fit the local context. There is some research conducted on the different motives that Nigerian consumers have. Culture, food safety/risk, healthiness and convenience are considered important motives for selecting a certain food product [19]. Future research should focus on the validity of the FCQ for the Nigerian context and context-specific motives might be useful to further improve the measurement scale. For the other drivers, the results were in line with previous studies that showed an association between self-efficacy and subjective knowledge with food intake. Increasing ability aspect of vegetable intake seems to be a promising way to move forward. Ability should be considered in combination with motivation and opportunity; the so-called MOA model [22]. While abilities are the individual's skills and/or knowledge that enable behavior change [27] and motivation represents the individual's willingness to change behavior; opportunity is the environmental or contextual mechanisms that enable behavior change, and ability. Collective changes in consumer behavior can open pathways to more sustainable food systems that enhance food security and nutrition and health. Therefore, we discuss the implications of the results from a food systems perspective in Section 4.4.

4.3. Study Limitations

This study has limitations. First, and most importantly, vegetable consumption is based on self-reported data. The results should be interpreted carefully, as we lack insights on how reliable self-reported vegetable consumption is. In addition, the FFQ was used which is a valid method to measure vegetable intake at a level where consumers can be ranked, but it is less suitable for establishing more detailed information on intake and quantification of intake [41]. Respondents might have over- or underreported their consumption. In developing countries consumers might be more prone to report socially desirable aspects, rather than real behavior [41]. However, respondents also might have underreported their vegetable consumption as a result of short memory or low educational level. However, in this study, this is less of a problem because we only compare the different SEC [41] and look at associations between drivers and intake while we do not draw conclusions in terms of the actual intake. Another limitation in the interpretation of the study results was the focus on vegetables rather than meals and preparation and the limited geographical position. Vegetables are a crucial

part of a healthy diet and often consumption is below recommendation which justifies the focus on vegetables. On the other hand, looking at combinations of vegetables with other food products, and studying preparation methods will help to formulate implications of the outcomes in relation to healthy eating patterns. Similarly, it is not feasible within the scope of the project to include the whole country, at the same time we must be aware that the results might differ in other regions of Nigeria and should try to gain some insights regarding the degree of these differences. Additionally, the timing of the research in the wet season, the relatively high-income level of our sample, and the focus on urban areas with relatively high availability of vegetables throughout the year limits the generalizability of the results.

4.4. Food Systems—Implications and Future Direction

To be able to effectively address current nutrition challenges, research and intervention strategies on consumer healthy eating behavior should not be considered in isolation, but in a broad setting. Dietary behavior related to consumer purchase behavior is shaped in the context of the food environment; food environments, in turn, are shaped by the activities of all actors in the food system [48]. The food system approach considers all the different activities in our food systems from production to consumption (and the relationships between them), as well as the outcomes of these activities on a range of domains, such as food security (including nutrition), socio-economics (income, employment) and the environment/climate (biodiversity, climate) [49]. In this way it provides good insights into particular parts of the food system and insights into opportunities for the development of food system interventions and effective entry points for longer-term policy [6,50]. In urban areas in Africa, food systems rapidly transform in many ways with changes in food supply (food environment) and food demand (consumers) [8]. Regarding the demand side, shifts in preferences, attitudes regarding foods, income and household structures will occur [8]. Consumers are part of the system and developed certain preferences through their knowledge, available time, resources (purchasing power), age, sex, culture, religion, etc. These preferences provide an entry point for the different dimensions of a food system: The food environment can be changed to influence consumer behavior at the level of production (product characteristics such as taste), retail (nudging, logos, prices) or governance (directly through regulations or indirectly through price and availability). In turn, changing preferences will again influence the system and might have side-effects on other parts of the system (e.g., environmental impact). The results of the present study provides insights into consumer behavior that could be used to develop such kind of intervention strategies, in particular the importance of health and convenience for vegetable consumption. The motive *health* is considered one of the most important motives in making food choices. Other research conducted in Nigeria confirms that urban Nigerians have become increasingly concerned about the amount of fat and sugar in their diet and the adverse health effects resulting from this [19]. An example of an intervention that affected the different dimensions within the whole food system is the Mexico sugar-sweetened beverage tax, The tax (enabling environment) specifically targeted the food environment (affordability aspect), and had an impact on the consumption of sugar containing beverages (food supply chain) and changed consumer choices (consumer characteristics) [6,51]. *Convenience* was a main barrier for vegetable intake in our study. Hollinger and Staatz (2015) showed that there is a growing need for convenience foods; there is less time to buy and prepare foods [19]. In the United States research has shown that mobile produce markets emerged as a strategy to improve vegetable access and consumption among lower-income consumers (food supply chain and enabling environment) [52]. The results of the study indicate that also in urban Nigeria such an intervention might possibly increase accessibility and consumption of vegetables.

5. Conclusions

The burden of NCDs is on the rise in Nigeria. One of the major contributors to the risks of the NCDs is poor eating habits. Current vegetable consumption is below recommendations and this study

provides insights into drivers to increase consumption in the context of Nigeria's burgeoning city regions of Lagos and Ibadan. The current consumption patterns also show a low variety in terms of vegetables types, outlets, and types of processing of vegetables. Increasing knowledge and the belief in one's own ability to prepare vegetables (self-efficacy) might be a way to increase vegetable consumption, especially in combination with interventions and product design focused at the motives Health and Mood and taking into account the importance of Price and differences between SEC. In the design of an intervention and/or experiment it would be more beneficial to target on specific SEC and consider that these groups differ in their vegetable consumption and purchase behavior, FCM, and subjective knowledge. For example, for the low SEC an intervention could focus on the limited variety of vegetable intake. This intervention should then also integrate the FCM, and other drivers that are relevant for the vegetable intake of low SEC consumers. Another implication of the study is that overall in Nigerian studies vegetables should be further defined as consumers have different definitions in mind regarding vegetables. Next, the importance of FCM in food choices is well known, however, to measure them there is a need for an FCQ that fits the local context.

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