East African Journal of Social and Applied Sciences (EAJ-SAS)
Vol.2, No.2 Publication Date: October. 20, 2020
ISSN: (Online) 2714-2051, (Print) 0856-9681
The current issue and full text archive of this journal is available at: http//www.mocu.ac.tz

Cite this article as: Kilima, F. T. M. (2020). Factors influencing the allocation of Households' food budgets in Tanzania, *East African Journal of Social and Applied Sciences,* 2(2), 1-21.

FACTORS INFLUENCING THE ALLOCATION OF HOUSEHOLDS' FOOD BUDGETS IN TANZANIA

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ABSTRACT
The on-going transition to middle income country in Tanzania resulting from rapid social and economic changes has induced changes in food expenditure and consumption patterns that are not well-understood. The paper assessed whether food expenditure shares vary across households in Tanzania based on their sex, age, marital status, education level, income status and residential areas. The analysis was done using nationally representative data where fractional multinomial logit model was adopted to model the relationship. Results show significant variation in food expenditure across the factors. Income-poor consumers are predicted to spend more on foods thereby raising concerns with respect to their ability to meet food requirements. The analysis has also revealed higher expenditure shares on foods other than animal-based protein among female- than male-headed households thereby echoing gender related nutritional concerns taking into account that men are principally the main decision makers in the African context and they have greater control over households' income than women. The study found significant spatial differences in expenditure shares where rural consumers spend less on foods other than animal-based protein when compared to consumers in urban areas. Efforts to enhance food and nutritional security should focus on identifying gaps in consumers' nutritional knowledge. It is also important to recognize the factors identified to influence expenditure patterns in this study and contextualise their impact for more effective policy interventions. Future studies should attempt to identify effects of own-produced food on food expenditure and interaction effects of factors including those analysed in this paper.

Key words: *Food groups, expenditure shares, consumers, fractional multinomial logit, Tanzania*
Paper type*: Research paper*
Type of Review: *Peer Review*

1. INTRODUCTION

Food expenditure constitutes the largest share of total household expenditure and is an important indicator of consumers' welfare (Zezza *et al*., 2017; Martins, 2007). Historically food intake and expenditure on some foods, especially animal protein has generally been lower in low income countries (LICs) than middle- and high-income countries for many years (Ochieng *et al*., 2017; Mbwana *et al*., 2016; Sans and Combris, 2015). However, in recent years, there has been a remarkable growth in consumers' income in many African countries (Zhou *et al*., 2013; Atkinson and Lugo, 2010). Some countries including Kenya and Zambia have realized remarkable growth in income and shifted from LICs to middle-income countries. Similar changes are occurring in Tanzania where there has been a modest growth in GDP per person (African Development Bank Group, 2020; Atkinson and Lugo, 2010). Historically the highest

growth is reported to be 29.9% and was observed between 2001 and 2007 (Atkinson and Lugo, 2010). The African Development Bank Group (2020) estimated the real GDP growth in 2019 to be 6.8% and attributed it to markedly diversified economy, characterized by among other things robust private consumption in Tanzania.

The observed growth in GDP has important ramifications on both poverty reduction efforts and nutrition transition[1]. In respect of poverty reduction there have been concerns that impressive growth in GDP does not necessary translate into substantial poverty reduction (Moyo *et al*., 2012; Mashindano and Maro, 2011; Atkinson and Lugo, 2010). Scholars have also been concerned with nutrition transition associated with the rapid social and economic transitions in LICs as well as middle-income countries (Keding, 2016; Kimani-Murange *et al*., 2015; Rischke *et al*., 2015). In general, these concerns reveal both positive and negative outcomes. While there is a consensus with respect to the overall growth in food expenditure and consumption patterns, there is disagreement about the significance of these changes to consumers as they always differ in terms of earnings and exhibit unique food preferences and choices. It is unclear whether their expenditure patterns are similar and equally impacted by factors hypothesized to affect consumption decisions and expenditure on foods. This article seeks to understand better differences in food expenditure among consumer groups in Tanzania and variation in the composition of foods they buy. The reminder of this article is structured as follows: A brief review of literature pin-pointing key debates, knowledge gap as well as conceptual and analytical issues is provided in section two. Section three offers a brief description of data, data source and methods adopted for analysis. Section four presents and discusses empirical results whereas section five highlights key findings and recommendations.

2. LITERATURE REVIEW

The effect of rapid economic growth on consumers' incomes, spending and consumption is perceived differently by scholars reflecting variations in factors underlying the process, interaction between such factors and the ultimate effects. In the context of LICs, there seem to be common concerns although minor variations have been reported. These concerns are evaluated focusing mainly on Tanzania while drawing lesson from other African countries.

Some analysts have raised concerns with respect to preferences of consumers shifting to energy dense foods when incomes rise. An assessment of food consumption in Tanzania (Mbwana *et al*., 2016; Weliweta *et al*., 2003) reveal sub-optimal consumption of foods rich in protein and fibres and excessive intake of sucrose and cholesterol that may subject consumers to dental and cardiovascular diseases. Similar evidence abounds in Kenya where there has been a shift from locally produced to processed and packed foods, especially among consumers in small towns (Rischke *et al*., 2015).

Other studies have registered concerns in respect of consumers who may ignorantly purchase foods without due consideration of their nutritional requirements and value for money particularly when subjected to new foods. Temu *et al*. (2014) revealed not only low public nutrition awareness and demand among consumers but also absence of market-based mechanisms to signal quality of foods that are sold in Tanzania. Consequently, there have been national-wide problems related to inadequate feeding practices, low nutritional quality of meals and poor nutrition (Kulwa *et al*., 2015; Mosha and Fungo, 2010; Kinabo, 2004; Sellen, 2003). Moreover, there have also been reports related to the differential impact of higher GDP growth on consumers who are in different groups. One aspect of these differences is its impact on

[1] Nutrition transition is defined as a shift in dietary consumption and energy expenditure resulting from changes in economic, demographic, and other economy-specific factors.

producers and consumers of agricultural products. The growth may encourage local producers to shift from producing for local to external markets (Moyo *et al*., 2012) thereby affecting local supply and consumption of agricultural produce. The on-going transition to middle-income country in Tanzania is associated with higher export supply response linked to emerging (non-traditional) export crops (Amani, 2005). Another aspect of the differences is in relation to influx of imported processed foods that has been reported to have affected local demand for foods in Tanzania and Kenya (Rischke *et al*., 2015; Kinabo, 2004). These changes are not only affecting food supply but also prices (Onal, 2012). Low income earners are particularly hurt the most when food prices increase because this change forces them to spend a significant proportion of their income to purchase the most needed (necessary) foods thus compromising consumption of some foods as well as their nutrition and health (Ricciuto *et al*., 2006; Gould, 2002). In general, it is unclear how consumers with different characteristics behave when their earnings increase. Thus, it is crucial to understand how food expenditure responds to changes in household's income and other socioeconomic and demographic variables and the welfare implications of such response.

2.1 Conceptual Framework

Food choice is a complex decision-making process which is influenced by physiological, psychological, social and economic factors. This decision can never be fully rational when consumers are confronted with diverse choices encompassing new and unfamiliar products (Fischer and Frewer, 2009). This situation limits consumers' self-control which can occasionally lead to consumption decisions that are not in their preferences. The problem of limited self-control is compounded when consumers have also limited abilities to process new information, which is technically known as bounded rationality. These limitations force them to rely on socially defined ways of making decision (heuristics) to ease the decision-making process. Moreover, scholars have also established that consumers are more likely to make quick and more intuitive decisions when they have limited time and when stressed or distracted (Kahneman, 2003). Otherwise, they require more time to make choices that are informed by their cognitive abilities (Evans, 2008). The observed changes in composition of foods in agricultural markets and other food outlets subject consumers to a wider range of food and food products and make their choices and expenditure decisions more difficult.

The on-going transition process towards middle-income country in Tanzania has resulted into better economic access to different foods at household level including imported products that would otherwise not have been in the market. This change has both positive and negative effects. It is worth noting that there could be increased frequencies and intensities of consuming animal source protein especially among middle- and high-income consumers leading to higher micronutrient intakes. The change may also discourage consumption of other sources of protein such as pulses. Moreover, other potential changes in dietary patterns like excessive intake of saturated fats and simple sugars constitute health risk to consumers. In summary, the introduction of new products in consumers' basket is considered to be associated with uncertainties with respect to foods that are consumed regularly and corresponding budgets for such foods. It is not yet established whether or not the GDP growth in Tanzania has led to significant shift from foods perceived to be inexpensive to more expensive ones across consumer groups. The paper assesses such effects for consumers in Tanzania taking into account drivers hypothesized to influence food choices.

2.2 Modelling food Expenditure

Expenditure on foods can be modelled using income elasticity of nutrients (Santeramo and Shabnam, 2015; Jha *et al*. 2009). The modelling approach takes into account changes in nutrient intake that are determined by factors such as sensitiveness of food expenditure to income; effects of price-induced

substitution between nutrients considered as well as preferences for such nutrients. The model gives robust estimates of changes in nutrient intake resulting from income changes and differential impacts of such changes on groups of consumers while accounting for substitutability. This approach requires data from a study purposefully designed to solicit the required information from consumers.

Structural time series models (STSM) can also be adopted to identify factors that drive consumers' food choices (Chitnis and Hunt, 2011). This model allows for stochastic seasonality and trend upon estimating long-run expenditure on food categories considered. However, its empirical functional form is not flexible enough to accommodate all potential shocks (independent variable) of interest and is appropriate when dealing with time series.

Quantile regression has also been applied in unique expenditure studies (Mishra *et al*., 2015; Variyam *et al*., 2002). The model is appropriate when food expenditure distribution is highly heterogeneous to the extent that consumers are likely to be clustered at upper and lower tails of the normal distribution. However, in Tanzania such a distribution is unlikely because most of the foods that are widely consumed tend to be inelastic with respect to own price but elastic with respect to expenditure on food (Weliwita *et al*., 2003).

Other approaches entailing systems of equations modelled as almost ideal demand system (AIDS) and its variant quadratic almost ideal demand system (QUAIDS) have also been deployed to estimate consumption and expenditure elasticities (Larochelle *et al*., 2017; Dybczak *et al*., 2014). These models estimate both own- and cross-price as well as income elasticities, pin-point potential impact of exogenous price changes on consumer demand and classify commodities as luxurious or necessary (Boysen, 2016). The approach is ideal when the primary purpose is to derive comparative statics[2] to measure price and income effects.

Multi-level linear regression models have been reported to be ideal for assessing effects of covariates at different levels like individual vis-à-vis location levels (Do and Bautista, 2015; Turrell and Kavanagh, 2006). The model is ideal when the interest is to identify fixed and random effects of the covariates on food expenditure. Fractional multinomial logit (FMNL) specification is another approach deemed appropriate for modelling expenditure on foods. Unlike other models it considers the proportions of income spent on foods only without comparing the actual amounts spent by each consumer (Ramalho *et al*., 2011). It guarantees that the predicted shares are restricted to the unit interval. Thus, is appropriate for comparing consumers with different incomes while at the same time allowing expenditure on one food only, some of- or all foods. The model provides consistent estimates of the parameters of a univariate conditional mean function when it is correctly specified and estimated using quasi-maximum likelihood (QML) method (Papke and Wooldridge, 1996).

The review of analytical approaches reveals varied and context-specific reasons to justify adoption of each approach. It has established that some approaches are meant to overcome unique estimation problems and guarantee robustness of estimators while others are adopted to match with data to be analysed or meet study objectives. The varied adoption circumstances imply that there are no rules of thumb dictating ad-hoc adoption of any of the approaches. Fractional Multinomial logit is more appropriate for this paper to account for zero expenditure on some of the food categories considered and

[2] In economics comparative statics measure changes in economic outcomes resulting from changes induced by some underlying exogenous shocks.

allow meaningful comparison between groups of consumers by considering expenditure shares only instead of value of money spent on foods.

2.3 Theoretical Model

An econometric model to estimate the relationship between consumers' expenditure shares and their socio-economic and demographic variables is given in a general form (Equation 1):

$$(\varphi_{i1}, \varphi_{i2}, \dots, \varphi_{iz}) = f(x_{1i}, x_{2i}, \dots, x_{ki}) \dots\dots\dots\dots\dots\dots\dots (1)$$

Where:

$\varphi_{i1}, \varphi_{i2}, \dots, \varphi_{iz}$ are food budget shares of i^{th} consumer for all (z) food categories;
$x_{1i}, x_{2i}, \dots, x_{ki}$ represent socio-economic and demographic variables of the i^{th} consumer.

The necessary condition for the dependent variable in Equation (1) is that:

$$0 \leq \varphi_{ij} \leq 1;\ i = 1,2, \dots, n \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

$$\sum_{j=1}^{z} \varphi_{ij} = 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

The dependent variable consists of several food items. Thus, the ordinary least squares (OLS) method is inappropriate because it cannot guarantee that the predicted values of the dependent variable will be restricted to the unit interval. This condition can be accommodated when fractional regression model is specified and estimated using an appropriate method (Papke and Wooldridge, 1996). A specific function to model this relationship is provided (Equation 4):

$$Prob((\varphi_{i1}, \varphi_{i2}, \dots, \varphi_{iz})|X) = F(X\beta) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where $F(.)$ is the logistic function, X is the vector of socio-economic and demographic variables as defined previously and β is vector of parameters to be estimated. In the empirical analysis average marginal effects are derived upon post-estimation in STATA to ease interpretation when discussing results. A brief review of factors hypothesized to affect food expenditure is provided in the next section.

2.4 Drivers of Food Consumption

Consumption behaviour is largely influenced by socio-economic and demographic variables of consumers including sex, age, marital status and nutritional education of a consumer (Mitchell *et al*., 2009). Consumer's disposable income is also considered an important consumption factor (Banterle *et al*., 2013; Begum *et al*., 2010). Additionally, food availability, cultural and religious beliefs along with spatial differences in these factors can also affect consumption (Mfikwa and Kilima, 2014; Vui, 2008). The potential effects of these factors on food expenditure are assessed and prior expectation are revealed.

Location is perceived to affect one's food choices and habits through its location-specific and cultural influences on the composition of traditional foods as well as extent of heterogeneity and interactions. While there are different ways to account for spatial difference in food consumption and expenditure (Dekker *et al*., 2017; Morrison *et al*., 2011), the study treats rural and urban consumers to potentially exhibit different food preferences based on the relative influence of cultural attributes and degree of openness to external effects such food import (Mfikwa and Kilima, 2014; Fischer and Frewer, 2009). Urban life normally exposes consumers to new ways of life thereby weakening one's adherence to traditional patterns and taboos in the realm of food consumption. The exposure broadens food choices through enhanced access to new food outlets and items that are largely unknown in villages, which in

Tanzania are predominantly subsistence economies (Wolter, 2009). On the contrary, rural consumers may exhibit rigid food habits (Cockx *et al*., 2019). It is hypothesized that urban consumers spend more on foods based on two main reasons: firstly, most of the foods sold in urban markets are either produced in rural areas or imported (Wenban-Smith *et al*., 2016; Bryceson, 2009). Thus, urban consumers are expected to pay more when transactions costs are considered. Secondly; unless marginalized, urban dwellers tend to have better access to income-generating opportunities in both formal and informal sectors including wage-paying activities in peri-urban agriculture, self-employment in commerce, manufacturing and other services (Tacoli and Mabala, 2010).

Literature suggests that education can influence food choice and such influence is predominantly exerted through enhancing consumer's access to food and health information as well as ability to accept new innovations (Bundala *et al.*, 2020). In the context of this paper the role of education is linked to consumers' level of awareness, cognizance and comprehension that allow them to seek for all relevant information (product quality, nutritional value and price) before they make choices and spend money. Low level of education is normally associated with inability to process information and make informed choices (Wosene *et al*., 2018). Its effect on expenditure could be negative where it allows consumers to economize on food without compromising nutritional requirements thereby increasing consumer's food expenditure efficiency (Zani *et al*., 2019; Yimer, 2011). Education can also have positive impact when it encourages consumers with higher education to have more diversified foods thereby spending more than those with low education (Backholer *et al*., 2016; McNaughton *et al*., 2008; Kirkpatrick and Tarasuk, 2003).

There have been notable differences in regards to health food choices between men and women. Men are perceived to be less knowledgeable than women to make informed food choices (Bundala *et al.*, 2020) and this knowledge gap may lead them to exhibit more careless consumption than women thereby spending more on foods. Olubukunmi *et al*. (2015) found higher per capita non-food expenditure among male- than female-headed households, which may compromise their food consumption. However, an evaluation of expenditure on commercially prepared food reveals higher expenditure among male than female, especially when unmarried (Kroshus, 2008). Overall, men's expenditure at home is likely to be lower than women even if they might be spending more on foods consumed away from home.

Empirical evidence reveals notable variation in expenditure across age groups. Blisard (2001) found that younger people spent less than older people on some food items including red meats, white meats (poultry and fish), eggs and dairy products but they spent more on cereal, bakery goods and other commercially prepared foods. Dennisuk *et al*. (2011) found that young people spent more on energy dense food items and beverage than older people who preferred ordinary foods. Hemphill *et al*. (2007) found that young people between 13 and 17 years were more likely to spend more on luxurious goods and alcohol. In general, many scholars support the view that young people and young adults are more likely to spend more on goods other than ordinary foods. Thus, it is hypothesized that adults above 30 years are likely to spend more on foods because they are also expected to support others including their own- and extended families.

Income has been found to have quantitative impact on consumption because is directly related to consumer's purchasing power (Ricciuto *et al*., 2006; Ghany *et al*., 2002; Gould, 2002). Also, it has qualitative effect on expenditure because increased purchasing power can encourage a shift to high quality foods that are more expensive than low quality foods (Haynes-Maslow *et al*., 2013). The two effects imply increase in expenditure as result of increase in quantity, quality of foods consumed or both. The exception is that for some, a significant increase in income may occur when they are old (Garcia and

Grande, 2010). This study assumes that there could be positive effect of increase in income on expenditure among some (e.g. those who are young and at late stages of adulthood) and negative effect for elderly people with higher incomes but few people (dependents) that require full-time support. However, income is not measured directly but through expenditures on foods.

Evidence suggests that when all other individual factors are controlled, married people tend to spend less than unmarried people although married men spend slightly more than married women (Kroshus, 2008). Moreover, when household size is taken into account married people might exhibit higher food expenditure than unmarried people because their family size could be relatively larger. There is always a positive relationship between family size and expenditures on foods (Garcia and Grande, 2010; Jacobson *et al*., 2010). Furthermore, there is evidence revealing higher expenditure on alcohol and foods consumed away from home among single than married parents (Ziol-Guest *et al*., 2006). This paper assumes the positive relationship between marital status and food expenditure because for a typical Tanzanian family, household size is about 5 persons and monogamously married, polygamous married, living together, separated, divorced and widowed people account for almost 60% of the adults (NBS [Tanzania], 2016).

The review of empirical studies has identified several factors influencing food consumption and expenditure. However, it is unclear whether such factors will affect food consumption and expenditure in Tanzania in the same way. Most of the previous consumption studies in Tanzania have mainly focused on food demand patterns (Weliweta *et al*. 2003), food diversity (Mbwana *et al*., 2016; Kulwa *et al*., 2015) as well as consumers nutritional knowledge, awareness and practices (Bundala *et al*., 2020; Mosha and Fungo, 2010; Kinabo, 2004). These studies have not assessed how household and individual demographic characteristics reported to influence food choices elsewhere affect food budgetary allocations in Tanzania. This study hinges on drivers hypothesized to influence food consumption and expenditure as well as macro-level consumption and expenditure data to assess the relative importance of the drivers in the allocation of food budget among consumers in Tanzania. The study is vital to inform stakeholders' decisions especially nutritionists, policy makers and development planners.

3. METHODOLOGY

3.1 Data and Data Source

The study used secondary data sourced from the Tanzania National Panel Survey (TZNPS). According to the source the data were collected by the National Bureau of Statistics (NBS[3]) from 21 regions in Tanzania Mainland and five in the Unguja and Pemba Islands during a survey conducted in 2010/2011. These are nationally representative data collected using an approved national sampling framework. The source revealed that 3,846 households were randomly selected and interviewed (2,583 from rural and 1,263 from urban areas). The survey solicited detailed information from the household rather than households' heads to allow a comprehensive assessment of broad consumption issues including those analysed in this paper. However, the sample for this study is 3,768 households because some are dropped due to missing and/incomplete information on variables that are analysed.

3.2 Data Analysis

The analysis focused on the relationship between expenditure on eight food categories (animal-based protein; pulses; cereals; nuts; roots and tubers; milk and milk product; vegetables, and; fruits) and selected socio-economic and demographic variable that are presented in Table 1. The analysis

[3] The Bureau has been established as an autonomous public office by the Statistics Act, 2015 and has the mandate to provide official statistics to the Government, business community and the public at large. The Act also gives NBS the mandate to play the role as a co-coordinating agency within the National Statistical System (NSS) to ensure high quality official statistics.

commenced with computation of various descriptive and inferential statistics as preliminary tests to assess the relative influence of selected socio-economic and demographic variables on food expenditure.

Table 1: Description of variables

Name	Description	Measurement	Role of the variable
EX_PROT	Monthly expenditure on animal-based protein such as red meats, white meats and eggs (TZS)	Continuous	
EX_PUL	Monthly expenditure on pulses (TZS)	Continuous	
EX_CER	Monthly expenditure on cereals (TZS)	Continuous	
EX_NUTS	Monthly expenditure on nuts (TZS)	Continuous	Dependent§
EX_R&T	Monthly expenditure on roots and tubers (TZS)	Continuous	
EX_MILK	Monthly expenditure on milk and milk products (TZS)	Continuous	
EX_VEGET	Monthly expenditure on vegetables (TZS)	Continuous	
EX_FRUITS	Monthly expenditure on fruits (TZS)	Continuous	
SEX	Sex of respondent (1=female, male=0)	Binary	
LOCATION	Residential location of a consumer (urban=1, rural=0)	Binary	
AGE_GROUP	Age of main decision maker as dummy variable for four distinct age groups (1=less than 30 years, zero otherwise; 1=30 to less than 45 years, zero otherwise; 1=45 to less than 60 years, zero otherwise; 1=60 years and above, zero otherwise)	Binary	Independent
EXP_GROUP	Expenditure group (1 if food expenditure (EXP) is above mean income; 0 if EXP is below the mean)	Binary	
MARITAL	Marital status of decision maker (1= married, zero otherwise)	Binary	
EDUC	Highest level of education attained (1=at least secondary education; 0= below secondary education)	Binary	

§ Means fractional response variables that are jointly modelled under the dependent variable and TZS denoted Tanzanian Shillings.

An independent sample *t*-test was used to test for mean differences in food expenditures between consumers: who are male vis-à-vis female, married vis-à-vis not married, residing in urban vis-à-vis rural areas; whose expenditure on foods is below the overall sample mean of TZS 168, 527.44 per month vis-à-vis those with expenditure above this mean and; with education below secondary education vis-à-vis those above this level. This and the Kruskal Wallis were preliminary tests adopted to assess whether there are differences in expenditure among consumer groups to inform subsequent analysis of the drivers hypothesized to influence the allocation of food budgets.The independent samples *t*-tests were performed using the STATA 13.1, which like other statistical software compares whether the difference in means from two groups perceived to be independent is equal to a given value. In this application it tests whether the difference in means between the groups is zero. The test was performed under the assumption of unknown variance.

The Kruskal-Wallis test was used to assess whether shares of total food budget spent on the eight food categories amongst consumers classified in four different age groups had the distribution as the normal distribution. The test was performed following Weiner and Craighead (2010). The rationale for adopting this non-parametric test is that age groups cannot be compared using group means because the assumptions that the observed data for different groups are normally distributed and that the population variances are equal fails; thus, ranks are compared instead. The process was accomplished by: i) substituting the rank in the observed data for each age group in such a way that the smallest got a rank of one, the second got a rank of two and the j^{th} observation got a rank of *j;* but all tied observation got an

average rank; ii) computing the sum of ranks (R_i) for each of the four age groups of size n_i where n_1=616, n_2=1422, n_3=989 and n_4=741 and; iii) computing the test statistic (H) as:

$$H = \frac{12}{N(N+1)}\sum_{i=1}^{k=4}\frac{R_i^2}{n_i} - 3(N+1),\ N = \sum_{i=1}^{n} n_i \dots\dots\dots\dots\dots\dots (5)$$

where N is a combined sample size of 3768 for all four groups.

The test statistics in (5) is approximately χ^2 distributed with the degrees of freedom equal to the number of groups (k) minus one, which in this case are four. The null hypothesis for this test was tested following the conventional approach. Finally, a fractional multinomial logit model was fitted using quasi-maximum likelihood in STATA as per specification in Equation (4) following Papke and Wooldridge (1996). The dependent variable is a vector of households' budget shares allocated to eight categories of foods that are described in Table 1. Independent variables included those described under the independent *t*- and Kruskal Wallis tests.

4. RESULTS AND DISCUSSION

4.1 Characteristics of Consumers

Results presented in Table 2 show that the sample of consumers predominantly consisted of male (75.2%) and middle aged (30-45 years) people. A majority were not married (75.9%) which included single, widowed, separated and co-habiting individuals. Moreover, many of the consumers (83.63%) had education below secondary school and their monthly expenditure on food was below the sample mean of TZS 168, 527.44 (97.55%).

Table 2: Socio-economic characteristics of consumers

Variable	Frequency (n=3,768)	Percent (%)
Sex of respondent		
Female	936	24.8
Male	2,832	75.2
Marital status		
Married	908	24.1
Not married§§	2,860	75.9
Age group		
16-30	616	16.35
30-45	1,422	37.74
45-60	989	26.25
Above 60	741	19.67
Education level		
Less than secondary education	3151.00	83.63
Secondary education and above	617.00	16.37
Expenditure group		
Below average	3638.00	96.55
Above average	130.00	3.45

§§ include all categories of marital status such as single, divorced, widowed, separated and cohabiting people.

An analysis of actual expenditure revealed higher spending on cereals followed by animal-based protein, roots and tubers, vegetables, pulses, nuts, milk and milk products and fruits (Table 3). Cereals especially maize, sorghum and pearl millet are the major staple foods in many parts of Tanzania (Weliweta *et al*.,

2003), while roots and tubers (cassava, sweet potatoes and round potatoes) are dominant in specific locations (Mbwana *et al*., 2016). Expenditure on animal-based protein is the second most important although this is largely a reflection of a relatively higher cost of these foods compared to others (Ochieng *et al*., 2017). Consumption studies reveal lower per capita consumption of animal-based products in Tanzania (Ochieng *et al*., 2017; Mbwana *et al*., 2016). Expenditure on milk and milk products as well as fruits is low because these are expensive and rarely consumed products except in milk shed and fruit producing areas (Njombe *et al*., 2011; Weliweta *et al*., 2003). Fruits are occasionally perceived as luxurious goods because consumers in LICs give higher priority to foods that are rich in energy (Weliweta *et al*., 2003).

Table 3: Expenditure on foods

Expenditure item	N	Minimum	Maximum	Mean	Std. Error Mean
Monthly expenditure on cereals	3768	0	376101	44862.55	577.20
Monthly expenditure on animal-based protein	3768	0	884939	25665.57	562.17
Monthly expenditure on roots and tubers	3768	0	387294.8	14853.74	376.52
Monthly expenditure on vegetables	3768	0	91832.84	11603.65	141.53
Monthly expenditure on pulses	3768	0	153774	7121.16	166.42
Monthly expenditure on nuts	3768	0	141126.8	6139.054	175.76
Monthly expenditure on milk and milk products	3768	0	262570.2	5672.269	266.23
Monthly expenditure on fruits	3768	0	156333	5325.976	180.53

Analysis of actual budget shares also revealed higher budget share for cereals followed by animal-based protein, roots and tubers, vegetables, pulses, nuts, milk and milk products and lastly fruits (Table 4).

Table 4: Shares of total food expenditure for all categories purchased

Food category	N	Minimum	Maximum	Mean	Std. Error Mean
Cereals	3768	0	0.9	0.38	0.003
Animal based protein	3768	0	0.73	0.18	0.002
Roots and tubers	3768	0	0.88	0.13	0.003
Vegetables	3768	0	0.7	0.11	0.001
Pulses	3768	0	0.82	0.07	0.001
Nuts	3768	0	0.72	0.05	0.001
Milk and milk products	3768	0	0.73	0.04	0.001
Fruits	3768	0	0.72	0.04	0.001

The trend in food expenditure shows a relatively low expenditure on some foods but it does not show how the pattern varies across consumer groups. This was analysed further as per results in Tables 5 through 8. The rationale for undertaking these analyses was to have a prior understanding of differences in consumer groups in terms of allocation of their food budgets.

4.2 Parametric Tests for Difference in Mean Expenditure

Comparison of expenditure between female- and male-headed households revealed significant variations ($p<0.01$) across all food categories under investigation except for milk and milk products (Table 5). Male-headed households spend significantly more on foods than female-headed households.

Table 5: Monthly expenditure on foods disaggregated by sex of respondents

Food category	Sex of respondent	N	Mean	Std. Error Mean	Mean difference (b-a)
Animal based protein	Female	936	19643.65[a]	960.62	8012.22***
	Male	2832	27655.87[b]	673.16	
Pulses	Female	936	6291.03[a]	306.16	1104.4***
	Male	2832	7395.53[b]	196.70	
Cereals	Female	936	37437.94[a]	1000.49	9878.51***
	Male	2832	47316.44[b]	687.03	
Nuts	Female	936	4923.37[a]	282.73	1617.48***
	Male	2832	6540.85[b]	213.86	
Roots and tubers	Female	936	12660.76[a]	604.91	2917.780***
	Male	2832	15578.54[b]	458.58	
Milk and milk products	Female	936	4950.29[a]	507.56	960.596
	Male	2832	5910.89[b]	311.91	
Vegetables	Female	936	10638.05[a]	254.86	1284.74***
	Male	2832	11922.79[b]	168.00	
Fruits	Female	936	3836.93[a]	270.51	1981.18***
	Male	2832	5818.12[b]	222.19	

*** Means the difference is significant at $p<0.01$.

Test for mean difference in expenditure between married and a combined group of widowed, separated, divorced and single consumers (Table 6) found slightly higher expenditure on nuts among married consumers ($p<0.10$). Nuts are essential ingredients in cooking and might be more effectively used by married than unmarried consumers (Garcia and Grande, 2010; Jacobson *et al.*, 2010).

Table 6: Monthly expenditure on foods disaggregated by marital status

Food category	Marital status of respondent	N	Mean	Std. Error Mean	Mean difference (c-d)
Animal based protein	Married	908	26009.67[c]	1003.79	453.34
	Not married	2860	25556.33[d]	668.66	
Pulses	Married	908	7159.63[c]	337.41	50.69
	Not married	2860	7108.95[d]	191.34	
Cereals	Married	908	46705.76[c]	1233.02	2428.41
	Not married	2860	44277.36[d]	651.70	
Nuts	Married	908	6538.19[c]	369.73	525.85*
	Not married	2860	6012.34	199.59	
Roots and tubers	Married	908	15162.27[c]	775.29	406.49
	Not married	2860	14755.78[d]	430.75	
Milk and milk products	Married	908	6239.71[c]	566.72	747.60
	Not married	2860	5492.12[d]	301.08	
Vegetables	Married	908	11554.20[c]	276.95	-65.15
	Not married	2860	11619.35[d]	164.45	
Fruits	Married	908	5265.52[c]	376.38	-79.65
	Not married	2860	5345.17[d]	205.69	

*** Means the difference is significant at $p<0.1$.

Test for mean difference in expenditure between consumers residing in urban and rural areas (Table 7) found statistically higher expenditures on animal-based protein and vegetables among urban residents ($p<0.01$). Although their expenditure was lower than consumers from rural area with respect to pulses, nuts, roots and tubers as well as milk and milk products ($p<0.01$). Per capita consumption of animal-based protein is normally higher in urban than rural areas because urban consumers have better access to wage employment in the formal and informal sectors of the economy (Tacoli and Mabala, 2010). Rural consumers are more likely to spend more on pulses, nuts, tubers as well as milk and milk products because these products tend to be readily available in rural areas where they are produced (Wenban-Smith *et al*., 2016; Bryceson, 2009) and are normally cheaper in rural than urban areas when transportation and other marketing costs are considered.

Table 7: Monthly expenditure on foods disaggregated by extent of urbanization

Food category	Consumer's location of residence area	N	Mean	Std. Error Mean	Mean difference (e-f)
Animal based proteins	Urban	1235	27923.47[e]	838.47	3358.77***
	Rural	2533	24564.70[f]	728.64	
Pulses	Urban	1235	5266.95[e]	191.69	-2758.27***
	Rural	2533	8025.21[f]	227.10	
Cereals	Urban	1235	45118.46[e]	912.00	380.68
	Rural	2533	44737.77[f]	734.62	
Nuts	Urban	1235	5509.59[e]	244.26	-936.37***
	Rural	2533	6445.96[f]	232.55	
Roots and tubers	Urban	1235	9220.34[e]	387.16	-8380.04***
	Rural	2533	17600.38[f]	518.69	
Milk and milk products	Urban	1235	5242.83[e]	334.69	-638.81
	Rural	2533	5881.65[f]	360.83	
Vegetables	Urban	1235	13216.07[e]	274.23	2398.57***
	Rural	2533	10817.49[f]	160.36	
Fruits	Urban	1235	5142.31[e]	210.31	-273.21
	Rural	2533	5415.52[f]	248.21	

*** *** Means the difference is significant at $p<0.01$.

Comparisons of shares of total food expenditure between consumers with food expenditure above and those below the sample mean of TZS 168,527.44 per month (Table 8) indicated that consumers in the lower income bracket spent significantly higher on animal-based protein ($p<0.01$), milk and milk products ($p<0.05$) and fruits ($p<0.1$). On the contrary consumers whose expenditure on foods was above the sample mean spent more on pulses, cereals, nuts, roots and tubers and vegetables ($p<0.05$).

Table 8: Shares of total budget spent on foods disaggregated by income levels

Food category	Expenditure group	N	Mean	Std. Error Mean	Mean difference (g-h)
Animal based protein	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.18	0.002	-0.09***
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.27	0.014	
Pulses	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.07	0.001	0.01**
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.06	0.006	
Cereals	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.38	0.003	0.04**
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.34	0.013	
Nuts	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.05	0.001	0.02**
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.04	0.004	
Roots and tubers	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.13	0.003	0.03**
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.10	0.009	
Milk and milk products	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.04	0.002	-0.02**
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.06	0.007	
Vegetables	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.11	0.001	0.03***
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.08	0.005	
Fruits	Consumer who spend at least 168, 527.44 TZS per month [g]	3638	0.04	0.001	-0.01*
	Consumers spending below 168, 527.44 TZS per month [h]	130	0.05	0.007	

***, ** and * Mean the difference is significant at p<0.01, p<0.05 and p<0.1, respectively.

4.3 Non-Parametric Test for Equality of Distribution of Expenditures between Age Groups

Results from the Kruskal-Wallis test (Annex 1) indicated that the null hypothesis that the distribution of expenditure shares for animal-based protein, cereals, pulses, roots and tubers and fruits have the same distribution for all four age groups should be rejected (p<0.01). However, the null hypothesis was not rejected for foods under nuts, milk and milk products and fruits categories of food classification.

4.4 Results from Fractional Multinomial Logit Model

Results from fractional multinomial logit model are presented in Table 9. The model fitted well the data (Wald $\chi^2(56) = 589.44, \text{Log}\, pseudolikelihood = -6675.47,\ Prob > \chi^2 = 0.00$). The model predicted the effect of being a female- relative to male-decision maker to be spending more on pulses, cereal grains, roots and tubers and vegetables than animal-based protein (p<0.01).

Consumers below 30 years spent more on pulses and fruits (p<0.05) than on animal-based protein when consumers above sixty years are the comparison (base) group. However, those whose age was 30 but less than 45 years spent less on food under roots and tubers category (p<0.05) as well as vegetables (p<0.1) than animal-based protein relative to those above 60 years. The model predicted slightly less expenditure on pulses (p<0.1), roots and tubers (p<0.1) and vegetables (p<0.05) than animal-based protein among consumers above 45 but less than 60 years relative to those above 60.

Consumers with education level above primary education spent smaller proportions of their food budget on pulses, cereals, roots and tubers, milk and milk products and vegetables relative to those with education below secondary school (p<0.05). The finding could be attributed to better income earning prospect among more educated consumers that allows higher flexibility in their budgetary allocations (Zani *et al*., 2019; Yimer, 2011).

Furthermore, consumers with monthly food expenditure above the sample mean spend less on pulses, cereals, nuts, roots and tubers and vegetables than animal-based protein relative to consumers whose monthly food expenditures were below the sample mean (p<0.01). The effect of being married relative to not being married was predicted to be increasing budgetary allocation to vegetables than animal-based protein (p<0.05).

Table 9: Factors Influencing Expenditure on Foods

Variable	Food Category						
	Pulses	**Cereal grains**	**Nuts**	**Roots and tubers**	**Milk and Milk Products**	**Vegetables**	**Fruits**
Female consumers	0.25***	0.13***	0.08	0.22***	0.10	0.26***	-0.01
	(0.07)	(0.04)	(0.07)	(0.06)	(0.10)	(0.05)	(0.07)
Consumer with age below 30 years	0.25**	-0.07	-0.07	0.01	0.10	-0.08	0.24**
	(0.10)	(0.06)	(0.11)	(0.09)	(0.13)	(0.07)	(0.11)
Consumer with age of 30 but less than 45 years	-0.05	-0.02	-0.14	-0.16**	-0.14	-0.12*	0.08
	(0.08)	(0.05)	(0.09)	(0.08)	(0.12)	(0.06)	(0.09)
Consumer with age of 45 but less than 60 years	-0.16*	-0.03	-0.17*	-0.13*	-0.18	-0.16**	0.02
	(0.09)	(0.05)	(0.09)	(0.08)	(0.12)	(0.06)	(0.10)
Consumer with education above primary level	-0.60***	-0.36***	0.03	-0.50***	-0.49***	-0.47***	-0.10
	(0.08)	(0.04)	(0.07)	(0.07)	(0.10)	(0.04)	(0.07)
Consumer with middle and high income	-0.43***	-0.47***	-0.74***	-0.68***	0.14	-0.60***	-0.17
	(0.13)	(0.08)	(0.14)	(0.12)	(0.14)	(0.09)	(0.18)
Married consumers	0.09	0.04	0.06	0.07	0.03	0.10**	0.02
	(0.07)	(0.04)	(0.07)	(0.06)	(0.10)	(0.05)	(0.07)
Location	-0.30***	-0.14***	-0.05	-0.51***	0.24***	-0.03	-0.15**
	(0.06)	(0.03)	(0.07)	(0.06)	(0.08)	(0.04)	(0.06)
Constant	-0.89***	0.83***	-1.16***	-0.10	-1.49***	-0.42***	-1.52***
	(0.08)	(0.05)	(0.08)	(0.07)	(0.12)	(0.06)	(0.10)
Observations	3768	3768	3768	3768	3768	3768	3768
$\mathbf{Wald}\ \chi^2(56) = 589.44,\ \mathbf{Log}\,pseudolikelihood = -6675.47,\ Prob > \chi^2 = 0.00$							

Note: Robust standard errors are presented in brackets; ***, ** and * means significant at p<0.01, p<0.05 and p<0.1, respectively; coefficients are estimated average marginal effects.

4.5 Discussion

Inferential statistics both parametric and non-parametric have identified significant differences with respect to factors hypothesized to influence expenditure on some of the food categories considered. Both the preliminary *t*-tests and FMNL model have identified expenditure on pulses, cereals, roots and tubers and vegetables to be significantly higher among female- than male-headed households. The lower expenditure on these food categories by males is associated with their tendencies to incur higher expenditure on non-food goods (Olubukunmi, *et al*., 2015) and commercially prepared foods including meats (Kroshus, 2008), which in Tanzania are normally served away from homes. Moreover, women are normally more interested in ensuring steady availability of foods for family members than men (Badstue, 2006; Bellon, 2003). Like in other African countries, males in Tanzania tend to be the main decision makers at household level and this has important ramifications on food consumption and expenditure because of their greater control over households' income while they have relatively low nutrition knowledge (Bundala *et al*., 2020).

In regards to marital status the predicted effect of being married vis-à-vis not being married on food expenditure appears to be low. The FMNL model predicted higher share of food expenditure on vegetables than animal-based protein among married relative to unmarried consumers ($p<0.05$). Other scholars have established that married people might spend more when household size is taken into account because their family size could be relatively larger (Garcia and Grande, 2010; Jacobson *et al*., 2010).

The Kruskal-Wallis test used to test whether the distributions of food expenditure shares was the same across age groups was rejected for all other food categories under investigation except nuts, milk and milk products and vegetables ($p<0.01$). The FMNL model revealed lower food shares for pulses ($p<0.1$), nuts ($p <0.1$), roots and tubers ($p<0.1$) and vegetables ($p<0.05$) than animal-based protein among people below 60 years relative to those above this age. These findings could be attributed to the tendency that income increases with age (Garcia and Grande, 2010). Literature also reveals positive association between income and expenditure levels (Ghany *et al*., 2002; Gould, 2002; Ricciuto *et al*., 2006) owing to its direct quantitative effect on consumption and indirect effect through increased quality of foods.

The analysis revealed lower expenditure shares on pulses, cereals, nuts, roots and tubers and vegetables than animal-based protein among consumers in the higher income bracket relative to those in the lower bracket ($p < 0.01$). The later were also the majority (approximately 97% in the sample). The larger budget share for consumers in the lower income bracket raises concerns with respect to their abilities to afford balancing foods to ensure adequate food diversity based on recommended nutritional requirements. However, it validates the view that growth in income rarely translates into increased food expenditure among income poor consumers and is consistent with empirical evidence from other African countries (Oldewage-Theron *et al*., 2006; Masanjala, 2006). The fact that consumers in the higher income bracket spend more on animal-based protein ($p < 0.01$) is consistent with the on-going food transition in Tanzania, especially urban areas (Maletnlema, 2002).

The analysis revealed lower expenditure shares on pulses, cereals, roots and tubers, milk and milk products as well as vegetables than on animal-based protein for consumers with secondary education and above relative to those below this level of education ($p < 0.01$). The findings are linked to the higher income earning prospect for more educated than less educated consumer groups in Tanzania, implying that they normally spend smaller proportions of their income on foods. The findings can also be linked to its negative effect on expenditure because it can allow more educated consumers to economize on food

without compromising nutritional requirements thereby increasing consumers' food expenditure efficiency (Zani *et al*., 2019; Yimer, 2011).

The effect of location has been predicted to be reducing expenditure on pulses ($p < 0.01$), cereals ($p < 0.01$), roots and tubers ($p < 0.01$), milk and milk products ($p < 0.01$) and fruits ($p < 0.05$) than animal-based protein for consumers in rural areas relative to those in urban areas. Other than spatial differences in taste and preferences which were not modelled, the variations are largely a result of: readily food availability in the rural (production area) than urban (consumption area) and; spatial differences in food prices between these locations where urban consumers pay more than consumers in rural areas. Muhiti *et al*. (2012) reveal that food choices and actual consumption decision are positively associated with factors such as sensory appeal, availability and affordability but are negatively affected by high cost, scarcity and negative perceptions.

5. SUMMARY AND RECOMMENDATIONS

The paper estimated a fractional multinomial logit model to assess whether food expenditure shares vary across consumers in Tanzania based on their sex, age, marital status, education level, income status and residential areas using nationally representative data. The analysis revealed significant variation in expenditure shares where poor-income consumers are predicted to spend more on foods thereby raising concerns with respect to their ability to meet food requirements. The analysis has also revealed higher expenditure shares on foods other than animal-based protein among female- than male-headed households. Thus, echoing gender-related nutritional concerns taking into account that men are principally the main decision makers in Tanzania and they also have greater control over households' income than women. The study found significant spatial differences in expenditure shares where rural consumers spend less on foods other than animal-based protein than consumers in urban areas. The model established modest effect of age on food expenditure where consumers above 60 were predicted to spend more on foods other than animal-based protein. The model predicted similar effect of higher education on expenditure shares where the less educated consumers spent more on foods other than animal-based protein than educated consumers. Efforts to enhance food and nutritional security should focus on identifying gaps in consumers' nutritional knowledge. It is worth recognizing factors underlying the observed expenditure patterns for more effective policy interventions. Future studies should focus on identifying effects of own-produced food on food expenditure and interactions of such factors including those analysed in this paper.

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Annex 1: Test for equality of distributions of expenditure on foods between age groups

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of SHARE_ANIMAL_PROTEIN is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
2	The distribution of SHARE_PULSES is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
3	The distribution of SHARE_CEREALS is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
4	The distribution of SHARE_NUTS is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.943	Retain the null hypothesis.
5	The distribution of SHARE_ROOOTS_TUBERS is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
6	The distribution of SHARE_MILK_MILK_PRPDUCTS is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.449	Retain the null hypothesis.
7	The distribution of SHARE_VEGETABLES is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.258	Retain the null hypothesis.
8	The distribution of SHARE_FRUITS is the same across categories of AGE_GROUPS.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.