

**ASSESSMENT OF FACTORS INFLUENCING CONSUMPTION OF ORANGE-  
FLESHED SWEET POTATO BREAD IN NAIROBI COUNTY, KENYA**

**BY**

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## DECLARATION

This thesis is my original work and has not been presented for a degree award in any other university.




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## **DEDICATION**

To my late dad Francis Shiundu

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## **ABBREVIATIONS AND ACRONYMS**

AERC	African Economic Research Consortium
CAADP	Comprehensive Africa Agriculture Development Programme
CBD	Central Business District
CIP	Centro Internacional de la Papa (International Potato Center)
CGIAR	Consultative Group on International Agricultural Research
CMAAE	Collaborative Masters in Agricultural and Applied Economics
DFID	Department for International Development
EIL	Euro-Ingredient Limited
GOK	Government of Kenya
HIV	Human Immunodeficiency Virus
HVM	Hierarchical Value Map
IFPRI	International Food Policy Research Institute
KNBS	Kenya National Bureau of Statistics
KNFFSP	Kenya National Food Fortification Plan
MEC	Means-End Chain
MOALF	Ministry of Agriculture Livestock and Fisheries
NFNSP	National Food and Nutrition Security Policy
OFSP	Orange-Fleshed Sweet Potato
RTB	Roots, Tubers and Bananas
SASHA	Sweet Potato Action for Security and Health in Africa
SDG	Sustainable Development Goal
SFSE	Shared Facility for Specialization and Electives

SSA	Sub-Saharan Africa
SUSTAIN	Scaling-Up Sweet potato Through Agriculture and Nutrition
UNICEF	United Nations International Children's Emergency Fund
UKAID	United Kingdom Agency for International Development
USAID	United States Agency for International Development
VAD	Vitamin A Deficiency
VIF	Variance Inflation Factor
WHO	World Health Organization
ZMET	Zaltman Metaphor Elicitation Technique

## **ABSTRACT**

Sweet potato is one of the widely consumed root tubers in Kenya. There are several varieties among them the Orange-Fleshed Sweet Potato (OFSP) which contains beta-carotene, a precursor of vitamin A. Vitamin A Deficiency (VAD) is prevalent in Kenya and the most affected are women (pregnant and lactating) as well as young children. Consumption of foods rich with vitamin A such as OFSP roots or derived products such as bread is thus, a suitable remedy for VAD. Efforts by Kenyan government and other partners led by International Potato Center (CIP) to promote consumption of bio-fortified foods led to introduction of OFSP bread in 2015, but to date the pattern of consumption and subsequently factors that influence the same have not been determined. More specifically, it is not clear whether or not nutrition knowledge and psychosocial factors which are inner motivations in a consumer's mind affect choice and intensity of purchase of OFSP bread. The objectives of this study were thus, to analyze the effects of nutrition knowledge on the decision and intensity of purchase OFSP bread and analyze psychosocial factors that influence choice of OFSP bread.

This study was anchored on first, the Random utility theory which posits that a choice decision is made by an individual from a set of alternatives and whichever choice made is assumed to maximize consumer's utility. This study focused on consumer choice of food, a decision affected by a set of factors including nutrition knowledge. Second is the Means-End-Chain theory which posits that observable product attributes are linked to consequences, which are driven by personal values. These are mental abstracts which affect choice. This study was conducted in six selected Tuskys supermarket branches in Nairobi County and which included Karasha, Chapchap, Pioneer, Hakati, T-Mall and Buruburu. Nairobi County was ideal for the study, as many residents depend of retail stores or supermarkets to buy food products rather than fresh wet

markets. A cross-sectional survey targeting bread shoppers that is, both OFSP and non-OFSP bread was used. A systematic random sampling technique was used to select respondents for survey, where every second shopper was requested to participate in the interview. A structured questionnaire was used to collect quantitative data from 345 respondents. Qualitative data was collected through laddering interviews conducted on a sample of 51 respondents and using a series of ‘*why is that important to you?*’ questions. A double-hurdle model was used to analyze the effect of nutrition knowledge on choice and intensity of purchase of OFSP bread. Psychosocial factors were examined by constructing Hierarchical Value Maps (HVM) using a Means-End Chain (MEC) analysis

Results indicate that nutrition knowledge had a positive effect on choice and intensity of purchase of OFSP bread. The probability that a consumer will choose OFSP bread increases by 9.9 percent while the quantity purchased increase by 73.9 percent if level of nutrition knowledge increases by one unit. The results also show that the main features why respondents chose to purchase OFSP bread were good sensory attributes, bread ingredients and bread brand. Consequently, ultimate life goals that drive choice and consumption of OFSP bread include staying healthy, long life, happiness, freedom, being responsible, and achieving prosperity.

In conclusion that nutrition knowledge has an effect on decision and intensity of purchase of OFSP bread by consumers. The ultimate decision to purchase OFSP bread is driven by personal life goals and that attributes of the bread are just but the means to the goals. Therefore, this study recommends that promotional efforts of OFSP bread need to emphasize nutritional benefits particularly as a source of vitamin A. Furthermore, bakers and sellers of OFSP bread need improve product design particularly the sensory attributes to satisfy consumers’ preferences.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background information

Among the widely produced tuber crops by small scale farmers in Sub-Saharan Africa, sweet potato (*Ipomea batatas*) is ranked third after cassava and yams (Kaguongo *et al.*, 2012). In Kenya, sweet potato is the third most important food crop after maize and Irish potato (CIP, 2017). The popularity of sweet potato has grown among smallholder farmers because of its flexibility in mixed farming systems, tolerance to drought and good yields in less fertile soils. (Nungo *et al.*, 2007). In addition, it requires less production inputs including fertilizer and pesticides. Sweet potato takes shorter period to mature compared to cassava and yam, and has multiple uses including income generating potential (Srinivas, 2009). Production of OFSP in Kenya is concentrated in western region and some parts of coastal region. The major producing counties are Bungoma, Homa Bay, Busia and Migori with an average of 133,037, 127,725, 119,970, and 69,642 tonnes, respectively (MOALF, 2015).

There are many varieties of sweet potato, among them are the yellow-fleshed, white-fleshed and orange-fleshed sweet potato (Karanja *et al.*, 2006). The Orange-Fleshed Sweet Potato (OFSP) variety contains high amount of beta-carotene, thus making it a good source of vitamin A (Low *et al.*, 2007). Vitamin A is one of the essential micronutrients required in the diet for good eye sight, keeping body immunity, general growth and development (Sommer *et al.*, 2012). However, low dietary intake or excretion due to illness can cause vitamin A deficiency (VAD).

In many of the developing countries, VAD is a common form of malnutrition. In Kenya, VAD is prevalent (WHO, 2015), and the most affected are women and children. It is estimated that 20 percent of women including adolescents and lactating mothers, and 9 percent of children below five years are deficient. Furthermore, only 35 percent of children below two years consume

vitamin A rich foods (Njoroge and Munene, 2017). According to KNBS (2015), majority of women and children do not receive minimum acceptable diets. Recent statistics disaggregated by different counties in Kenya show that in Nairobi, the frequency of household consumption of micronutrient rich foods and particularly those with vitamin A is either low or non-existent. According to Njoroge and Munene (2017), 24.3 percent of the households do not consume foods containing vitamin A in a one-week cycle.

In an effort to correct VAD, governments especially in Sub-Saharan Africa are developing strategies to either supplement or promote consumption of foods that are rich with vitamin A. The Kenyan government through public hospitals provides vitamin A supplements to children under five years. However, coverage of 30.3 percent of the target population achieved so far is still low (KNBS, 2015, UNICEF, 2019). On the other hand, the Kenyan government has promoted bio-fortification, a process of enriching different foods with essential micronutrients, so as to improve daily adequacy of micronutrient intake by households. Indeed, since bio-fortified foods are not different from conventional foods, they are widely acceptable (Meenakshi, 2010). Some examples of food crops already bio-fortified with vitamin A include orange maize, yellow cassava and OFSP. Consumption of such foods or products derived from them has been fronted as a suitable remedy to VAD (Jones and de Brauw, 2015; Low *et al.*, 2017).

A focus on OFSP shows that ninety percent of the roots are consumed domestically in Kenya (KNBS, 2015). They are either boiled, roasted, fried, creamed or baked in their skins and eaten either alone or combined with other foods such as milk, soups, or porridge (Nungo *et al.*, 2007). Low *et al.* (2009) argue that it is healthy to consume OFSP in either boiled or steamed form. However, fresh OFSP roots are often found at wet-markets, for example Wakulima and Muthurwa fresh produce markets in Nairobi County. These markets are rarely visited by

consumers, particularly those in middle and high income brackets (Sindi *et al.*, 2013). Consumers living in urban setups face time constraint to purchase and prepare fresh foods (Senauer and Alderman, 1986). This has shifted the consumption pattern from traditional foods which take longer time to prepare, to commercially processed, ready to eat foods for example baked breads (Senauer and Alderman, 1986). The latter are considered to be time saving foods. It is further argued that processed food products for example OFSP bread are likely to reach the increasing number of urban consumers who find it convenient to purchase these products from retail stores or supermarkets (Muzhingi *et al.*, 2016). Indeed, OFSP bread is highly acceptable by consumers, just like other alternative wheat products with similar attributes (Naico and Lusk, 2010, Chowdhury *et al.*, 2011, Sindi *et al.*, 2015).

OFSP bread is a product of the promotional efforts by International Potato Center (CIP) to enhance consumption of pro-vitamin A rich bio-fortified foods. This was achieved through Mama SASHA (Sweet Potato Action for Security and Health in Africa), and SUSTAIN (Scaling-up Sweet Potato through Agriculture and Nutrition) projects. Mama SASHA project was undertaken in Bungoma and Busia counties between the year 2011 and 2013. The project used an integrated model that linked nutrition counselling with ante-natal and infant health services, OFSP dissemination and agricultural extension. The SUSTAIN project was carried out in Homa Bay, Migori, Nyamira, Kisumu and Siaya counties, and applied a combination of strategies in agriculture, nutrition, utilization, and marketing with an aim of strengthening production and consumption of OFSP. It is through the SUSTAIN project and with additional technical and equipment support by Euro-Ingredient Limited (EIL), a private food technology firm, that several baked products were developed from mashed OFSP roots.



Later, in an agreement with Tuskys supermarket, another private food processing company Organi Limited was selected as OFSP puree processor and a facility for the same was opened in 2015 in Homa Bay County. Organi Limited delivers OFSP puree (mashed OFSP roots) to Tuskys supermarket in Nairobi for processing of various bakery products such as bread buns, and scones (Muoki and Agili, 2015). Studies conducted earlier by Mazuze (2004), Wheatley and Loechl (2008) and Sindi *et al.* (2013), had proved that OFSP could be used in baking products and it could replace up to 50 percent of wheat-flour.

OFSP bread is usually packed in 400grams and retailed in Tuskys supermarket branches just like other bread brands. The major ingredient of the bread, OFSP puree, classifies it as pro-vitamin A champion and with great potential of contributing to food and nutrition security especially in urban areas (Low and Van Jaarsveld, 2008, Mills *et al.*, 2009). However, for Kenya to achieve the ambitious goal of ending all forms of malnutrition including VAD by 2030, consumption of bio-fortified foods by individuals or households must be emphasized as a way of acquiring the added micronutrients. Consumption of these foods begins with consumers choosing them over other products. Such decisions are often faced with product tradeoffs. The OFSP bread for example, will be confronted with many alternative high-calorie, low-nutrient types of breads. Consumers with low income tend to choose low quality products because most often they are cheaper (UNICEF, 2019).

Since the inception of OFSP bread in the year 2015, little is known about what motivates or affects urban customers to buy and consume OFSP bread, as well as the characteristics of people who prefer it to traditional wheat flour bread. The majority of previous studies relied on hypothetical choice studies (Naico & Lusk, 2010; Chowdhury *et al.*, 2011); or real taste tests of fresh products presented to consumers at their homes (Tomlins *et al.*, 2007; Lagerkvist *et al.*,

2016), in a school setting (Laurie *et al.*, 2018), or in grocery stores (de Groot *et al.*, 2014). Ouro-Gbeleou (2018), Bocher *et al.* (2019), and Wanjuu *et al.* (2019) are the exceptions, who used econometric approaches and neoclassical economic theories to examine drivers of OFSP adoption, focusing on only a narrow set of sensory qualities. While such analyses provided helpful information, consumer studies have highlighted the need to expand the understanding of consumer decisions and preferences beyond the neoclassical economic analysis of rational behavioural assumptions (Grunert, 2019; Jaeger *et al.*, 2019). This implies that choice and consumption of OFSP bread, one of the high quality products, is likely to influence by both socioeconomic and psychosocial factors. Socioeconomic factors refer to individual characteristics that relate to the social environment and the economic aspects. On the other hand, psychosocial factors combine both psychological aspects which include individual-level processes and meanings that influence mental constructs or states, and social aspects which include the concerns of the human society about the social structure and processes that impinge on the individual (Stansfeld and Rasul, 2007). Thus, the discussion going forward must focus on both socioeconomic and psychosocial factors as likely drivers of choice of OFSP bread. This will highlight specific policy intervention areas so as to improve consumption rates.

## **1.2 Statement of the problem**

Vitamin A deficiency remains a major problem in Kenya as 20 percent of women and 84.4 percent of children are currently affected (CIP, 2018). Consumption of foods rich with vitamin A such as bio-fortified sweet potato has been fronted as a sustainable remedy for VAD (Jones and de Brauw, 2015; Low *et al.*, 2017). The government of Kenya and other organizations led by CIP have promoted production and consumption of bio-fortified foods including OFSP. Through the SUSTAIN project in 2015, CIP introduced OFSP bread in the Kenyan market, specifically in

Tuskys supermarket branches to target urban consumers who are likely to find it convenient to purchase and consume the bread (Muoki and Agili, 2015), rather than OFSP in its raw form. However, to date the pattern of consumption and subsequently the factors that influence the same have not been determined.

Kaguongo *et al.* (2012) and Etumnu (2016) identified factors that influence consumption of OFSP roots. These factors include income, age of consumer, years of formal education, number of persons in the household and number of young children. However, these studies first, were conducted in rural areas where OFSP is classified as one of the staple foods, thus mostly consumed in large quantities. In the urban setups, OFSP is consumed in small quantities due to the cumbersome nature of buying it from the wet markets. Second, they focused on consumption of fresh OFSP roots, but processed OFSP bread is both a different product as well as an alternative form of presentation of vitamin A supplement. Third, the studies did not capture consumers' nutrition knowledge about OFSP particularly as a source of vitamin A, and as a factor that can influence choice of OFSP (Lind, 2007, Laurie *et al.*, 2015). By extension, nutrition knowledge could probably influence choice of OFSP bread. Essentially, nutrition knowledge about OFSP bread is obtained from the bread label and shelf branding by Tuskys supermarkets. Thus, it is not clear whether nutrition knowledge affects choice and intensity of purchase of OFSP bread.

Choice of product by consumers is a behavioral aspect and therefore the decision making process depends on consumers' mental constructs (Okello, *et al.*, 2014). Thus, it is probably not sufficient to base choice on socioeconomic factors only, but extend the focus on psychosocial factors. There are inner motivations behind consumers' decision to purchase and consume a given product such as OFSP bread and which could differ from one individual to another

(Okello, *et al.*, 2014). Consumers differ in cognitive ability, personality, attitude and purpose of purchasing the OFSP bread. The fact that the bread contains vitamin A and thus considered a nutritionally enhanced product could, in the subconscious mind of consumers, be linked to several consequences and subsequently to numerous personal values or life goals. Furthermore, consumer perceptions towards OFSP could have been influenced by earlier promotion mechanism by CIP which targeted beneficiaries through health facilities and thus being associated with Human Immunodeficiency Virus (HIV) patients. In addition, some consumers perceive OFSP as a ‘sweet food’ suitable for children and women, and ‘poor man’s crop’ making it an inferior commodity (Wheatley and Loechl, 2008, Thiele *et al.*, 2009). Such social conceptualizations are likely to influence choice of OFSP products such as bread.

Previous studies have often been based on neoclassical theory of utility maximization and therefore, they have not sufficiently captured psychosocial factors (Wambugu *et al.*, 2009, Okello, *et al.*, 2014). Therefore, there is a literature gap in determining and documenting psychosocial factors that influence choice of OFSP bread by consumers.

### **1.3 Overall objective of the study**

The overall objective of this study was to assess the factors influencing consumption of orange-fleshed sweet potato bread in Kenya.

### **1.4 Specific Objectives**

- i. To analyze the effect of nutrition knowledge on choice of OFSP bread by consumers.
- ii. To analyze the effect of nutrition knowledge on the intensity of purchase OFSP bread by consumers.
- iii. To analyze psychosocial factors influencing choice and consumption of OFSP bread by consumers.

## **1.5 Hypotheses**

- i. Nutrition knowledge has no effect on choice of OFSP bread by consumers.
- ii. Nutrition knowledge has no effect on the intensity of purchase of OFSP bread by consumers.

## **1.6 Research question**

- i. What are the psychosocial factors that influence choice of OFSP bread by consumers?

## **1.7 Justification of the study**

Promoting consumption of OFSP bread is one of the strategies to alleviate VAD, support commercialization through processing, and improve smallholder farmers' income through backward linkages along OFSP value chain. Results on the effect of nutrition knowledge on consumption of the bread will support the implementation process of National Food and Nutrition Security Policy by enabling stakeholders to develop appropriate educational programmes, nutrition campaigns, OFSP promotional messages and other strategies that aim to reduce micronutrient deficiency in household diets.

This study is part of the CGIAR Research Program on Roots, Tubers and Bananas (RTB), and funded through the Scaling Up Sweet potato for Agriculture and Nutrition (SUSTAIN) project implemented in Kenya. Thus, the results will be useful in the design of effective interventions for success of the project. In addition, the results will contribute to the improvement of OFSP value chain especially consumption stage. Essentially, enhanced consumption of OFSP bread will prevent adverse consequences of VAD. This study therefore aligns with the global policy on nutrition sensitive agriculture and contributes to the achievement of Sustainable Development

Goals (SDGs) two (eliminating hunger) and three (achieving good health and well-being). It also contributes to the achievement of pillar three (reducing hunger) of the Comprehensive Africa Agriculture Development Programme (CAADP).

This study identified psychosocial factors that influence choice of OFSP bread, hence, contributing to the growing literature on consumption pattern of OFSP bread. Information on these factors will assist the commercial producers of OFSP bread to design concrete promotional messages based on superior pro-vitamin A attribute, so as to increase consumption rates. Furthermore, this understanding will serve as a basis for distinct cognitive advertising strategies which will reinforce various levels of abstractions and perceptual orientation.

Generally, this study supports bio-fortification as a strategy under National Food and Nutrition Security Policy (NFNSP) to alleviate VAD, as well as effort by other stakeholders, in particular CIP, towards enhancing nutrition, good health and wealth using OFSP.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Overview of vitamin A bio-fortification in Kenya**

Malnutrition remains one of the taunting problems in the world and it is more pronounced in most of Sub-Saharan African (SSA) countries (IFPRI, 2020). One of the major forms of malnutrition is vitamin A deficiency (VAD). In Kenya VAD is prevalent with the latest statistics showing that 20 percent of women and 84.4 percent of children are affected (CIP, 2018). In fact, in a one-week cycle 24.3 percent of the households in Nairobi County do not consume foods containing vitamin A (Njoroge and Munene, 2017). Furthermore, even households that exhibit sufficiency in foods that meet their daily energy requirements, suffer from micronutrient deficiency and especially vitamin A.

The Kenyan government continues to put in effort to combat VAD as part of its commitment to global and regional policies on food security. In the year 2015, Kenya adopted the Sustainable Development Goals (SDGs) with a particular focus on goals number two and three that seek to end hunger and achieve good health and wellbeing for all by the year 2030. Additionally, Kenya is also committed to CAADP pillars of accelerating development in Africa and the focus is on pillar three that outlines strategies of reducing hunger. The National Food and Nutrition Security Policy (NFNSP) has been aligned to cover all the components of food security based on the definition of food security by the World Food Summit (1996) that specified food availability at all times, access by individuals, utilization and stability (GoK, 2011). As outlined in NFNSP, the Kenyan government is focused on enhancing food access as well as providing special nutrition interventions for vulnerable groups to achieve optimum health through good nutrition

In an effort to tackle VAD, the government combines several strategies including supplementation, industrial food fortification and more recently bio-fortification of several food

crops to increase vitamin A density (Mwaniki, 2007). First, supplementation of vitamin A is done in public hospitals during antenatal and postnatal clinical visits. Vitamin A supplements are usually given to children below five years and pregnant women. However, not all people visit public hospitals and that is why the programme has only managed to reach out to 30.3 percent of the target population (UNICEF, 2019). The second strategy, industrial food fortification, involves addition of essential micronutrients like vitamin A to processed foods consumed by many of households (GoK, 2018). Kenya has indeed made great strides since 1970's, and this far several foods including wheat flour, maize flour, sugar, vegetable fats and oils have been fortified with vitamin A. According to Kenya National Food Fortification Plan (KNFFSP), food fortification is arguably a cost effective way of availing superior food sources of vitamin A (GoK, 2018). However, resource-poor households consume an insignificant amount of processed foods, thus limiting the use of industrial food fortification to combat VAD.

The last strategy is bio-fortification which refers to genetic improvement of crops to enhance their nutritional value. This process seeks to breed crops that are rich with essential nutrients such as iron, zinc, and vitamin A so as to address micronutrient deficiencies (Pambo *et al.*, 2014). The focus is on food crops that people consume every day. Bio-fortification has been termed as the key tool of NFNSP in attaining better nutrition especially for the poor and vulnerable groups (GOK, 2011). Kenya has progressed by adopting several vitamin A bio-fortified crops which include maize, cassava and orange-fleshed sweet potato. These crops are widely consumed and thus have the potential of improving vitamin A component in diets of many households (Mulongo, 2018).

The above review throws light on the priority that vitamin A bio-fortification program is receiving in NFNSP and shows evidence of its contribution to combating dietary micronutrient



deficiency. This study however recognizes the need to improve consumption of vitamin A bio-fortified foods as one of drivers of success of the whole bio-fortification program. Thus, it contributes to literature by placing a special focus on factors that influence consumption of these foods.

## **2.2 Consumer acceptability of vitamin A bio-fortified food products**

Several studies conducted in different parts of the world have provided an understanding of consumers' acceptability of bio-fortified products. A study by Meenakshi *et al.* (2010), provided the evidence that bio-fortified foods are widely acceptable by people because they are similar in taste when compared to other conventional foods. Furthermore, there is usually no need to change dietary habits yet people gain an added advantage of nutritive value. These findings laid the ground for further assessment of consumers' acceptance of bio-fortified food products particularly those that are rich in vitamin A.

Chowdhury *et al.* (2011), assessed whether consumers were willing to pay more for micronutrient dense bio-fortified foods in Uganda and found that consumers attached higher premiums on nutritionally rich foods. Similarly, De Groote *et al.* (2011) estimated the willingness to pay for fortified maize meal and found that consumers would actually pay a higher premium especially if it was fortified with minerals and vitamins. Simply, they were willing to choose it over the normal maize meal. However, although Meenakshi *et al.* (2012) through a discrete choice experiment that estimated the willingness to pay for bio-fortified orange maize in rural Zambia concurred with these findings, they noted the importance of nutritional information. A more recent study by Oparinde *et al.* (2016), also concurred that consumers were willing to pay higher premiums for nutrition rich bio-fortified yellow cassava in Nigeria, but on the contrary, they did not need to have nutrition knowledge. Additional contribution to this literature

and particularly focusing on acceptability of bio-fortified foods by young consumers, was provided by Talsma *et al.* (2013). In their study, they focused on vitamin A bio-fortified cassava and whether it was accepted by school children. The study used paired preference tests to measure sensory acceptability and concluded that indeed vitamin A rich cassava was acceptable by this category of consumers.

A focus on OFSP roots revealed that it was acceptable just like other bio-fortified foods. A choice experiment among sweet potato shoppers in Mozambique by Naico and Lusk (2010), compared OFSP roots with other traditional varieties of sweet potato and found that they both attracted similar premiums. Consumers liked OFSP roots just like the other varieties. An earlier study by Low *et al.* (2007) in the same country had focused on young consumers but the findings were nonetheless similar. The two-year quasi experimental intervention study had concluded that indeed young children liked taste of OFSP tubers.

Narrowing down to processed products from OFSP roots, it was revealed that these products generally received a higher acceptability rating. A study by Laurie and Van Heerden (2012), assessed beta-carotene rich products namely doughnuts, chips, juice and cooked sweet potato leaves in South Africa. Using facial expressions to measure acceptability, the study found that all products received a high acceptability rating of between 85 and 95 percent. These results were corroborated by those from more recent studies. Okello *et al.*, (2014), focused on perceptions by consumers and demand for bio-fortified sweet potato-based biscuit among the low to middle-end and middle to high-end income earners in Rwanda. The study found that low/middle income consumers had higher willingness to pay for bio-fortified biscuits and thus, product was highly acceptable among this group.

Studies by Sindi *et al.* (2013) in Rwanda and Muzhingi *et al.* (2016) in Kenya focused directly on acceptability of OFSP bread. Both studies concluded that OFSP bread was highly acceptable by consumers even if the price was higher than wheat flour bread. Therefore, OFSP puree could be used to bake bread in bakeries just like wheat flour. However, studies by Birol *et al.* (2015) and Wanjuu *et al.* (2019) reiterated the fact that the discussion about acceptability is inconclusive without a look at influencing factors. Birol *et al.* (2015) and Low *et al.* (2015) provided evidence that acceptability can be improved by availing information about the health benefits of bio-fortified food products to the consumer. The two studies draw on lessons learned from private-sector marketing businesses about how they analyze personal, psychological, social, economic, and environmental determinants to examine urban consumer food choice. Wanjuu *et al.* (2019) added that acceptability is influenced by consumer demographics, knowledge and overall rating of the sensory attributes. Studies by Banović *et al.* (2016) and Rocha *et al.* (2019) suggest that more widely utilized marketing strategies could be employed to better understand consumers' perceptions and acceptance of products, particularly those in the early stages of development.

The current study acknowledges from the above review that bio-fortified food products are widely accepted by consumers both adult and young children. In particular, they are willing to purchase and consume OFSP bread, a singular product that attracted the focus on this study. Furthermore, this study recognizes that OFSP bread is widely acceptable and thus, purchased by many consumers from retail outlets. Therefore, it could be a good vehicle of incorporating vitamin A into the diet of many households. This study however, adds to the discussion by going forward to document what exactly drives choice decisions as well as consumption quantities of vitamin A bio-fortified OFSP bread.

### **2.3 Linkage between Orange-fleshed sweet potato consumption and food nutrition security**

According to the World Food Summit (1996), food security can be defined as a situation where all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and preferences for a healthy life (Stephens & Parsons, 2018). From this definition, four pillars including food availability, access, utilization and stability have been used to measure the status of individuals' food security. All the four pillars must be satisfied before an individual is declared to be food secure. However, discussions about food security have inclined towards food availability to indicate sufficiency in terms of physical volumes, yet sufficiency should be in terms of macro and micronutrients required (UNICEF, 2016). Individuals often fail to consider micronutrients in their consumption options.

Consumption of micronutrient dense foods has been shown to be the most effective way of controlling their deficiency. For instance, several studies found positive results towards reducing VAD when individuals consumed foods bio-fortified with vitamin A. Talsma *et al.* (2016) used a replicated discrimination tests to show that consumption of vitamin A bio-fortified yellow cassava tremendously reduced VAD in young children. Similarly, a study by Wanjuu *et al.* (2018) used quasi-experimental analysis and found that OFSP was an excellent and sustainable source of vitamin A. The study suggested that consumption of OFSP must be enhanced if positive results are desired in the fight against VAD.

A study by Owade *et al.* (2018) noted that consumption of OFSP will be enhanced through processed products such as bread, biscuits, scones, buns and cookies. In particular, the fact that bread is a widely consumed product, the study argued that OFSP bread was an effective way of incorporating vitamin A in diets of many households. Earlier, a study by Stathers *et al.* (2013) had indicated that cultivation of OFSP had significantly increased leading to commercialization

by processing into products such as bread and scones ready for consumption. Moreover, consumption of processed products will probably be more important in combating VAD in urban areas. A study by Senauer and Alderman (1986) found that consumers in urban areas face time constraint to purchase and prepare fresh foods. A study by Sindi *et al.* (2013), further indicated that wet markets where fresh foods such OFSP roots are found are rarely visited by consumers living in urban setups. Therefore, consumers find it convenient to purchase and consume products especially bread from retail stores or supermarkets (Muzhingi *et al.*, 2016).

The above review reveals the importance of consuming vitamin A bio-fortified foods as way of improving nutrition security especially sufficiency in vitamin A intake. However, little attention has been given to the drivers of consumption of these foods. This limits policy options on the most effective target and entry points to improve consumption of vitamin A rich foods so as to reduce its deficiency. By examining factors that influence consumption of OFSP bread, this study outlines specific policy target options and which could be effective in improving dietary vitamin A intake.

#### **2.4 Effects of nutrition knowledge on choice and consumption of vitamin A bio-fortified food products**

Nutrition knowledge refers to consumers' awareness of the potential health benefits from consuming a given product (Meenakshi *et al.*, 2012, Wanjuu *et al.*, 2019). This study contextualized that consumers are considered to have nutrition knowledge if they are aware of the fact that OFSP roots as well as products processed from it, are a rich source of vitamin A and that consuming such products has numerous health benefits. Nutrition information could be obtained from sources such as nutrition campaigns by public health institutions, mass media,

community based health workers (Meenakshi *et al.*, 2012). In addition, information could also be disseminated through the use of written labels (McFadden & Huffman, 2017), private organizations, Non-Governmental Organizations (NGOs), or endorsement by public figures. Community based agents like teachers and health workers who command respect are argued to be the effective in delivering nutrition information. Studies by Lind (2007), Liu *et al.* (2009), Bhutta *et al.* (2013) and Pambo *et al.* (2018), have indeed provided evidence of the importance of nutrition knowledge. These studies showed that nutrition education intervention could lead to consumers' change of behavior towards product consumption

Several studies have focused on the effect of nutrition information on consumption of bio-fortified products. Chowdhury *et al.* (2011) provided evidence that the effect of nutrition information on consumption of nutrition enhanced products was sizable. It suggested that information campaign translated into a premium which indicated a positive change in consumption. This conclusion is similar to that obtained by De Groote *et al.* (2011), who in their study that focused on consumption of fortified maize meal, found that familiarity with health benefits of vitamin A was an important factor in consumption decisions. Negative associations towards fortified maize such as being used as animal feed and given as food aid were cleared with an understanding of the importance of vitamin A to human body. Later, Meenakshi *et al.* (2012), analyzed the effect of nutrition messages on acceptance of orange maize among five different treatment groups. This study revealed that nutrition campaigns had a positive effect on the acceptance of vitamin A bio-fortified foods especially if consumers are enlightened on nutritional benefits. Indeed, consumers who understood the health benefits purchased and consumed the orange maize.

More recent studies by Laurie *et al.* (2015), and Etumnu (2016) in South Africa and Ghana respectively, concluded that knowledge on nutrition benefits of OFSP tubers particularly as a rich source of vitamin A, could promote its consumption. However, these findings were different from those found by Okello *et al.* (2014), in a study that assessed the effect of knowledge of vitamin A on consumer rating for bio-fortified biscuit. The study found no evidence that promotional campaigns changed consumer perceptions. Despite the contrary findings, the study suggested that it was necessary to analyze the different types of information and its effects on consumer preferences.

This study explores a direct relationship between nutrition knowledge and consumption of vitamin A bio-fortified food products based on the above review. In particular, it narrows down to effects of nutrition knowledge on consumption of a specific product, OFSP bread. This study focuses on providing empirical evidence on the effects of nutrition knowledge on actual purchase decisions and amount of bread purchased by urban bread consumers, thus, contributing to already existing literature on OFSP bread.

## **2.5 Psychosocial factors that influence the decision to consume OFSP bread**

Consumption of bio-fortified food products can be influenced by both socio-economic and psychosocial factors. However, many studies use neoclassical economic theory to study the effects of socio-economic factors on consumption of bio-fortified foods products (Okello *et al.*, 2016), and neglect psychosocial factors.

‘Psychosocial’ factors combine two concepts psychological and social factors. Psychological factors include individual-level processes and meanings that influence mental constructs or states while social factors include the concerns of the human society about the social structure and

processes that impinge on the individual (Stansfeld and Rasul, 2007). Mental constructs entail several domains such as mood status (anxiety, depression, and positive affect), cognitive behavioral responses (satisfaction, self-efficacy, self-esteem) and social factors (socioeconomic status, education levels, relationships, social norms, and personal roles) (Suzuki and Takei, 2013).

Several studies have sought to assess the psychosocial factors that influence consumption of bio-fortified foods including OFSP. Bredahl *et al.* (1998) focused on genetically modified food products and used a cognitive approach to explain consumer attitudes and purchase decisions. The study concluded that how consumers make product purchase decisions is a complex mental phenomenon. A consumer's perception of product attributes is linked to consequences in consumer's mind, which in turn are associated mentally with personal values. Attributes are recognizable product characteristics, consequences are outcomes expected after consuming a product, while values are goals or cognitive representation of desires a consumer wants to fulfill (Lin *et al.*, 2018, Mandolesi *et al.*, 2020).

A study by Leng *et al.* (2017) provided evidence that consumers' emotions and psychological mechanisms determine food choices. Consumer's mental constructs could be perceptual, affective or behaviour-deciding and that these could successfully be used in predicting the choices made by these individuals. Consumers' answers to questions about reasons for choosing a given product can be used in understanding the underlying consumer thought process.

A study by Okello *et al.* (2016) narrowed down to OFSP roots. It analyzed the association between OFSP consumption decisions, sensory attributes and mental models that determine the decision to consume OFSP. The study concluded that sensory attributes (nutrition, taste, colour),



are mentally linked to personal values (happiness, long life, staying healthy and being independent), which determine OFSP consumption. Additionally, findings from studies by Okello *et al.* (2017) and Shikuku *et al.* (2019) reiterated that product attributes such as taste, colour, sweetness, liking by children and food related norms affect a consumer's perception. These findings were corroborated by those from a recent study by Ouro-Gbeleou (2018) in Ghana, which indicated that bread attributes including sweet taste, soft texture and yellow colour were some of the important determinants of OFSP bread choice. However, this study failed to link these attributes to consequences or personal goals for which an individual chooses to consume OFSP bread.

In summary, this study acknowledges that psychosocial factors represented by mental associations between product attributes, consequences associated with consumption and personal values influence choice decisions and consequently consumption of the product in question. Thus, this study focused on comprehensively mapping out attributes of OFSP bread, the associated consequences and the final personal goals that drive choice and consumption decisions. The fact that OFSP bread is a vitamin A rich product, documenting these factors not only contributes to the growing literature about the bread but also increases scope for specific policies that could improve its consumption.

## **2.6 Review of past studies on factors that influence consumption of vitamin A bio-fortified foods**

It is evident as documented by several studies that there are diverse factors that influence consumption of vitamin A bio-fortified foods. In addition, different methods have been used in previous analyses. A study by De Groote and Kimenju (2008) used a semi-double-bounded

logistic model to estimate preference of urban consumers in Nairobi-Kenya towards vitamin A bio-fortified yellow maize. This study found that gender of the consumer, education level, amount of income earned as well as ethnic background were factors that influenced choice of bio-fortified yellow maize over white maize. Focusing on a similar product, vitamin A bio-fortified orange maize in rural Zambia, Meenakshi *et al.* (2012) used a discrete random parameter logit model to analyze consumer preferences. However, the study narrowed down to nutrition information and concluded that consumers, who were aware of vitamin A and its importance, chose and were willing to pay for orange maize. The two studies modelled choice of bio-fortified maize as a single decision made by the consumer; hence, they both used a logit regression model. Although the current study adopts choice as a single decision, it follows up with another decision on the amount of the product consumed, recognizing that both decisions are made almost simultaneously.

A study by Bett *et al.* (2013) modelled product choice and willingness to pay as two separate decisions made by a consumer. The study used a Heckman two-stage selection model to determine factors that influenced both decisions. Choice is a decision observed by actual type of product chosen, while willingness to pay is indicated by the price at which the consumer is willing to purchase the product.

Using a cross sectional survey and a probit regression model, Pambo *et al.* (2014) analyzed factors that affect consumption decisions regarding fortified sugar. The study found that trust in point of purchase, and consumers' prior knowledge on importance of vitamin A, had a positive influence on consumption of bio-fortified sugar. Similarly, a study by Etumnu (2016) in Ghana used a choice experiment and conditional logit regression model to investigate determinants of consumption of vitamin A bio-fortified OFSP. The study concluded that age of the consumer as

well as household size influenced consumption decisions of OFSP. A more recent study by Bocher *et al.* (2019) in Rwanda, analyzed the determinants of choice of fresh OFSP juice using a multinomial logit regression model. The study concluded that gender of the consumer and knowledge of vitamin A had a positive influence on choice of the juice. In addition, general nutrition information about a product was a key determinant of consumers' choice.

Generally, studies reviewed highlight first, the various socio-economic factors that influence consumption decisions on vitamin A bio-fortified foods. Some of the factors include age of the consumer, gender, education level, amount of income earned, prior awareness of vitamin A rich foods and size of the household. However, the effect of level of nutrition knowledge of a consumer on choice and consumption decisions eluded the previous studies. Thus, this study seeks to find the relationship between consumers' levels of nutrition knowledge and their consumption decisions for foods rich in vitamin A. Moreover, this study narrows down to a specific product, OFSP bread. Second, the studies reviewed provide insights on different methodologies used to analyze the effects of the various socio-economic factors on consumption decisions. In addition, the method chosen depends on the levels of decision making by the consumer as well as the nature of socio-economic factors being analyzed.

On psychosocial factors, a study by Okello *et al.* (2017) used a Means-End Chain (MEC) analysis to analyze mental models associated with consumption of OFSP. The study found that personal values that are related to and motivated by consumers' pursuit for happiness, long life, independence and good health were the key drivers of consumption of OFSP. In addition, the kind of information that consumers received on attribute changes affected the mental constructs. However, the study did not include male participants yet there could be gender differences in what motivates male consumers as compared to their female counterparts (Johansen *et al.*, 2011).

A similar study by Pambo *et al.* (2017) combined laddering technique and MEC analysis to examine consumers' mental models towards foods from edible insects. Although the study did not focus on vitamin A bio-fortified foods, findings showed that provision of nutrition information influenced mental models. Moreover, personal values that included being happy, attaining food security and staying a long life motivated the consumption decision for cricket buns.

The studies reviewed highlight some of the psychosocial factors that influence purchase and consumption decisions for vitamin A rich foods. They include consumers' happiness, staying long and healthy life, and independence. Although the current study acknowledges the documented factors, it explores the possibility of more psychosocial factors that influence consumption decisions. On the other hand, the reviewed studies provide insights on the methods used to map and determine psychosocial factors.

In conclusion, this study intends to add to already existing literature by assessing and providing empirical evidence on how consumption of OFSP bread, a vitamin A rich product, is shaped by the level of nutrition knowledge as well as psychosocial factors for consumers in urban areas.

## CHAPTER THREE: METHODOLOGY

### 3.1 Theoretical framework

This study was anchored on two theories; the Random Utility theory and Means-End Chain (MEC) theory. Utility as a concept in economics is seen as an abstract measurement of the degree of goal-attainment or want-satisfaction provided by a product or service. One cannot measure directly how much utility a person may gain from a product or a service. However, inferences can be made about utility based on individual's behaviour, presuming that people act rationally. Thus, it follows that a rational person acts to increase utility (Train, 2003). Essentially, this means that consumer preferences can be revealed by their purchasing habits. Consumers choose from an array of alternatives that are fundamentally different based on specific product attributes and their trade-offs.

Random utility theory posits that a choice decision is made by an individual  $i$  from a set of alternatives  $j$  (McFadden, 1978). Individuals have a set of available consumption choices and whichever alternative that is chosen maximizes their utility. The Specific choice made by a consumer is usually a function of a set of influencing factors. The level of utility  $U_i$  from a specific choice is a latent variable known only to the decision maker and observed through the choices made. Individuals are thus, presumed to choose a product from which they derived highest utility (Greene, 2003). Utility derived is expressed as the linear sum of two components; a deterministic part  $V_{ij}$ , that captures observable components of the utility function and a random error term  $\varepsilon_{ij}$ , that captures unobservable components of the function including measurement errors for the  $i^{th}$  individual among  $j^{th}$  number of options as follows:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \dots \dots \dots 3.1$$

The deterministic part  $V_{ij}$  is a linear combination of observed explanatory variables and their estimated parameters. The stochastic error term  $\varepsilon_{ij}$  include all unobserved variables which influence utility derived from choosing a specific product. Therefore, random utility theory provided a basis under which this study could test the effect of nutrition knowledge on choice and intensity of purchase of OFSP bread.

The second theory, Means-End Chain (MEC) theory, draws from economic psychology and thus, it can be applied in the assessment of the mental processes that drive consumers' decision making process. MEC theory is a departure from neoclassical economic theory, which many studies have widely used to assess socio-economic factors that influence demand of a product. Since its development by Gutman (1982) and later improved by Reynolds and Olson (2001), this theory has been applied to studies focusing on factors influencing choice of certain product by consumers (Santosa and Guinard, 2011). This is the case of this study which focuses on factors that determine consumption of OFSP bread.

MEC theory posits that product attributes are linked to consequences in consumers' mind. These consequences are driven by personal goals that individuals yearn to fulfill in life. Attributes are recognizable product features such as smell, colour, taste and texture of OFSP bread. According to Arsil *et al.* (2014) and Okello *et al.* (2014), consequences refer to outcomes individuals get after consuming a given product. Personal values are goals, cognitive representations or desires that determine decisions by individuals to consume a given product. They are the end states and can either be individual or societal expectations and thus psychological and sociological in nature (Lind 2007). The latter makes individual needs socially acceptable (Mason 1995).

Consumers' choice of a product is influenced by goals which act as stimulus to action (Aarts *et al.*, 2008). Thus, this study conceptualizes that knowledge about nutritive value of OFSP bread, could activate goals which lead to action. Hence, consumers make a decision to purchase OFSP bread. Goals exist in individual minds and require special methods for example the laddering technique that was used by this study to retrieve them.

The linkage between attributes-consequences-values (A-C-V) form connections in a hierarchical manner. This is referred to as MEC hierarchy that comprise of attributes at the base then consequences and personal values at the top. Based on identified associations between attributes, consequences and values, a Hierarchical Value Map (HVM) can be developed and used to determine mental models towards choice of a product.

MEC theory was therefore considered appropriate to analyze the psychosocial factors that determine purchase and consumption decisions about OFSP bread. It promised more insights into consumers' product choice process than neoclassical theories for example Lancaster's consumer theory.

### **3.2 Conceptual framework**

Evidence from previous studies has shown that nutrition knowledge (awareness of the potential health benefits from consuming OFSP bread) may influence the decision to purchase the bread (Chowdhury *et al.*, 2011; De Groote *et al.*, 2011; Meenakshi *et al.*, 2012). Moreover, the intensity of purchase of OFSP could also be influenced by nutrition knowledge.

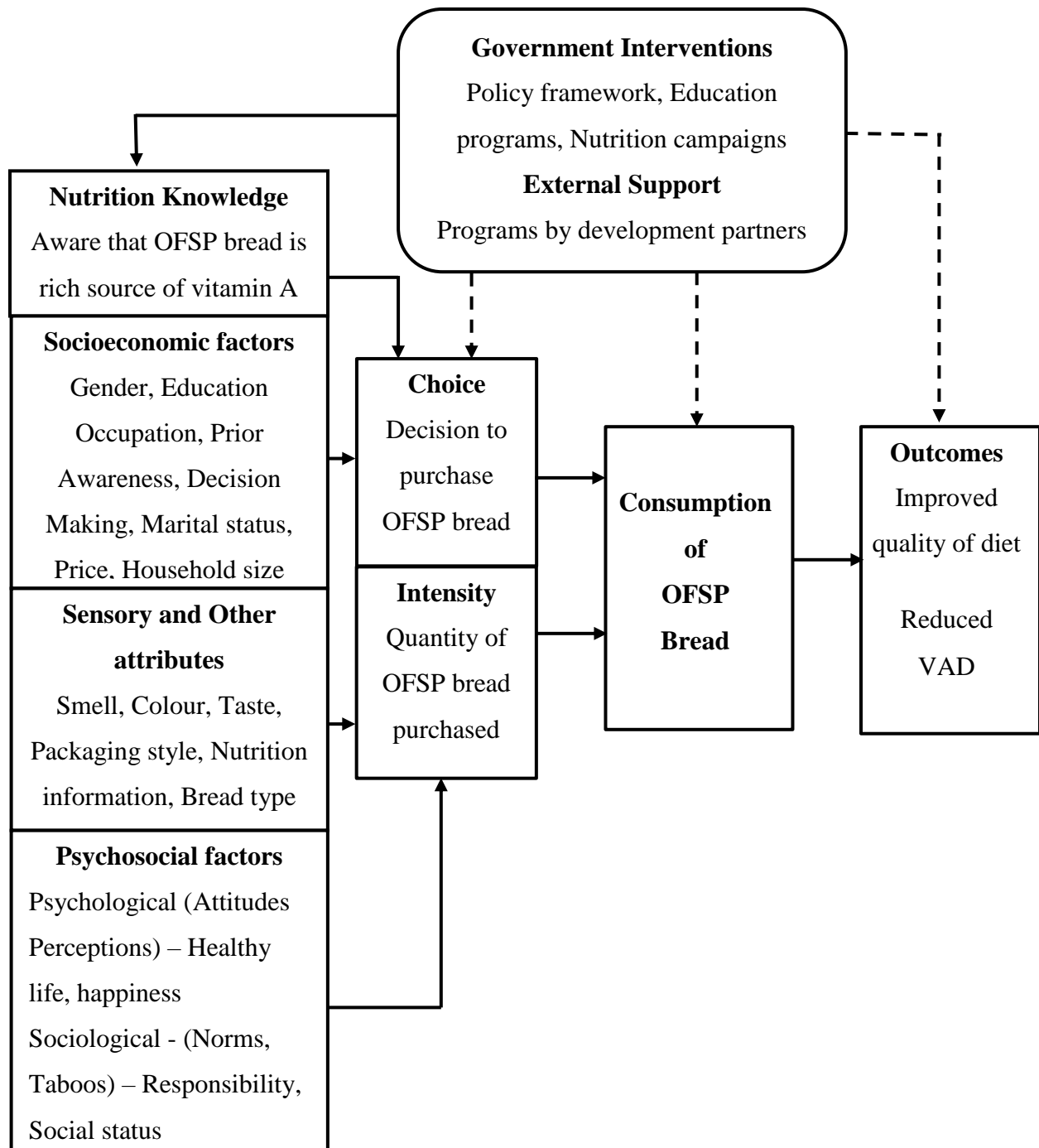


Figure 3.1: A Conceptual Framework showing relationship between nutrition knowledge, psychosocial factors and consumption of OFSP bread

Source: Author's own conceptualization (2018)



Apart from the level of nutrition knowledge of the consumer, there are other socio-economic factors that influence choice and intensity of consumption of vitamin A rich foods including OFSP bread. Some of the factors documented by previous studies include age of the consumer, gender, education level, amount of income earned, prior awareness of vitamin A rich foods and size of the household. These factors are included as control factors since their expected effects on choice and intensity of consumption of OFSP bread are already known.

There are also psychosocial factors that influence consumption of OFSP bread. Psychosocial factors combine both psychological and sociological mental aspects that relate to consumption of OFSP bread (Stansfeld and Rasul, 2007). Psychosocial factors can be derived from associations between the OFSP bread attributes, resulting consequences, and ultimate life goals that a consumer strive to achieve. These associations are mental constructs in a consumer's mind. Therefore, choice of OFSP bread is influenced by psychosocial factors.

Product attributes such as smell, colour, taste and texture influence consumer perceptions, and thus the decision to purchase the OFSP bread (Okello *et al.*, 2016). Consumers could also differ depending on their gender, age, income level and family size (Etumnu, 2016). Consumption of OFSP bread starts with an individual choice and intensity of purchase of the bread. Choice was observed by a consumer's decision to purchase OFSP bread over other bread types available on the supermarket shelves. On the other hand, intensity of purchase was measured by the number of loaves of OFSP bread purchased by consumer. Consumption of OFSP bread could be linked to several outcomes such as being happy, independent, self-sufficient and long life. These outcomes reflect the general well-being of the consumers.

Government interventions for example through food and nutrition security policy, education programs and campaigns on proper nutrition have a direct influence on factors that affect choice

of OFSP bread particularly on consumers' level of nutrition knowledge. Outcomes from such interventions together with programs by development partners (CIP and USAID) will therefore influence consumption of OFSP bread. Consequently, the ultimate outcome is improved quality of consumers' diet by incorporating vitamin A and thus reducing its deficiency.

### **3.3 Empirical framework**

The main objective of this study was to assess the factors influencing consumption of orange-fleshed sweet potato bread. This was achieved by descriptive statistics and econometric approaches. Descriptive statistics which included means and proportions were used to explain socio-economic and demographic characteristics of respondents. Independent t-tests (for continuous variables) and chi square tests (for categorical variables) were used to establish whether the means/proportions of socio-economic variables as well as demographic characteristics were similar between OFSP bread consumers and non-OFSP bread consumers. A non-significant t-test/chi-square value indicated there was no difference between the means/proportions of the two groups, while a significant t-test/chi-square value indicated statistically significant differences. Consumer's nutrition knowledge, a set of socio-economic factors as well as product sensory attributes were analyzed.

#### **3.31 Objective 1 and 2: Analyzing the effect of nutrition knowledge on the decision and the intensity of purchase OFSP bread**

In analyzing the effect of nutrition knowledge on first, choice of OFSP bread and second, on intensity of purchase by consumers, a double-hurdle model was used. This model provided a two-tiered decision making framework. Product purchase decisions by consumers are usually characterized as occurring in two steps. First, a consumer makes a choice on the type of product

to purchase, and second, decides on amount of the product to purchase and consume (Holloway *et al.*, 2001, Makau *et al.*, 2016).

Although a Tobit model or Heckman two-step model could have been used for this objective, they exhibit some limitations. For instance, a Tobit model assumes that the same set of variables is used to determine probability of making a decision and the extent of action. A Tobit model is thus considered restrictive. On the other hand, Heckman model assumes zero observations are non-existent in the second stage after the first stage has been passed (Heckman, 1976). A double-hurdle model relaxes the two restrictions. According to Cragg (1971), it allows determination of the discrete probability of choice and intensity of purchase as two separate actions and influenced by different set of factors. Moreover, zero observations in the second stage are considered as rational purchase decisions. Thus, the two hurdles were: first, whether the consumer made a choice to consume OFSP bread, and second, the amount of OFSP bread that was purchased (intensity). The assumption was that the amount of bread purchased directly indicated the level of consumption.

Since outcomes were determined by choice in the first stage and the amount purchased in the second stage, it was possible to estimate the two equations in both hurdles using different sets of explanatory factors (Burke, 2015). Choice was defined by the type of bread actually selected by the consumer while intensity was defined by the typical number of OFSP bread purchased in one week. The major assumption of the double-hurdle model is that there are no missing observations and that zeros in the dataset are usually as a result of consumers' rational decisions (Burke, 2009a).

The likelihood function of the double-hurdle model was an integration of the binary-probit for the first stage and truncated regression for the second stage. This structure is similar to Cragg's

(1971) when he integrated probit and lognormal and Burke's (2015) when he integrated probit, ordered probit and lognormal models.

The first stage of the double-hurdle model was used to analyze the effect of nutrition knowledge on choice of OFSP bread. The model was specified based on Burke (2009b), Gujarati and Porter (2009) as follows:

$$\Pr(y = 1|x) = \Pr(y = 1|x_1, x_2, x_3, \dots, x_k) \dots\dots\dots 3.2$$

where the dependent variable, choice of OFSP bread represented by  $y$ , and determining factors represented by  $x$ .

The probability regarding whether  $y$  is equal to zero that is when a consumer does not choose OFSP bread will be given by:

$$P(y_i = 0|x_i) = 1 - \Phi(x_i\beta_i) \dots\dots\dots 3.3$$

where  $\Phi$  is the standard normal probability distribution function and  $\beta_i$  are parameter estimates.

Similarly, the probability regarding whether  $y$  is equal to one that is when a consumer chooses OFSP bread will be given by:

$$P(y_i > 0|x_i) = \Phi(x_i\beta_i) \dots\dots\dots 3.4$$

where  $\Phi$  is the standard normal probability distribution function and  $\beta_i$  are parameter estimates.

The model was simplified as follows:

$$y_i^* = x_i \beta_i + \varepsilon_i \dots\dots\dots 3.5$$

$$y_i = 1 \text{ if } y_i^* > \tau \text{ and } y_i = 0 \text{ if } y_i^* \leq \tau \dots\dots\dots \tau \text{ is the cut off threshold}$$

where  $y_i^*$  is the latent dependent variable (choice of bread), which was observed by the actual type of bread purchased.

Either, a consumer chose OFSP bread and hence believed to be above the cutoff threshold or chose non-OFSP bread and thus, fall below the cutoff threshold. Therefore, the dependent variable choice of bread took two outcomes, either *YES* if consumer chose OFSP bread or *NO* if a consumer chose other types of bread.  $X_i$  is a vector of independent variables, which include consumer's nutrition knowledge, socioeconomic factors and product sensory attributes.

The implicit functional form estimated, was thus written as follows:

$$\begin{aligned}
 \text{Choice of OFSP Bread} = & \beta_{0i} + \beta_{1i}\text{NutritionKnowledge} + \beta_{2i}\text{Gender} + \beta_{3i}\text{Education} + \\
 & \beta_{4i}\text{Occupation} + \beta_{5i}\text{Pregnantmember} + \beta_{6i}\text{RelationHH} + \beta_{7i}\text{Maritstatus} + \\
 & \beta_{8i}\text{Aware} + \beta_{9i}\text{Decisionmaking} + \beta_{10i}\text{Priceperunit} + \beta_{11i}\text{ConsiderTaste} + \\
 & \beta_{12i}\text{ConsiderSmell} + \beta_{13i}\text{ConsiderColour} + \beta_{14i}\text{ConsiderPackstyle} + \\
 & \beta_{15i}\text{ConsiderNutrinfo} + \beta_{16i}\text{ConsiderBreadtype} + \varepsilon_i \dots\dots\dots 3.6
 \end{aligned}$$

The first hypothesis that nutrition knowledge had no effect on choice of OFSP bread by consumers was tested using post-estimation t-test method (Stevens, 2012). The hypothesis was specified as follows:

$$\begin{aligned}
 H_0: \beta_{1i} &= 0 \\
 H_1: \beta_{1i} &> 0
 \end{aligned}$$

The test statistic was given by;

$$t = \frac{\widehat{\beta_{1i}} - \beta_{1i}}{se(\widehat{\beta_{1i}})} \dots\dots\dots 3.7$$

where  $\beta_{1i}$  is the coefficient estimate of explanatory variable nutrition knowledge in the first stage of the double-hurdle model. *The decision rule was that the null hypothesis was rejected in a situation where the coefficient estimate of the explanatory variable nutrition knowledge was positive and statistically significant.*

The second stage of the double-hurdle model was used to determine the effect of nutrition knowledge on the intensity of purchase of OFSP bread. Intensity of purchase was measured by the typical number of bread purchased by the respondent in one week. According to Burke (2009b), the expected value of  $y$  conditional on  $y > 0$  is given by:

$$E(y_i | y_i > 0, x_i) = x_i \beta_i \dots\dots\dots 3.8$$

Where  $y_i$  is the expected quantity of OFSP bread purchased by consumer per week,  $x_i$  is a vector of explanatory variables including consumers' nutrition knowledge, socioeconomic factors and product sensory attributes, and  $\beta_i$  represent parameter estimates.

According to Gujarati and Porter (2009) the value  $y_i$  can be estimated by a truncated regression specified as follows:

$$y_i = x_i' \beta_i + \varepsilon_i \dots\dots\dots 3.9$$

Where we only observe  $y_i$  and  $x_i$  for those cases in which  $y_i = 1$  in Equation 3.5. This simply implies that consumers who did not make a choice to purchase OFSP bread were truncated and not included in the second stage of the model.

The specification of the implicit functional form of the model was as follows:

$$\begin{aligned} \text{Quantity of OFSP Bread Purchased} = & \beta_{0ii} + \beta_{1ii} \text{NutritionKnowledge} + \beta_{2ii} \text{Aware} + \\ & \beta_{3ii} \text{Decisionmaking} + \beta_{4ii} \text{Occupation} + \beta_{5ii} \text{Pregnantmember} + \beta_{6ii} \text{Maritalstatus} + \\ & \beta_{7ii} \text{RelationHH} + \beta_{8ii} \text{Pricealternativebread} + \beta_{9ii} \text{SizeHH} + \varepsilon_{ii} \dots\dots\dots 3.10 \end{aligned}$$

Similar to the first hypothesis, a post-estimation t-test was used test the second hypothesis that nutrition knowledge had no effect on the intensity of purchase of OFSP bread by consumers (Stevens, 2012). The hypothesis was specified as follows:

$$H_0: \beta_{1ii} = 0$$

$$H_1: \beta_{1ii} > 0$$

The test statistic was given by;

$$t = \frac{\widehat{\beta_{1u}} - \beta_{1ii}}{se(\widehat{\beta_{1u}})} \dots\dots\dots 3.11$$

Where  $\beta_{1ii}$  is the coefficient estimate of explanatory variable nutrition knowledge in the second stage of the double-hurdle model.

*The decision rule was that the null hypothesis was rejected in a situation where the coefficient estimate of the explanatory variable nutrition knowledge was positive and statistically significant.*

Whereas the coefficient values of each explanatory variable in both hurdles of the model explain their respective probable influence of choice of OFSP bread and intensity of purchase, marginal effects are usually used in probabilistic studies to measure the actual effect (Anderson & Newell, 2003). Therefore, marginal effects were calculated to estimate the actual effects of changes in any explanatory variable on the predicted probability of choosing OFSP bread as well as the intensity of purchase while holding other explanatory variables constant.

In the first hurdle of the model, marginal effects that showed effect of explanatory variables on choice of OFSP were computed based on Burke (2009b) and StataCorp (2013) as follows:

$$\frac{\partial E(y_{1i} | x_{1i})}{\partial x_j} = \beta_{1j} \dots\dots\dots 3.12$$

where the change in dependent variable  $y_{1i}$  (Choice of OFSP bread) is given by a change in the explanatory variable  $x_{1i}$  of the  $j^{th}$  probability and  $\beta_{1j}$  is an element of  $\beta$  representing the coefficient on  $x_j$ .

Similarly, the marginal effects of the explanatory variables on intensity of purchase (typical number of loaves of bread purchased by a consumer in one week) in the second hurdle were computed as follows:

$$\frac{\partial E(y_{2i}|x_{2i})}{\partial x_j} = \beta_{2j} \dots\dots\dots 3.13$$

Where the change in dependent variable  $y_{2i}$  (Intensity of purchased of OFSP bread) is given by a change in the explanatory variable  $x_{2i}$  of the  $j^{th}$  probability and  $\beta_{2j}$  is an element of  $\beta$  representing the coefficient on  $x_j$ .

**3.311 Description and justification of model variables**

The explanatory variables used in this study were chosen based on extensive literature review of past studies relating to choice (decision to purchase) and consumption behavior towards different foods and particularly those bio-fortified with different micronutrients. The variables are grouped into three. First, those that affect both choice decision and intensity of purchase of OFSP bread and whose expected outcomes are shown for both hurdle 1 and 2 in Table 3.1. The second group are those variables that exclusively affect choice of OFSP bread and whose expected outcomes are shown for hurdle 1 only in Table 3.1. The third group are those variables that exclusively affect intensity purchase of OFSP bread and whose expected outcomes are shown for hurdle 2 only in Table 3.1.

**a) Level of nutrition knowledge**

In the context of this study, nutrition knowledge was defined as the extent by which a respondent was aware that OFSP bread was a rich source of vitamin A and the health benefits obtained from its consumption. The level of nutrition knowledge of the consumer, was measured as a continuous variable, that is, a weighted score generated based on the accuracy of the answers to



**Table 3.1: Expected signs of regressors included in the double-hurdle model**

Variable	Hurdle 1	Hurdle 2
	<i>Choice of OFSP Bread</i>	<i>Intensity of Purchase of OFSP Bread</i>
Level of nutrition knowledge of the consumer (weighted score – number)	+	+
Level of decision making (weighted score – number)	+	+
Awareness about OFSP bread (1=yes 0=no)	+	+
Occupation (1= salaried employment 0 = otherwise)	+	+
Pregnant member in household (1=yes 0=no)	+	+
Marital status (1 = married 0=not married)	+	+
Relation with Household head (1=self 0=other)	+	+
Price per unit of alternative bread (number)	+/-	+/-
Gender of the consumer (1=male 0=female)	+/-	
Education level of the consumer (number)	+	
Respondent considers taste (1=yes 0=no)	+	
Respondent considers smell (1=yes 0=no)	+	
Respondent considers colour (1=yes 0=no)	+	
Respondent considers packaging style (1=yes 0=no)	+	
Respondent considers nutrition information (1=yes 0=no)	+	
Respondent considers type of bread (1=yes 0=no)	+	
Household size (count 1=one person, 2=two persons..)		+

several questions posed to the respondent. Questions that were asked related to nutrition as well as ingredients of OFSP bread.

Vitamin A is one of the important micronutrients that promote health of the human beings. Therefore, according to Pambo (2013), consumers with high level of knowledge were expected to purchase and consume foods rich with vitamin A. Similarly, De Groote *et al.* (2011) argues that awareness about nutrition benefits would positively influence frequency of consumption of vitamin A bio-fortified foods. Therefore, literature has shown that nutrition knowledge would have a positive effect on both choice and intensity of purchase of OFSP bread.

#### **b) Level of decision making**

In the context of this study, level of decision making referred to a measure of how much a respondent was involved the food purchase decisions especially the type of bread and amount purchased. It was measured by a weighted average score based on the rating of the level of involvement on different aspects about bread purchasing provided by the respondent. A higher level of decision making indicates autonomy in making food purchase decisions. A study by Amugsi *et al.* (2016) argued that if individuals have some power over food purchased decisions, they are likely to focus on achieving dietary diversity, thus increasing the probability of buying nutritious foods. Moreover, autonomy in decision making allows an individual to decide on amount of food to be purchase. This study hypothesized that level of decision making will have a positive effect on both choice and intensity of purchased of OFSP bread.

#### **c) Awareness about OFSP bread**

It was expected that consumers who were aware about OFSP bread before the study were likely to be repeat customers, and therefore they would choose the bread again. Prior awareness offers a consumer an opportunity to find facts about the product especially the potential benefits

(Bailey, 2005, Nair, 2012). Moreover, it is a tool for rational choices and making informed decisions. A positive effect was thus, expected on both choice of OFSP bread and the amount of bread purchased.

**d) Occupation of the consumer**

Consumers were categorized into two groups; those who were on salaried employment and those who were not. This study hypothesized that consumers who were employed and earned a salary were likely to choose and purchase more bread compared those who were not employed. According to Nair (2012), consumers with a higher income have a higher probability of consuming bio-fortified foods because they may easily accept any added cost that may come with the product. Similarly, De Groote *et al.* (2011) noted that holding all other factors constant, consumers with higher income were likely to allocate some money for nutritionally enriched foods. Therefore, salaried employment was hypothesized to positively influence purchase and consumption of OFSP bread.

**e) Having pregnant member in the household**

Household composition is an aspect that explains variations in food purchasing. For example, presence of adult individuals or a pregnant member directs the consumption pattern towards purchase of more nutritious foods (Ricciuto *et al.*, 2006). This study hypothesized that people who had pregnant members in their households were likely to choose OFSP bread especially if they understood the nutritional benefits. Moreover, presence of such special cases is likely to prompt an increase in quantity of food purchased in the interest of taking care of their needs as well as those of the other family members (Horton and Campbell, 1990). A positive influence on quantity of OFSP bread purchased in the second hurdle was thus, also expected.

**f) Marital status**

This study hypothesized that consumers who were married were likely to choose OFSP bread. A study by Haapala *et al.* (2012) reported that couples seemed to have healthier dietary habits compared to single individuals. In essence, their choice of food is inclined towards nutrient rich food. Moreover, in a sense of responsibility especially for men, they are likely to increase the quantity of food purchased. Therefore, in the case of purchasing bread, a positive influence was expected on both choice and quantity of OFSP bread purchased for married consumers.

**g) Relationship with household head**

Respondents were categorized in two groups, those who were household heads and those who were not. The aim was to find out whether being a head of a household influenced food purchase decisions especially the type and quantity of food purchased. According to King and Mason (2001), household headship offers autonomy in decision making on economic, social as well as cultural aspects. This includes food purchase decisions. Moreover, autonomy in decision making influence food choice and quantity that is usually purchased by a consumer (Amugsi *et al.*, 2016). This study hypothesized that those who were household heads had a high probability of choosing OFSP bread as well as increasing the quantity purchased. Thus a positive sign was expected in both tiers of the double-hurdle model.

**h) Price per unit of alternative bread**

The actual price of alternative bread chosen by the consumer was captured in Kenya shillings per kilogram. If the weight of the bread was 400grams, 600grams, 800grams or any other weight, then price observed was re-calculated to find a price equivalent to one kilogram. A consumer's reaction towards the price of an alternative product is usually a measure of price sensitivity or simply cross-elasticity of demand. The demand of a product is expected to increase if the price of

alternative product is higher (Varian, 1992). This study hypothesized that if the price of alternative bread is higher than the price of OFSP bread, it will have a positive effect on choice of OFSP bread as well as the quantity purchased. A negative effect was expected if the price of alternative bread was lower.

**i) Gender of the consumer**

Several previous studies showed that there exist gender differences in preference of bread attributes (Johansen et al 2011, Ouro-Gbeleou, 2018). This explains the difference in bread choices made by both male and female consumers. It has been argued that female consumers have a greater concern towards functional and nutritious foods and hence, they purchase more of these foods compared to their male counterparts. Moreover, Pambo (2013) argues that women take primary responsibility in acquisition and preparation of food in the household. However, according to Ricciuto *et al.* (2006) food selections by women is largely influenced by tastes and preferences of their husbands. Although women bear the primary responsibility of purchasing food, men find it easier to take up this task particularly if they are buying from retail outlets like supermarkets. Therefore, this study expected that gender of the consumer would either positively or negatively influence choice of OFSP bread since both female and male respondents participated in the survey.

**j) Education level of the consumer**

This represented the number of years of education attained by the respondent. Education may have a positive influence on food choices owing to the fact that people can acquire information on nutritive value of different kinds of foods (Ricciuto *et al.*, 2006). Educated people seem to be more concerned about their health as compared to the less educated. They are reportedly reflective of the diet-disease associations and hence believe that their health is dependent on their

food choices (Ricciuto *et al.*, 2006). Additionally, formal education is considered an important tool for utilizing market information (Lubungu *et al.*, 2012). According to Worsley *et al.* (2015), the duration of education is positively correlated to nutritional knowledge leading to demand of quality products. This group of consumers is more likely to be aware of consequences of VAD and thus, motivated to consume foods rich in Vitamin A. It was expected that higher education will positively influence choice of OFSP bread.

#### **k) Sensory attributes**

Consumer perception and acceptability of a product is greatly influenced by consumer tastes and preferences (Gellynck *et al.*, 2009.) Tastes and preferences are determined by product attributes which include among others smell, taste, texture, colour, appearance, packaging and labelling. Consumers rating of these attributes will determine whether they like or dislike the product (Teuber *et al.*, 2016). A positive influence on choice is expected for those who like the product and negative influence for those who dislike the product. Previous studies showed that if consumers like the taste, smell, colour packaging, and nutrition information, then they were likely to choose the product (Chowdhury, 2011, Laurie and Van Heerden, 2012, Okello *et al.*, 2014). When making a decision to purchase a product a consumer may consider one, or two or more attributes simultaneously. This study focused on analyzing whether a consumer who considers taste, smell, colour, type of bread, packaging style, and nutrition information indicated was likely to choose OFSP bread and not the other types of breads. A positive influence was expected on choice of OFSP bread for each attribute depending on whether a consumer considers the attribute or not.

### **1) Household Size**

This was a count variable with values assigned depending with the actual number of persons residing in the household of the respondent. The size of the household has been found to be one of the significant determinants of expenditure on food especially the quantities purchased (Ricciuto *et al.*, 2006). Simply, larger households demand larger quantities of food compared to small households. There is no evidence that household size influences food choices but rather consumers have a tendency of substituting less-expensive foods so as to achieve the required quantities (Horton and Campbell, 1990). Therefore, this study hypothesized that the higher the number of persons in the household, the greater the quantity of OFSP bread consumed.

It is important to note that for each of the variables described and discussed above, *the null hypothesis that they had no influence on either choice of OFSP bread or intensity of purchase was rejected if their coefficient estimates were either positive or negative and statistically significant.*

For all hypotheses tested, *P*-values were used to determine the statistical significance of any relationships. The null hypotheses in all the tests undertaken were rejected if the corresponding *P*-values to the coefficient estimates of any respective variable was less than the standard significance levels of 1 percent, 5 percent and 10 percent.

### **3.312 Diagnostic tests**

#### **a) Testing for multicollinearity**

Multicollinearity occurs when one or more variables are a linear function of another variable (Wooldridge, 2010). The immediate effect as explained by Farrar and Glauber (1967) is that it

leads to inefficient OLS estimates. The confidence intervals are wide, hence increasing the possibility of committing type I error (Wooldridge, 2009). Presence of multicollinearity means that small changes in the dataset will cause changes in OLS estimates and standard errors (Gujarati, 2009).

This study tested for multicollinearity using Variance Inflation Factor (VIF) and Pearson's pairwise correlation matrix tests. According to Gujarati (2009), presence of multicollinearity is confirmed if any variable has a VIF greater than 5. Similarly, if Pearson correlation coefficient is greater or equal to 0.5 and is statistically significant, it indicates presence of multicollinearity in the data set (Gujarati, 2009). Variance Inflation Factors for each variable and Pearson correlation coefficients are tabled in Appendix 1 and 2 respectively.

#### **b) Testing for heteroscedasticity**

Heteroscedasticity refers to inconsistency in the variance of the error term. According to Wooldridge (2010), heteroscedasticity leads to invalid and inefficient test of hypothesis. This study used White's test to test for heteroscedasticity. A significant p-value leads to rejection of the null hypothesis of constant variance (homoscedasticity) implying presence of heteroscedasticity problem in the data set (Coenders and Saez, 2000).

#### **c) Testing for goodness-of-fit**

A test for goodness-of-fit is one of the recommended measures of how accurate the model being used fits the data set being analyzed. A model that fits the data well implies that good results are obtained from the analysis. In qualitative models, Likelihood Ratio (LR) or McFadden  $R^2$  has been used to indicate the goodness-of-fit (Greene, 2003). A model that does not fit data at all is



indicated by a zero LR while a model that perfectly fits the data has an LR of 1. For cross-section data, empirical evidence suggest that LR usually lie between 0.2 and 0.4.

### **3.32 Objective 3: Analyzing psychosocial factors that influence choice and consumption of OFSP bread by consumers**

This objective was achieved using the Means-End Chain (MEC) analysis. This method has been widely used to examine consumers' mental models that drive choice of a given product based on actual content of cognitive structures (Costa *et al.*, 2004, Okello *et al.*, 2014). The other method that has been applied in many exploratory analyses is the Zaltman Metaphor Elicitation Technique (ZMET). However, although this method elucidates actual meaning representations through generated metaphors, its applicability is rather difficult (Zaltman, 1997; Sugai, 2005). This is because metaphorical elicitation by way of generating pictures or images to represent actual meanings is a challenging task for respondents.

The first step in MEC analysis involved checking the ladders generated from the respective interviews and isolating the complete ones. A ladder is an association map that traces the linkage between product attributes, the arising consequences from consumption and the corresponding personal values or goals as outlined by the respondent. Therefore, for a ladder to be considered as satisfactorily complete, it must begin with a product attribute and followed through to end with a personal value or life goal.

The second step was to generate summary codes for the attributes, consequences and end goals that arose from the complete ladders. Coding was important because it summarized attributes, consequences and the end goals. For example, respondents who mentioned that the bread was

made from sweet potato, had vitamin A, contained essential micronutrients or was bio-fortified were all coded to mean bread ingredient as an attribute that made them like the bread.

The third step was to analyze the ladders based on the summary codes generated using MEC analyst software to develop concept matrices and aggregate them into Hierarchical Value Maps (HVM) (Gutman, 1997, Lagerkvist *et al.*, 2012). Concept matrices indicated how often an attribute, a consequence or a value had been mentioned. Based on the resulting counts, a cut-off level used when generating HVMs is chosen. A cut-off level refers to the number of times variables must be mentioned either directly or indirectly, before they are chosen for a link to be drawn between them. In the case of this study a cut-off level of 5 was chosen for the aggregate HVM while cut-off levels of 4 and 3 were chosen for independent HVMs for female and male respectively.

A Hierarchical Value Map is a summary of associations that can be traced between the attributes, resulting consequences and end goals for a group of respondents. The associations indicated by HVM represent mental constructs or models (Lagerkvist *et al.*, 2015). The thickness of the lines between these pairwise associations, depict the strength of the link. The mental constructs depicted and particularly the end life goals and personal values, enabled the study to determine psychosocial factors that influence choice and consumption decisions about OFSP bread. The factors were grouped as psychological if they referred to individual level processes or meanings and sociological if they related to concerns about the human society

Finally, apart from HVM for the aggregated sample, HVMs for respondents disaggregated by gender were also generated so as to investigate if mental models for female OFSP bread consumers differed from those of their male counterparts.

### **3.4 Study area**

This study was conducted in Nairobi County, the capital city of Kenya and hosting an approximated population of 4.4million people. Nairobi County covers an area of 696 square kilometers (KNBS, 2019), and borders Kiambu, Kajiado, and Machakos counties to the Northwest, South, and East respectively.

Nairobi County was purposively selected for the survey because it hosts a chain of Tuskys supermarket branches or retail stores in various locations where OFSP bread is baked and sold. In 2015 a processing facility that makes puree from OFSP roots was opened in Homa Bay County through the SUSTAIN project and in collaboration with a private food company, Organi Limited. According to Muoki and Agili (2015), OFSP puree is usually delivered to Tuskys head office in Nairobi for processing of various bakery products such as bread, buns, and scones. OFSP bread is usually packed in 400grams and retailed just like other types of breads in Tuskys supermarket branches in different locations in Nairobi County. Despite the retailing of OFSP bread, consumption of vitamin A rich foods is still low. According to Njoroge and Munene (2017), 24.3 percent of the households in Nairobi County do not consume foods containing vitamin A in a one-week cycle.

Tuskys supermarket has more than twenty retail outlets in different locations within Nairobi County. However, the survey was conducted in six branches. The first four outlets which included Karasha, Chapchap, Hakati and Pioneer are located in the Central Business District (CBD) of the city with a flow of consumers in all income cadres, low, middle and high income earners. Moreover, most of the consumers were likely to be on salaried employment. Thus, these branches were purposively selected so as to target consumers in all the three income categories. However, Tuskys Karasha branch targeted more of middle income consumers owing to the fact

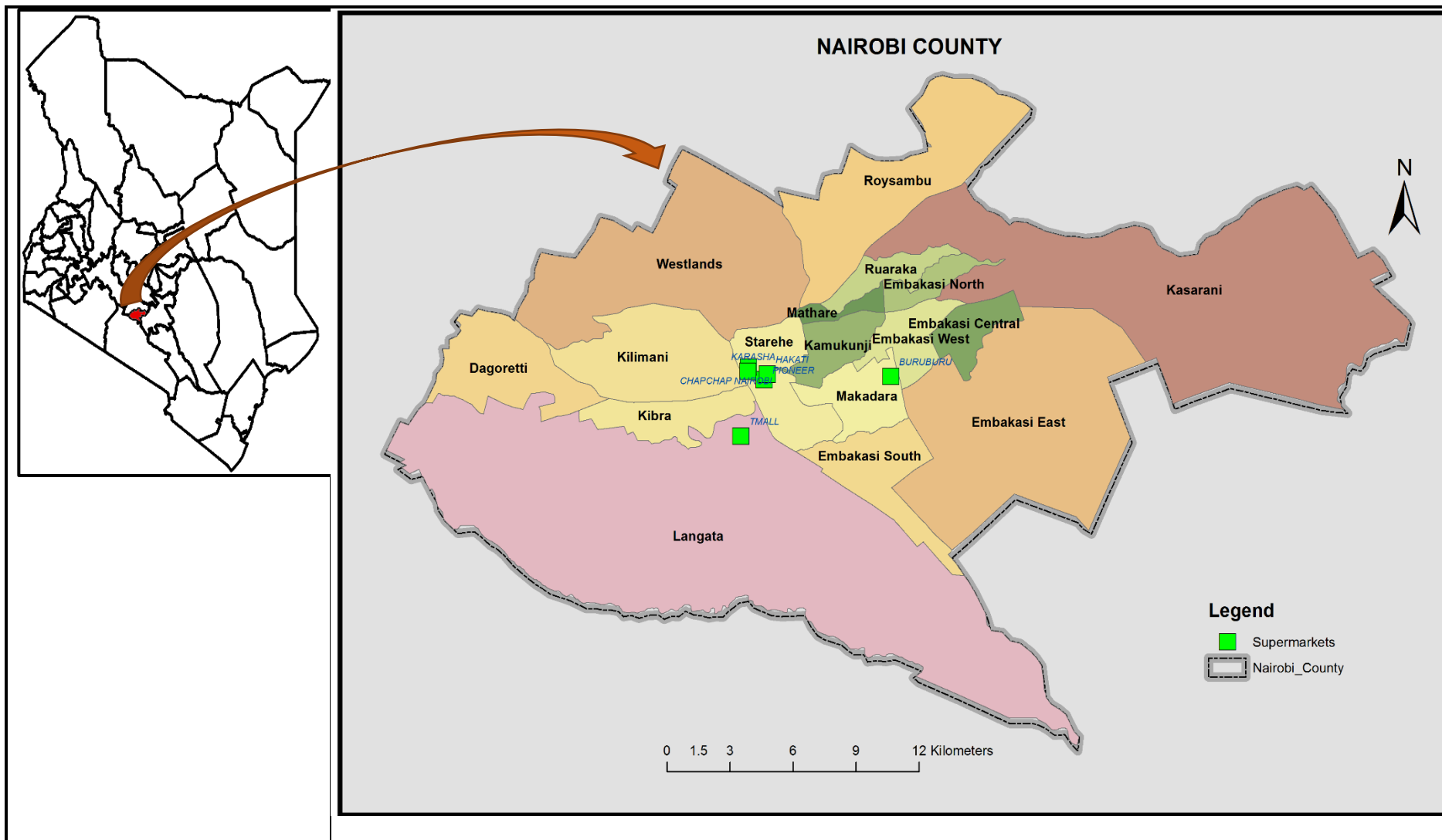


Figure 3.2: A map of Nairobi County in Kenya and showing Tuskys supermarket branches where survey was conducted

Source: Geographic Information System (GIS) Laboratory, Bukura Agricultural College – Kenya (2019)

that it is surrounded by several government and private entities as well as high-end business ventures when compared to the other three branches.

The fifth branch included in the study was Tuskys Buruburu located in Eastlands of area Nairobi County and approximately four kilometers from the CBD. The population in the neighborhood is predominantly of low income earners and who were likely frequent shoppers in this outlet. This branch was thus, selected to target more low income consumers and who were likely not to be on salaried employment.

The last branch included was Tuskys T-mall located near Lang'ata and Karen residential suburbs of Nairobi. Lang'ata is dominated by middle-class income earners while Karen is dominated by high-class income earners. Most of the residents in both areas were likely to be on salaried employment. This branch was thus, selected to target more middle and high income earners.

Nairobi County was also ideal for the study, as many residents depend on retail stores or supermarkets rather than fresh wet markets to buy food products. Furthermore, most of the residents of the city spend approximately half of their disposable income on food and beverages (KNBS, 2019) with flour and rice topping the list of staple foods while bread topping the list of baked products.

### **3.5 Research design**

This study adopted a mixed research design. It encompassed both quantitative and qualitative aspects. A cross-sectional survey that targeted bread shoppers as respondents in selected Tuskys supermarkets was used. Respondents were categorized in two groups comprising OFSP and Non-OFSP bread consumers. OFSP bread consumers included those who chose and purchased OFSP bread while Non-OFSP bread consumers included those who chose and purchased other

types of breads. Categorization of the respondents was important in determining factors that influence choice and consumption of OFSP bread by comparing aspects between the two groups. In particular, it was instrumental in assessing the effects of nutrition knowledge on the decision to purchase OFSP bread as well as the quantity of the bread purchased. Laddering technique which is qualitative in nature was used to dig into the subconscious mind of the respondent to uncover mental constructs. This was important in mapping out psychosocial factors that influence choice and consumption of OFSP bread.

### **3.6 Sampling method and sample size**

This study applied a multi-stage sampling technique to identify respondents for the survey. First, six Tuskys supermarkets which included Karasha, Chapchap, Pioneer, Hakati, T-Mall and Buruburu, were purposively selected based on their location in Nairobi. The difference in location enabled the survey to capture consumers with different socio-economic characteristics.

In the second stage, a systematic random sampling technique was used where every second bread shopper was requested to participate in the general interview. Due to the cumbersome nature of obtaining the population densities served by each of the six selected retail outlets, it was possible to apportion specific sample sizes to each outlet. Thus, the study targeted an equal number of 50 bread shoppers (both OFSP and Non-OFSP bread consumers) in every outlet. This resulted in a sample size of 300 respondents for the general interview from the six Tuskys supermarket outlets sampled for the study. Similarly, for laddering interviews, a systematic random sampling technique was used where every second shopper who chose OFSP bread was requested to participate in the process. As already noted, due to lack of population densities served by each of the six selected supermarkets, the study targeted to interview 50 respondents from all the outlets.

The sample size for the laddering interview compares well with previous MEC studies. For instance, Pambo *et al.* (2017) used a sample size of 54 to investigate the association between differentiated nutrition information and consumer mental models regarding cricket buns, an example of foods from edible insects. Okello *et al.* (2014) used a similar sample size to investigate the soil fertility management decisions by peri-urban vegetable growers in Kenya, while Schaefer (2013) used a sample of 14 participants to assess motivations for the use of car-sharing services in the United States. Although a sample size of 14 was small, the findings from the study were still valid. The sample size for laddering interviews is usually small due to the tedious nature of the laddering process (Okello *et al.*, 2014).

### **3.7 Data types and sources**

This study used both primary and secondary data. Primary data was both quantitative and qualitative in nature. A general interview and a laddering process were used to collect quantitative and qualitative data respectively. A structured questionnaire was used during the general interviews to collect data from sampled bread shoppers. Relevant variables were included in the questionnaire to capture data on socio-economic factors, nutrition knowledge, purchase practice and product attributes. Before actual data collection process, the questionnaire was pretested by administering to 11 randomly sampled bread shoppers in three Tuskys supermarkets; Pioneer, Hakati and Chapchap branches. The questionnaire was then revised based on pretesting exercise, particularly the flow of questions that enabled respondents to easily follow the interview.

Two Focus Group Discussions (FGDs) were held to help understand more about OFSP bread attributes. The first FGD had a total of nine participants of which four were male and five were female. The second FGD had seven participants, four males and three females. The information obtained was first, used to refine the study questionnaire by validating some of the OFSP bread attributes and understanding those that are mostly considered when purchasing bread. Secondly, it was important to understand whether many consumers purchased bread from supermarkets, an aspect that was confirmed during the FGDs. Lastly, the information obtained was relevant in explaining some of the results obtained by this study.

Laddering interviews were used to collect qualitative data for MEC analysis. Laddering interview format for this study was modified from that used by Okello *et al.* (2014). Respondents were asked about the attributes that made them buy the OFSP bread. The mentioned attributes formed the basis for the laddering interview. A series of ‘*why is that important to you?*’ questions were asked and each response was followed up separately by the probing question (Russell *et al.*, 2004) to ensure all linkages are revealed. Attributes were defined by the distinguishing features of the OFSP bread stated by the respondent, while consequences were outlined by responses to the probing questions. Personal values were obtained from the terminal ends associated with consumption of OFSP bread.

Secondary data was mostly important for literature review, discussion of results and validating some of the findings. The data was obtained from journal articles, published books and reports from national as well as county governments. Other sources included reports from stakeholders and information documented by several development partners.



### **3.8 Data analysis**

Data obtained from the survey was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 22 and STATA version 14 respectively. First, descriptive statistics were obtained using STATA to compare means, frequency distributions and percentages of various variables including age, sex, education levels, family size and occupation of the respondents. Second, results for the first and second objective were obtained by an empirical analysis of the double-hurdle model in STATA. The first stage of the model was used to determine whether nutrition knowledge influences the decision to buy OFSP bread while the second stage was used to determine whether nutrition knowledge influences the intensity of purchase of OFSP bread.

Data from laddering interviews was analyzed using Means-End Chain (MEC) Analyst software. The process generated HVMS which combined OFSP bread attributes at the bottom, consequences at the middle and values (end goals) at the top. The end goals which are usually psychological or sociological in nature are thus, psychosocial factors that influence consumption of OFSP bread.

## CHAPTER FOUR: RESULTS AND DISCUSSION

### 4.1 Descriptive Statistics for OFSP and Non-OFSP bread consumers

Descriptive statistics which include means and percentages for the level of nutrition knowledge, a set of socio-economic factors as well as product sensory attributes are presented in Table 4.1. As shown in the table a cumulative sample of 345 respondents which included 141 OFSP bread consumers and 204 non-OFSP bread consumers participated in the study.

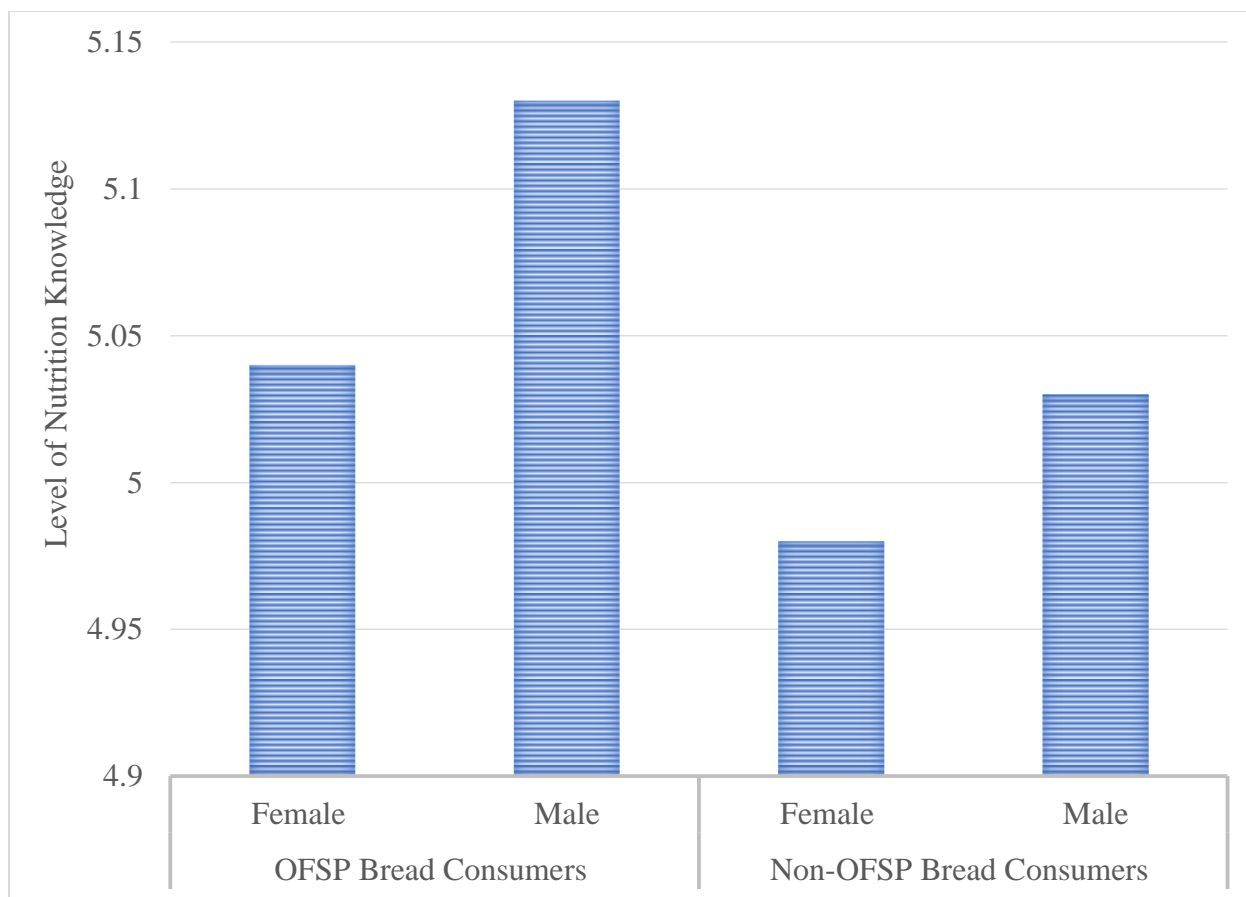
A comparison by gender showed that more than half (55.36%) of respondents who participated in the study were female. Furthermore, the proportions of female respondents from OFSP bread consumers group and the non-OFSP bread consumers group were not significantly different. This implies that mostly female members of the household are involved in food purchase decisions, in this case purchase of bread. As noted by Pambo *et al.* (2014), female members of the household generally take much responsibility in food purchase decisions. Thus, this probably implies that intervention programmes to improve consumption of novel foods such as OFSP bread should target more women as compared to men.

The overall mean level of nutrition knowledge was 5.03 (71.9%), indicating that most of the respondents knew that OFSP bread was a rich source of vitamin A. In addition, they understood the importance of vitamin A to the human body. It is however important to note that the level of nutrition knowledge was lower among the non-OFSP bread consumers group (4.87). Indeed, t-test results showed that there was a significant difference in the levels of nutrition knowledge across the two groups of consumers. Moreover, as shown in Figure 4.1 the level of nutrition knowledge among male bread consumers was different from that of their female counterparts.

**Table 4.1: Descriptive statistics of bread consumers in Nairobi County**

Variable	Overall	OFSP bread	Non-OFSP bread	Significance
	<i>N = 345</i>	<i>N = 141</i>	<i>N = 204</i>	
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>T-test</i>
Level of nutrition knowledge	5.03 (0.92)	5.28 (0.77)	4.87 (0.97)	4.198***
Level of decision making	3.73 (1.39)	3.97 (1.13)	3.56 (1.53)	2.743***
Education (years)	14.54(2.81)	14.59 (2.75)	14.50 (2.86)	0.288
Price per unit of alternative bread	122.46 (37.67)	125.34 (54.76)	120.47 (18.08)	1.180
Household size	3.77 (1.92)	3.66 (1.92)	3.85 (1.92)	- 0.922
Age of respondent	35.38 (11.95)	35.08 (11.74)	35.59 (12.11)	- 0.393
Quantity of bread purchased	1.73 (2.99)	2.21 (3.22)	1.37 (2.78)	2.564**
	<i>Proportion (%)</i>	<i>Proportion (%)</i>	<i>Proportion (%)</i>	<i>Chi<sup>2</sup>-test</i>
Aware of OFSP bread	73.04	77.30	70.10	2.199
Gender (female respondents)	55.36	51.77	57.84	1.243
Occupation (salaried employment)	49.28	48.94	49.51	0.011
Pregnant member in household	2.90	2.84	2.94	0.697
Marital status (married)	59.13	60.28	58.33	0.131
Relation with household head (self)	51.01	51.77	50.49	0.055
Consider taste when purchasing bread	64.06	63.83	64.22	0.005
Consider smell when purchasing bread	85.22	90.07	81.86	4.459**
Consider colour when purchasing bread	74.78	78.01	72.55	1.321
Consider packaging style when purchasing bread	68.99	76.60	63.73	6.455**
Consider nutrition information when purchasing bread	89.86	94.33	86.76	5.230**
Consider bread type when purchasing bread	90.43	92.20	89.22	0.858

*Source: Field survey data (2018)*



*Figure 4.1: A bar graph showing the level of nutrition knowledge among OFSP and Non-OFSP bread consumers disaggregated by gender*

***Source: Field survey data (2018)***

The male bread consumers were more knowledgeable in both categories of bread consumers. This implies that first, differences exist in OFSP bread choice decisions based on the level of nutrition knowledge. This explains further the differences observed in quantity of bread purchased between the two groups. Consumers who purchased OFSP bread had a higher level of nutrition knowledge and therefore purchased larger quantities compared to the other bread consumers. Second, female consumers who are mostly involved in purchasing food in the household, particularly OFSP bread, are deprived of essential nutrition knowledge.

The proportion of respondents who were aware of OFSP bread before the interview was higher among the OFSP bread consumers group. This was an obvious observation as awareness positively influences product purchase and consumption decision. An overall proportion of 73.04 percent implied that most of the respondents were aware of OFSP bread. They were either repeat customers or had acquired information about OFSP bread from various promotional strategies that included a banner mounted next to the bread shelf in most of Tusky's supermarket branches.

The results further indicate that the overall mean level of decision making on type and quantity of bread to be purchased was 3.73 (74.6%) meaning that most of the consumers who purchased bread possessed the power over decisions on food purchase. However, the level of decision making was higher among the OFSP bread consumers. Probably, this explains their choice of OFSP bread hence justifying an earlier argument by Amugsi *et al.* (2016) that individuals who had power over decisions on food purchased, were likely to focus on achieving dietary diversity by considering nutritious foods

Focusing on the age of respondents, an average of 35 years meant that most of the respondents were middle aged. This is the most active stage of life where most people are either working or venturing into business. The implication is that these groups of consumers face time constraints that limits them to depend on retail outlets to purchase ready-to-eat foods such as OFSP bread (Senauer *et al.*, 1986). Further, the results show that respondents had an average of 14 years of schooling, meaning that majority of them had acquired post-secondary education. This is in tandem with KNBS (2019) findings that showed that majority of the residents in Nairobi County has acquired tertiary education. The implication is that most of bread consumers are capable of synthesizing information if promotional messages are presented through posters or broadcast media.

As shown in Table 4.1, half of the respondents were full-time employees and earned a salary implying that they possessed the purchasing power that enabled them consume OFSP as well as other types of breads. The average size of the household was 4 persons indicating that Nairobi County dwellers had relatively small families. These results concur with KNBS (2019) that found the average household size in Kenya comprised of four persons. Most of the respondents were married (59.13%) implying that they were likely to practice healthier dietary habits as noted by Haapala *et al.* (2012). Moreover, half of them were household heads meaning they had power over food purchase decisions, including OFSP bread. On the contrary only a few of households reported presence of a pregnant member, that is, 2.9 percent of the overall sample.

More than 50 percent of the respondents considered bread attributes; taste, smell, colour, packaging style, nutrition information and bread type when making purchases. These results are consistent with those found by Naico and Lusk (2010), that choice of OFSP bread was dependent on attributes which included taste, texture, colour and knowledge of the health benefits. This implies that OFSP bread design must focus on improving these attributes so as to meet consumers' tastes and preferences

#### **4.2 Objectives 1 and 2: Effects of nutrition knowledge on choice and intensity of purchase of OFSP bread**

Table 4.2 presents results of the outcome equations of the double-hurdle model that estimated the effects of consumers' level of nutrition knowledge on type of bread chosen and intensity of purchase of OFSP bread. The first hurdle shows effects of nutrition knowledge as well as other factors on choice of OFSP bread (first objective) while the second hurdle presents effects of nutrition knowledge as well as other factors on quantity of OFSP bread purchased (second objective).

**Table 4.2: Determinants of choice and intensity of purchase of OFSP bread**

Variable	Hurdle 1 <sup>†</sup>		Hurdle 2 <sup>†</sup>	
	Choice of OFSP bread		Quantity of OFSP bread purchased	
	Coefficient	p-value	Coefficient	p-value
Level of nutrition knowledge	0.099	0.000***	0.739	0.029**
Level of decision making	0.038	0.015**	0.133	0.718
Education (years)	-0.019	0.008***		
Price per unit of alternative bread	-0.001	0.210	0.002	0.782
Household size			0.105	0.056*
Aware of OFSP bread	0.525	0.000***	1.612	0.017**
Gender (female respondents)	0.011	0.829		
Occupation (salaried employment)	0.128	0.005***	0.490	0.785
Pregnant member in household	0.268	0.008***	1.733	0.041**
Marital status (married)	0.041	0.397	-0.622	0.046**
Relation with household head (self)	0.017	0.733	-0.285	0.086*
Consider taste when purchasing bread	-0.086	0.071*		
Consider smell when purchasing bread	-0.052	0.429		
Consider colour when purchasing bread	0.004	0.930		
Consider packaging style when purchasing bread	0.107	0.024**		
Consider nutrition information when purchasing bread	-0.181	0.025**		
Consider bread type when purchasing bread	0.027	0.710		
Log pseudo likelihood = - 477.183		Wald chi2 (16) = 105.11	Prob > chi2 = 0.000	
T-test on nutrition knowledge in Tier 1		chi2 (1) = 16.81	Prob > chi2 = 0.000	
T-test on nutrition knowledge in Tier 2		chi2 (1) = 4.74	Prob > chi2 = 0.030	

<sup>†</sup> Coefficients in the first and second hurdle represent marginal effects  
\*, \*\* and \*\*\* represent statistical significance at 10%, 5% and 1% levels respectively.

*Source: Field survey data*

The hypothesis that all factors had no joint effect on choice and intensity of consumption of OFSP bread was tested using a Wald multiple exclusion test. As shown in Table 4.2, the results generated were Wald  $\chi^2 (16) = 105.11$  and  $\text{Prob} > \chi^2 = 0.000$  meaning that the *Wald chi-square value* was significant at 1 percent. These results indicate that all the explanatory variables included in the model jointly influenced consumers' decision to purchase OFSP bread as well as the quantity of bread purchased.

The level of nutrition knowledge was found to have a positive effect on both choice and intensity of purchase of OFSP bread by consumers. This was consistent with the hypothesis of the study that a significant positive relationship exists between level of nutrition knowledge and choice of OFSP bread. A similar relationship was observed between the level nutrition knowledge and quantity of OFSP bread purchased. These results are similar to those found by Pambo *et al.* (2014), that a higher level of consumer knowledge especially on health benefits of vitamin A had a positive influence on consumption of bio-fortified foods

A unit increase in the level of nutrition knowledge possessed by a consumer increased the probability of choosing OFSP bread by 9.9 percent and increasing the quantity of bread purchased by 73.9 percent. This is additional empirical evidence to Pambo *et al.* (2018), who showed that nutrition education intervention could lead to positive change on consumers' behavior towards consumption of a product. These findings also corroborate those by De Groote *et al.* (2011) who concluded that consumers who were familiar with health benefits of vitamin A had high consumption levels of fortified maize.

The results of the post-estimation t-test on nutrition knowledge in tier 1 ( $\chi^2 (1) = 16.81$ ,  $\text{Prob} > \chi^2 = 0.000$ ) led to rejection of the null hypothesis that *nutrition knowledge has no effect on the decision to purchase OFSP bread by consumers*. Therefore, this study found that nutrition



knowledge had an effect on the type of bread chosen by consumers. Similarly, the post-estimation t-test results on nutrition knowledge in tier 2 ( $\chi^2(1) = 4.74$ ,  $\text{Prob} > \chi^2 = 0.030$ ) led to rejection of the null hypothesis that *nutrition knowledge has no effect on intensity of purchase of OFSP bread by consumers*. Thus, this study found that nutrition knowledge has an effect on the quantity of OFSP bread purchased by consumers.

The results further indicate that several other controlling factors were significant in either of the two tiers of the double-hurdle model. First, the level of decision making had a positive effect on choice of OFSP bread by the consumers. However, the same variable was found to have no effect on quantity of OFSP bread purchased by the consumer contrary to the hypothesis that it had a positive influence. A unit increase in the level of decision making increased the probability of a consumer choosing OFSP bread by 3.8 percent. This result implies that consumers who had greater power over decisions in the household were more likely to choose OFSP bread. A possible explanation for this is that ability to make decisions reduces restriction on choices that can be made by a consumer. These findings corroborate those by Amugsi *et al.* (2016) that if individuals have some power over decisions on food purchased, then they are likely to focus on achieving dietary diversity, thus increasing the probability of buying nutritious foods.

Second, contrary to the hypothesized positive influence on choice of OFSP bread, the number of years of formal education had a negative relationship. One more year of formal schooling reduced the probability of choosing OFSP bread by 1.9 percent. Probably, more years of formal education seem to increase choice options among foods rich in vitamin A since a consumer acquires more information on different varieties of such foods. These results are similar those of Lubungu *et al.* (2012), who found that formal education was an important tool for utilizing market information in Zambia hence enabling consumers to diversify their food choices. As

consumers acquire more knowledge specifically on importance of vitamin A and the various sources, they will probably diversify their diets by purchasing other food types for example green leafy vegetables or fruits.

Third, prior awareness about OFSP bread by consumer, positively influenced choice of OFSP bread and the quantity of bread purchased as well. This was consistent with the hypothesis by this study that a positive relationship existed between awareness and OFSP bread choice as well as quantity of the bread purchased. These results point to effects of promotional campaigns that increase awareness about OFSP bread among bread consumers. Such campaigns reduce chances of an individual not purchasing OFSP bread because they have no idea about it. Prior awareness increased the probability of a consumer making a decision to purchase OFSP bread by 52.5 percent. Perhaps, most of the consumers who were already aware of OFSP bread were either repeat customers or were familiar with Tuskys supermarket as a retailer of the OFSP bread. Moreover, the marginal effect in the second tier indicate that prior awareness increased the probability of buying large quantities of OFSP bread by 161.2 percent. These results are similar to those found by Bailey (2005) that awareness offers a consumer an opportunity to learn about potential benefits of a product hence chances of consuming such a product. In addition, results by Nair (2012) showed that awareness is a powerful element that enables a consumer to make rational and informed food choices. Furthermore, consumers are able to distinguish food products based on attributes that satisfy their dietary needs.

Fourth, salaried employment had a positive effect on choice of OFSP bread. However, there was no effect on quantity of OFSP bread purchased by a consumer contrary to the hypothesis of this study. Salaried employment means a consumer earns an income, and therefore has purchasing power. In effect, study expected that such consumers would purchase more of OFSP bread.

Being in an employment increased a consumer's probability of choosing OFSP bread by 12.8 percent. These results concur with those found by De Groote *et al.* (2010) that consumers with a higher income were likely to purchase nutritionally rich foods if all other factors are held constant.

Consistent with the hypothesis of this study, having a pregnant member in the household had a positive influence on choice of OFSP bread by a consumer. Similarly, it had a positive effect on the quantity of OFSP bread purchased. The marginal effect indicates that having a pregnant member in the household increased the probability of choosing OFSP bread by 26.8 percent. Vitamin A is an important supplement to the diets of expectant women and young children (CIP, 2018). Perhaps, this is the reason for the observed positive effect. Consumers are likely to purchase OFSP bread as source of vitamin A and particularly if they understand the health benefits of vitamin A to pregnant women and young children. These results support those found by Ricciuto *et al.* (2006), that presence of adult individuals or a pregnant member directs the consumption pattern towards purchase of more nutritious foods. Moreover, according to Horton and Campbell (1990), presence of such special cases prompts an increase in quantity of food purchased in the interest of taking care of their needs.

The results also show that household size had a positive influence on the quantity of OFSP bread purchased by consumers, confirming the hypothesis of the study. One more person in the household increased the quantity of OFSP bread purchased by 10.5 percent. This result is similar to that of Etumnu (2016), who concluded that an increase in household size increases the quantity of OFSP roots consumed. Additionally, the household size was found to be a significant determinant of quantities of food purchased (Ricciuto *et al.*, 2006). Simply, larger households demand larger quantities of food compared to small households. According to Horton and

Campbell (1990), consumers have a tendency of substituting less-expensive foods so as to achieve the required quantities, rather than switching between different food choices.

Contrary to the study expectation, marital status and relationship with household head had a negative effect on the quantity of OFSP bread purchased. This study expected that consumers who were married and those who were heads of their households were more likely to purchase larger quantities of OFSP bread. The results of this study contradicts those found by Haapala *et al.* (2012) and King and Mason (2001). The two studies found that among couples, when compared to single individuals, dietary habits were healthier and that household headship offered autonomy in decision making including food purchase decisions. Probably, an explanation for this is that food purchase decisions particularly the type of bread, are greatly influenced by tastes and preferences of other members in the household rather being a sole decision of the purchaser.

Consumers who considered taste of bread and nutrition information on the label as very important attributes when purchasing bread, reduced the probability of choosing OFSP bread by 8.6 percent and 18.1 percent respectively. This was contrary to the study hypothesis. A possible explanation for this could be based on the findings from Focus Group Discussion (FGD), where participants noted absence of nutrition information on the bread label and more than half of them did not like the taste of OFSP bread. These results suggest that the taste of OFSP bread has to be improved and the bread properly labelled if the consumption trend has to be improved. These results support those found by Pambo *et al.* (2014) that consumers endowed with nutrition information were likely to consume bio-fortified foods compared to those who are not. On the other hand, consumers who considered packaging style were likely to choose OFSP bread. This reiterated the findings of the FGD where participants noted that OFSP bread had been well packaged.

### 4.3 Descriptive statistics of respondents who participated in the laddering interviews

Laddering interviews were applied to generate linkages between the OFSP bread attributes, resulting consequences and corresponding personal values. Descriptive statistics including means and percentages of the various socio-economic characteristics are presented in Table 4.3.

**Table 4.3: Descriptive statistics respondents who participated in laddering interviews**

Variable	Overall	Female	Male
	<i>n = 51</i>	<i>n = 31</i>	<i>n = 20</i>
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Age of respondent	38.53 (12.93)	37.13 (13.39)	40.70 (12.20)
Household size	4.31 (2.16)	4.32 (2.45)	4.30 (1.63)
Education (years)	15.12 (2.25)	14.97 (2.11)	15.35 (2.50)
	<i>Proportion (%)</i>	<i>Proportion (%)</i>	<i>Proportion (%)</i>
Occupation (salaried)	54.90	51.61	60.00
Income (low category)	72.55	87.10	50.00
Pregnant member in household	1.96	3.23	0.00
Marital status (married)	66.67	58.06	80.00
Relation with household head (self)	62.75	38.71	100.00
Person below 6months in household	1.96	3.23	00.00
Person below 2years in household	21.57	12.90	35.00
Person below 5years in household	35.29	78.01	72.55
Breastfeeding member in household	19.61	16.13	25.00

*\*Numbers in parenthesis are standard deviations*

*Source: Field survey data*

As shown in Table 4.3, a cumulative sample of 51 respondents participated in the study. There were more female respondents (60.78%) than the male respondents. These results are in tandem those found earlier by Pambo *et al.* (2014), that female members of the household generally take a lot of responsibility in food purchase decisions. This implies women are mostly involved in food purchase decisions including purchasing bread for the household.

The average age was 38 years indicating that a majority of the respondents were middle aged, and a majority of them had acquired post-secondary education. This is in tandem with KNBS (2019) findings that showed that majority of the residents in Nairobi County were middle aged and in their active stage of life. Similarly, a majority of them had gone beyond secondary level of education.

The results further show that more than half (54.90%) were on a salaried employment. This implies that they had purchasing power that enabled them consume OFSP. According to De Groote *et al.* (2010), consumers were likely to choose nutritionally rich foods if their earnings were relatively higher. It was noted that more female respondents (87.10%) fall in the low income category as compared to male respondents meaning that female consumers had a low purchasing power. The central role of women in household food purchase decisions is thus hampered by limited disposable income.

The average size of the household for the group of respondents was 4 persons. Although this implied that respondents had smaller families, the results concur with KNBS (2019) that found the average household size in Kenya comprised of four persons. The results further indicate that majority of the respondents (66.67%) were married, implying that probably their dietary habits were healthier. Simply, married consumers seem to purchase more nutritious foods (Haapala *et al.*, 2012). Majority of the respondents (62.75%) were household heads meaning they had some

autonomy over food purchase decisions in the household. This explains their choice of OFSP bread over other types of breads.

A larger proportion of the households (19.61%) indicated that they had a breastfeeding member in their household compared to the proportion of households (1.96%) that indicated they had a pregnant member within their household. This implies many households had young children, a group of people who usually require much of vitamin A.

#### **4.4 Objective 3: Analyzing psychosocial factors that influence choice and consumption of OFSP bread**

A Means-End Chain (MEC) analysis was used to generate Hierarchical Value Maps (HVMs) that were used to determine psychosocial factors that influence choice and consumption of OFSP bread. Figure 4.1 shows the aggregate HVM representing the whole sample. The results shown by the HVM indicate respondents were motivated to purchase OFSP bread by four attributes which include bread ingredients (sweet potato), good sensory attributes (good taste), brand and price of bread. Most of the respondents considered good sensory attributes of the bread (85%), followed by bread ingredients (44%). A possible explanation could be drawn from the Focus Group Discussion (FGD), where participants rated OFSP bread as sweet and with attractive colour. Thus, consumers generally like products with sweet taste. On the other hand, the fact that OFSP bread was made from OFSP roots, which is one of the foods considered as traditional, could perhaps motivate some consumers to like the bread.

The four attributes reflect the kind of products preferred by consumers. First, good sensory attributes imply that OFSP bread should be tasty, sweet, and attractive in colour. The fact that good sensory attributes dominated the aggregate HVM, suggests that to improve consumption of

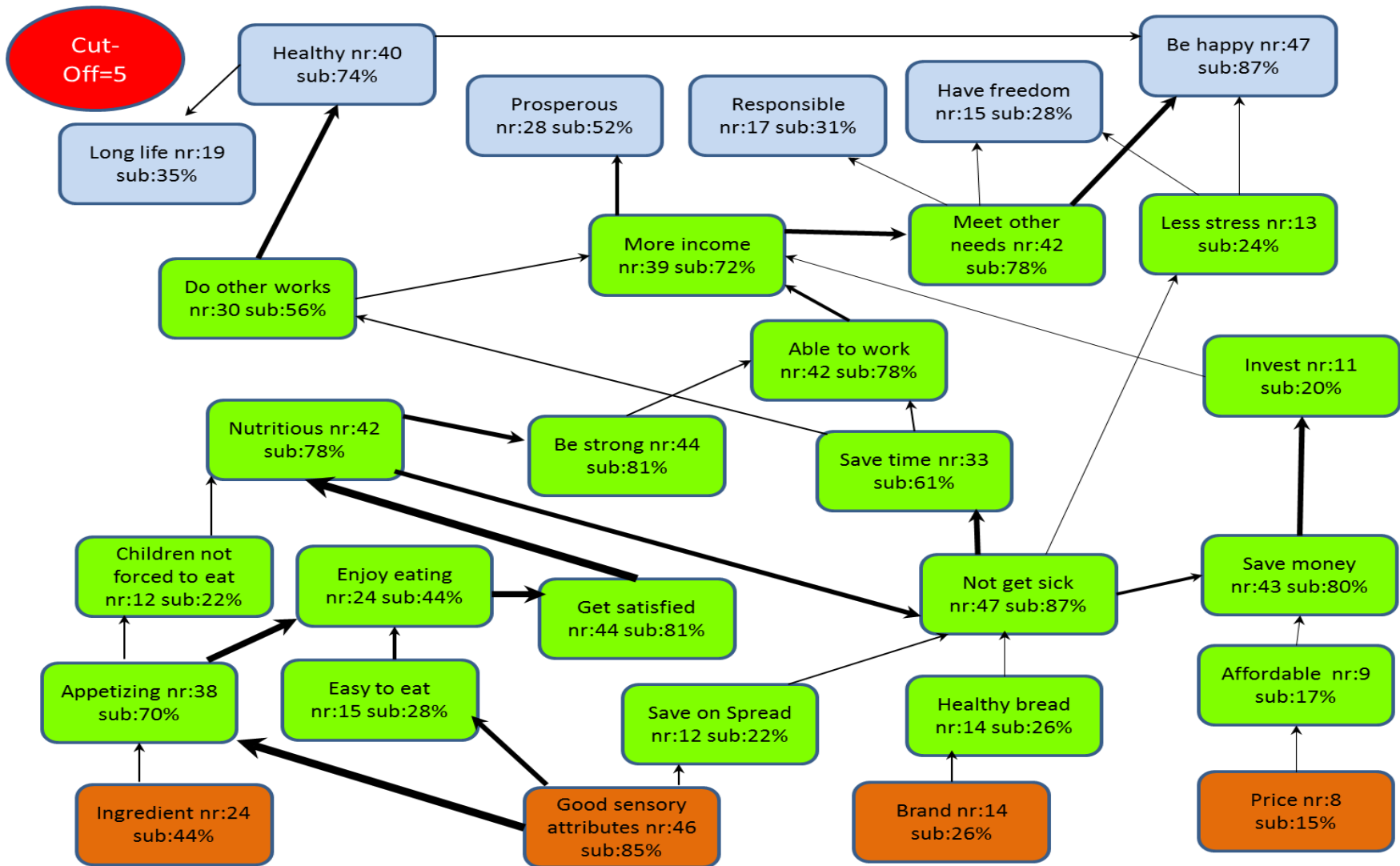


Figure 4.2: The hierarchical value map for aggregate sample

Source: Survey data (2018)



novel foods such as OFSP bread, attributes like taste, sweetness or colour must be appealing to consumers. This conclusion corroborates that by Pambo *et al.* (2017), that consumers would be motivated to take cricket buns if sensory attributes; taste colour and sweetness were improved.

Second, OFSP bread is perceived to be nutritious owing to the fact that respondents strongly considered bread ingredient (sweet potato) when purchasing the bread. These findings concur with those by Pambo *et al.* (2017), that consumers considered cricket buns due to perceived nutritious nature of the product. Third, contrary to the fact that consumers consider sensory attributes and nutrition aspects, they are mindful about the price of the OFSP bread. These findings are similar to those by De Groot, Kimenju, and Morawetz (2010), who suggested that some consumers will value price more than other attributes. Thus, they are likely to choose a product that is perceived to be affordable. Lastly, the attribute bread brand was associated with the retail outlet (Tuskys Sweet Potato Bread) to imply that many consumers are usually concerned with sources of food they consume. The priority is to ensure that the food they buy is clean and thus, trusting the source.

Several consequences were strongly associated with the bread attributes most of which a primarily linked to bread consumption, health aspects as well as income or wealth aspects. First, good sensory attribute was associated with bread being appetizing or easy to eat. These two aspects enhance OFSP bread consumption. In fact, the two aspects are further linked to enjoying eating the bread and thus, getting satisfied. Second, the association of bread brand to healthy food product that enables individuals not to get sick imply that consumers strongly associate OFSP bread with health aspects. OFSP bread is therefore considered to be a health food product. Third, many consumers associated price with affordability hence enabling an individual to save money that can otherwise be used to cater for alternative family needs. Moreover, the money

saved can be invested to generate more income. On the other hand, healthy and strong individuals are perceived to be able to work and earn an income. A similar argument was put forward by Pambo *et al.* (2017), that consumption of nutritious cricket buns was associated with making more income and creating wealth.

The consequences were linked to several ultimate life goals. As indicated by the HVM, the ultimate life goals (values), which include staying healthy and long life, happiness, freedom, being responsible and achieving prosperity were drivers to purchase decision and consumption of OFSP bread. The attributes and the consequences are just but the means to the life goals. These results are in tandem with those found by Okello *et al.* (2017), that consumption of Orange Flesh Sweet Potato roots was motivated by good health, long life, happiness and independence. In addition, Pambo *et al.* (2017), found that happiness, food security and long life were the major drivers behind consumption of cricket buns.

Separate HVMs for female and male respondents are presented in Figures 4.2 and 4.3 respectively. As noted by Johansen *et al.* (2011), gender differences could exist in what motivates the female consumers as compared to the male counterparts. Results indicated by the two HVMs show respondents of either gender were motivated to consume OFSP bread by good sensory attributes, bread ingredients and bread brand. The male respondents however, considered one more attribute; the price of the bread. This implies that men take much responsibility in budgetary aspects since they are the main providers in the household in the contemporary African set-ups. Therefore, they are likely to choose affordable food products.

Female respondents associated OFSP bread attributes to several consequences that can be divided into two clear themes; those that focused on bread consumption and those that focused on health aspects.

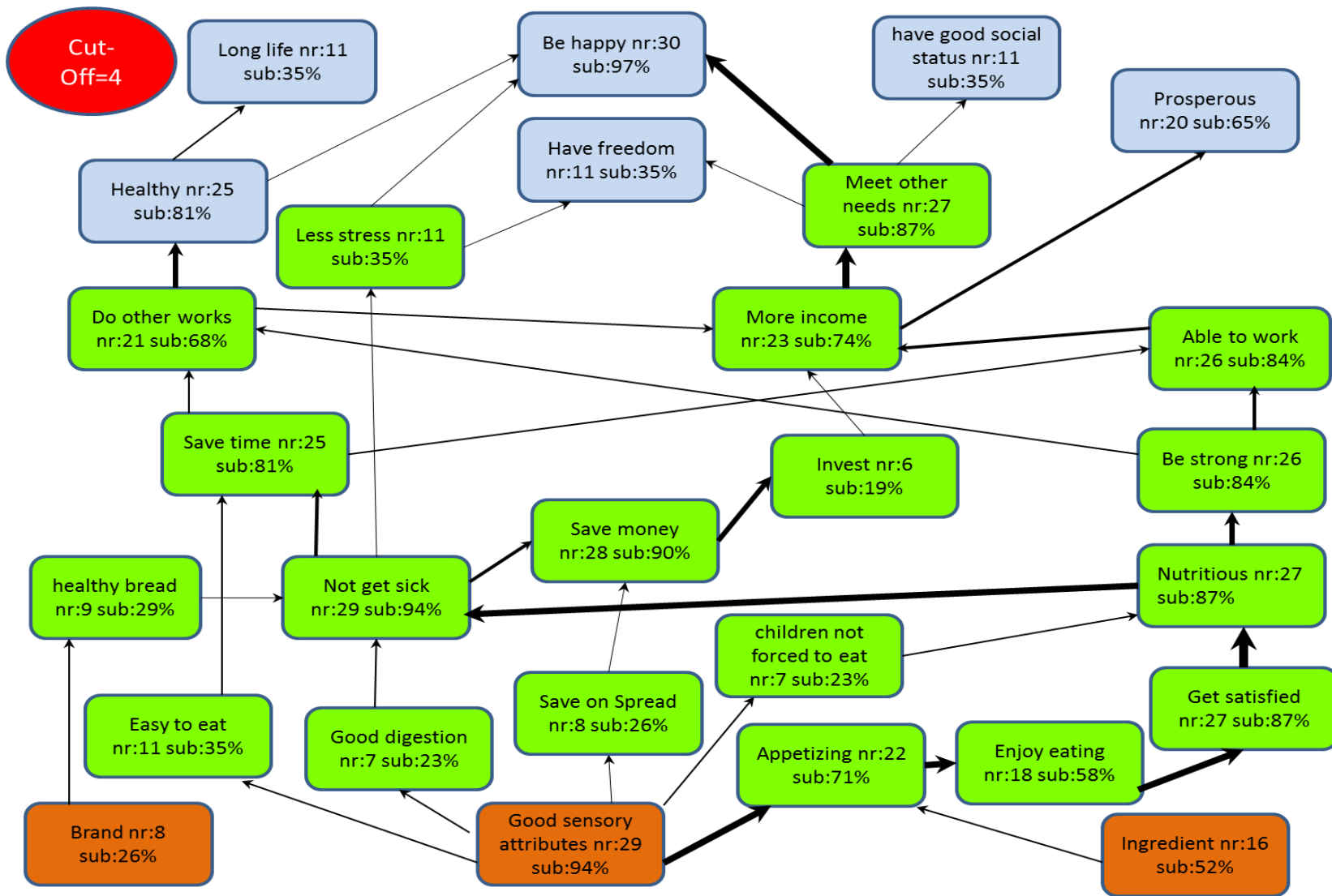


Figure 4.3: The hierarchical value map for female respondents

Source: Field survey data (2018)

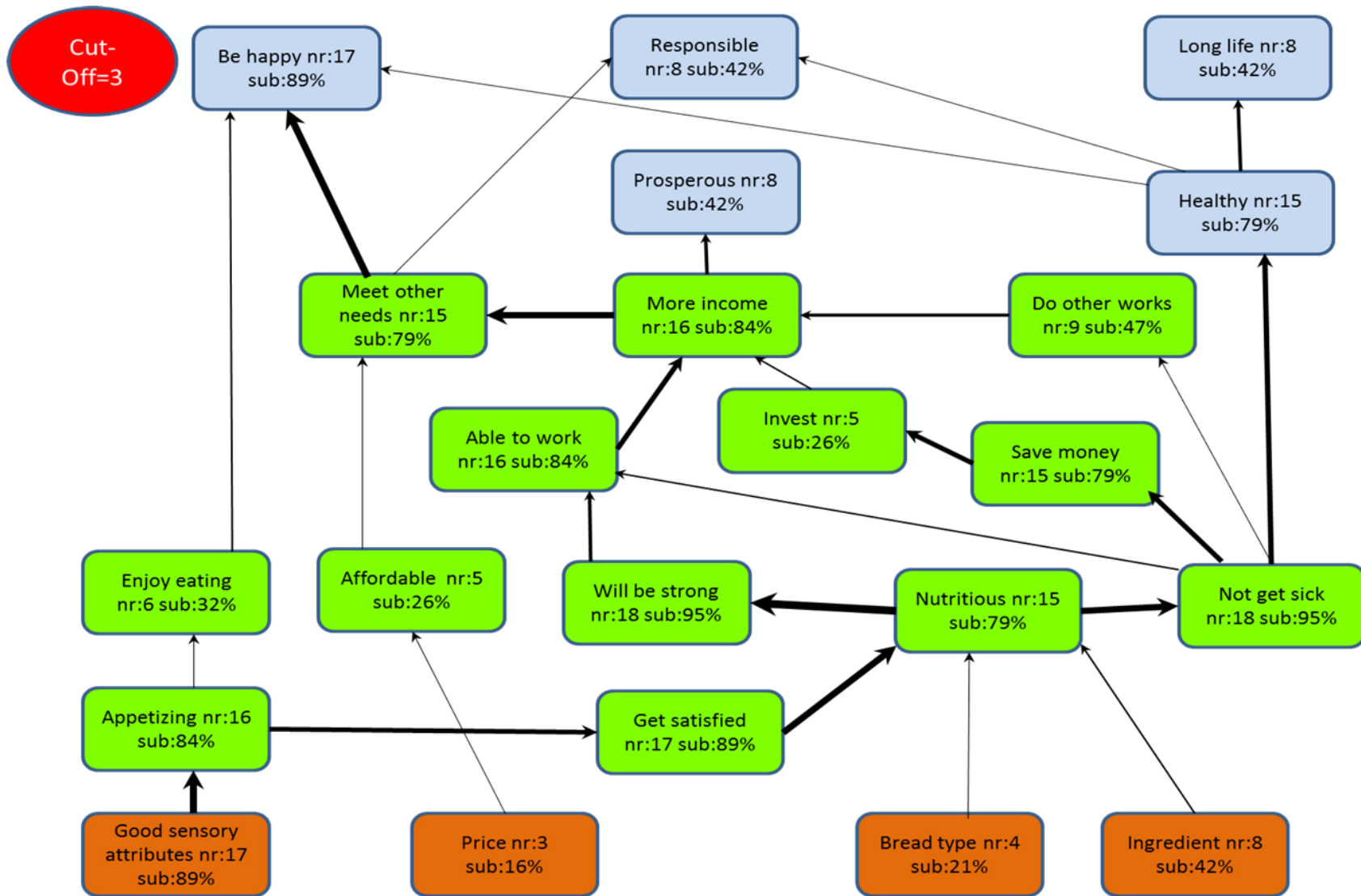


Figure 4.4: The hierarchical value map for male respondents

Source: Field survey data (2018)

Good sensory attributes were linked to making the bread appetizing, easy to eat and good digestion. This reaffirms the fact that products with good sensory attributes are easily acceptable by many consumers. It implies that promotional strategies for novel food products such as OFSP bread must ensure that product sensory attributes for example taste, colour, smell and texture are good enough to influence consumers' choice and consumption the foods. Bread brand and bread ingredient were linked to healthy and nutritious bread that enabled consumers not get sick or be strong. This depicts health concerns within a consumer's mind when making a choice to consume OFSP bread.

Although health consequences were revealed by the male respondents also, they however linked OFSP bread to affordability thus enabling them to save money that can be used to cater for other family expenses. Both male and female respondents linked OFSP bread to making them strong and healthy, being able to work and earn extra income.

Four common ultimate life goals which include long life, healthy life, happiness and being prosperous were found to drive choice as well as consumption of OFSP bread for both female and male respondents. However, several differences exist between the two groups. First, the female respondents further linked product attributes and consequences to two more life goals; having freedom and good social status. This implies that probably, female respondents are usually concerned with their family image in society and thus desire to have freedom and avoid dependency. On the other hand, the male consumers associated bread attributes and consequences to being responsible. The implication is that men shoulder the burden of the taking care of the family thus, provision of OFSP bread, a vitamin A rich product is perceived to be contributing to this goal.

## **CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Summary**

Consumption of foods rich in vitamin A such as OFSP bread has been fronted as a suitable remedy for VAD. Efforts by Kenyan government and other partners led by the International Potato Center (CIP) to promote consumption of bio-fortified foods led to the introduction of OFSP bread in 2015, but to date the pattern of consumption and subsequently factors that influence the same have not been determined. The overall objective of this study was thus, to assess the factors influencing consumption of orange flesh sweet potato bread in Kenya.

The first objective was to analyze the effects of consumers' nutrition knowledge on choice of OFSP bread, while the second objective was to analyze the effect of nutrition knowledge on the quantity of OFSP bread purchased by the consumers. These two objectives were achieved using a double-hurdle model, a two stage regression method, where the first stage analyzed the first objective while second stage analyzed the second objective. The third objective was to analyze psychosocial factors that influence choice and consumption of OFSP bread. This was achieved using a Mean-End Chain (MEC) analysis that developed HVMS and mapped out mental associations between OFSP bread attributes, the consequences and ultimate life goals associated with consumption of the bread.

The results of the double-hurdle model indicated that consumers' level of nutrition knowledge had a positive effect on choice and intensity of purchase of OFSP bread by consumers. The post-estimation t-test results confirmed that nutrition knowledge had a significant effect choice of OFSP bread as well as the quantity of OFSP bread purchased by consumers.

Several other controlling factors were found to have an affect choice of OFSP bread, quantity of bread purchased or both. Prior awareness of OFSP bread by a consumer had a positive influence

on choice of OFSP bread as well as the quantity of bread purchased. Similarly, having a pregnant member in the household positively influenced choice and quantity of OFSP bread purchased. Level of decision making by the consumer and salaried employment positively influenced choice of OFSP bread implying that higher level of decision making offers a consumer freedom of choice while salaried employment offers a consumer purchasing power.

On contrary, formal education had a negative effect on a consumer's choice of OFSP bread. A similar negative effect was observed for consumers who considered taste of bread and nutrition information on the label as very important attributes when purchasing bread, implying the need to improve taste and proper labelling of OFSP bread. Consistent with the hypothesis of this study, total size of household positively influenced the quantity of OFSP bread purchased implying that more persons in the household meant they require large amounts of food, hence increasing the quantity purchased. However, marital status and being a household head had a negative effect on quantity of OFSP bread purchased contrary to the expectation of this study.

For the second objective, Hierarchical Value Maps (HVMs) showed that the main attributes that motivated consumers to purchase OFSP bread include bread ingredients, good sensory attributes, brand and price of bread. Most of the respondents noted that good sensory attributes were major drivers of choice and consumption of OFSP bread. Consequences that were strongly associated with the bread attributes were primarily linked to bread consumption, health aspects as well as income or wealth aspects. The bread attributes and their associated consequences were ultimately linked to several personal values (life goals). These include staying a healthy long life, being happy, prosperous, being independent, responsible and gaining good social status. A consumer's decision to purchase and consume OFSP bread is driven by these ultimate personal life goals (values) and that attributes are just but the means.

## **5.2 Conclusions**

Results of this study confirm the importance of nutrition knowledge and psychosocial factors on choice and consumption of OFSP bread. Nutrition knowledge was found to have positive effect of on choice of OFSP bread. Thus, this study concluded that increasing consumers' nutrition knowledge positively influences consumption of OFSP bread. Similarly, nutrition knowledge was found to have a positive effect of quantity of OFSP bread purchased. This provided evidence that consumers purchase and consume more of OFSP bread if they are aware that it contains vitamin A and understands the importance of it in the human body. In general, increasing levels of consumers' nutrition knowledge will increase consumption rates of OFSP bread

This study confirms that awareness of OFSP bread by a consumer had a positive influence on choice of OFSP bread as well as the quantity of bread purchased pointing to the effect of promotional campaigns about OFSP bread. The fact that consumers who considered taste of bread and nutrition information on the label were unlikely to choose OFSP bread lead to the conclusion that taste of OFSP bread should be improved while the labelling style should provide more nutritional information.

On psychosocial factors, this study concluded that some ultimate life goals (values), which include staying healthy, long life, happiness, freedom, being responsible, achieving prosperity and good social status drive consumers' decision to purchase and consume OFSP bread. OFSP bread attributes which include good sensory attributes (good taste), bread ingredients (sweet potato), bread brand and the price are means to achieving to achieving the life goals.



### **5.3 Policy recommendations**

From the results and conclusions of this study, possible recommendations and policy interventions can be suggested. Based on the findings there is need for promotional efforts of OFSP bread to emphasize nutritional benefits particularly as a source of vitamin A. Promoting consumption of bio-fortified foods rich in vitamin A, is part of the Kenya National Food and Nutrition Security policy implementation strategies. Moreover, promotional campaigns play a significant role especially when introducing new products among different categories of customers. Therefore, it is important that nutrition campaigns and promotional messages by government or other agencies should emphasize on nutritional benefits. Furthermore, awareness campaigns should sensitize the population on existence of functional bio-fortified foods such as vitamin A rich OFSP bread

Commercial producers and sellers of OFSP bread like supermarkets should design concrete promotional messages based on superior pro-vitamin A attribute, to increase consumption rates. Information on the bread ingredients and thus nutrition content should be provided clearly either through bread labels or through promotional campaigns by bakers and sellers of OFSP bread such as supermarkets and other retailers. Furthermore, findings relating to ultimate life goals provide designers of promotion campaigns with concrete messages especially those that associate consumption of OFSP bread with healthy, long life, happiness and freedom, thus, motivating consumption of OFSP bread. Currently, promotional messages through shelf branding are limited to depicting the bread as a rich source of vitamin A and thus, a healthy option.

There is need for bakers and sellers of OFSP bread outlets used to improve product design. They should focus on improving sensory attributes such as taste, sweetness and colour to satisfy

consumers' preferences. Similarly, the pricing strategies for OFSP bread should achieve not only a competitive but also an affordable price. The Kenya government should design a price subsidy programme so as to enable poor households purchase and consume OFSP bread as well as other bio-fortified products.

#### **5.4 Limitations and suggestions for further research**

This study focused on consumers of OFSP and Non-OFSP bread in general. The consumers were categorized into two; those on salaried employment and those who were not. However, there could be differences in purchase decisions among consumers in different income level categories. Therefore, there is need for further research that disaggregates consumers into different income levels to reveal differences in purchase behavior. Consumption of OFSP bread was measured by proxies, that is, choice that was observed by the actual type of bread picked from the shelf and amount of bread purchased that was used to indicate consumption level of OFSP bread. There is need for a confirmatory research using real household scenarios and by measuring the exact amounts of OFSP bread that is consumed by the households.

Population densities served by each supermarket outlet should be estimated so that proportion to size sampling method is used to determine the number of respondents to be interviewed from every outlet. On the other hand, laddering interviews conducted by this study were one directional (positive laddering). Thus, there is need for further research that encompasses negative laddering particularly for consumers who are aware about the OFSP bread but did not choose to purchase it. The focus should be on attributes that made them not purchase or consume OFSP bread.

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## APPENDICES

### Appendix 1: Results for Variance Inflation Factor (VIF) test for multicollinearity

Variable	VIF	1/VIF
Relation with household head	1.51	0.66
Marital status	1.36	0.74
Gender	1.31	0.76
Household size	1.29	0.77
Occupation	1.14	0.88
Consider smell when purchasing bread	1.11	0.90
Consider taste when purchasing bread	1.11	0.90
Level of decision making	1.10	0.91
Consider nutrition information on package when purchasing bread	1.10	0.91
Education (years)	1.10	0.91
Consider bread type when purchasing bread	1.09	0.92
Consider packaging style when purchasing bread	1.09	0.92
Pregnant member in household	1.09	0.92
Price per unit of alternative bread	1.08	0.92
Consider colour when purchasing bread	1.08	0.93
Level of nutrition knowledge	1.06	0.95
Aware of OFSP bread	1.05	0.96
<b>Mean VIF</b>	<b>1.16</b>	

## Appendix 2: Results for Pearson's pair-wise correlation matrix test for multicollinearity

Variable	Nutrition Knowledge	Awareness	Decision Making	Gender	Occupation	Education (years)	Pregnant member	Marital status	Relation with head	Taste	Smell	Colour	Package Style	Nutrition Info.	Bread type	Perunitprice	Household size
Nutrition Knowledge	1.00																
Awareness	-0.04	1.00															
Decision Making	0.07	-0.01	1.00														
Gender	0.03	-0.11	-0.08	1.00													
Occupation	-0.03	0.05	0.04	0.07	1.00												
Education (years)	0.04	0.13	-0.08	0.00	0.16	1.00											
Pregnant member	0.01	0.06	-0.09	-0.05	0.03	0.03	1.00										
Marital status	-0.07	-0.01	-0.01	0.05	0.21	-0.03	0.00	1.00									
Relation with head	0.09	-0.02	0.10	0.41	0.14	0.09	0.03	-0.27	1.00								
Taste	-0.04	0.06	0.02	0.03	0.06	-0.10	-0.05	-0.04	0.09	1.00							
Smell	-0.02	0.00	-0.06	0.05	0.01	0.02	0.02	-0.09	0.07	0.22	1.00						
Colour	-0.05	-0.01	0.01	-0.11	-0.01	-0.06	-0.06	-0.03	-0.07	0.11	0.13	1.00					
Package Style	-0.08	-0.02	-0.08	-0.05	0.00	0.05	0.06	0.10	-0.06	0.01	0.11	0.09	1.00				
Nutrition Info.	-0.15	-0.03	-0.08	-0.01	-0.08	-0.03	-0.05	-0.11	0.02	0.01	0.13	-0.04	0.15	1.00			
Bread type	-0.05	0.04	-0.06	-0.03	0.03	-0.02	-0.05	-0.03	-0.06	0.02	0.00	0.13	0.08	0.02	1.00		
Perunitprice	0.06	0.01	-0.03	0.06	0.03	0.08	-0.02	0.08	0.06	0.11	-0.01	0.00	-0.06	-0.03	0.16	1.00	
Household size	-0.08	0.01	-0.18	-0.10	0.01	-0.05	0.19	0.32	-0.29	-0.07	-0.08	-0.02	0.05	-0.04	0.10	0.02	1.00

### Appendix 3: Results for White's test for heteroscedasticity

White's test for $H_0$ : Homoscedasticity	
$H_1$ : Unrestricted Heteroscedasticity	
Tier 1	Tier 2
$\text{Chi}^2 (133) = 226.95$	$\text{Chi}^2 (49) = 146.44$
$\text{Prob} > \text{Chi}^2 = 0.0000$	$\text{Prob} > \text{Chi}^2 = 0.0000$

### Appendix 4: Sample Questionnaire

#### An Assessment of Factors Influencing Consumption of Orange Flesh Sweet Potato Bread in Kenya

##### Consent statement

Thank you for giving us an opportunity to speak to you. We are researchers from the International Potato Center (CIP) and University of Nairobi. We are currently conducting a study on consumption of bread by residents of Nairobi. You have been randomly selected to participate in this study. The information you provide will help improve understanding of what consumers like in bread and CAN help bakers improve the quality of bread. Therefore, we request that you be honest and truthful in your responses. The interview will take 30 minutes to 1 hour.

Please note that your participation in this study is purely voluntary. You can decide to withdraw anytime or not answer any question you do not want to. In case you decline/withdraw, your lack of participation will not have any negative consequence on you. We would however be very grateful if you can complete the interview. Any information you provide will be combined with those of others and reported together, and your name or contact will not be revealed or reported.

If you have any concerns or questions now or in the future about this study, please feel free to contact Dr. Penina Muoki (Tel. 0706284877) of CIP or Prof. Rose Nyikal (Tel. 0722248405) of University of Nairobi.

With your permission/consent, I would like to start the interview. May I now proceed to start the interview? Yes..... No.....

**Respondent screening questions**

1. Do you eat bread?

1 =Yes, 0 = No [If **NO** terminate the interview]

2. Have you been interviewed elsewhere about sweetpotato bread in the last [.....] days?

1 =Yes, 0 = No [If **YES**, terminate the interview]

**Questionnaire identification**

i. Date of the interview ..... Start time ..... End time

.....

ii. Enumerator name

.....

.....

iii. Tuskys Branch name ..... Branch location

.....

iv. Names of respondent [*full name*]

.....

v. Respondent mobile contact

.....

Bread purchased was [*Tick*]: Sweetpotato bread ( ) Other bread ( )

**Part One: OFSP and Non-OFSP buyers**

*Instruction:* On this table is the same type of bread as you have just picked from the shelf.

Question 1: Who will typically eat the bread that you just have selected?

	Select just one alternative: [ <i>Use 1 if mentioned, and 0 if not mentioned</i> ]
1. Myself only	
2. Mostly other members of my household, but not me	
3. Most members of my household including me	
4. All members of my household in <u>almost</u> equal shares	

**Question 2:** How many times per week, on average, do you eat the type of bread that you have just selected? [*Put tick (...) where mentioned and 0 if not mentioned*]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Other
Answer:															

**Question 3:** How many times per week do you eat bread in general (other than this bread)? [*Put tick (...) where mentioned and 0 otherwise*]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Other
Answer:															

**Part two: Measures**

1. Please indicate the extent to which you agree/disagree with statements below about the bread you typically eat: It is important to me that the bread that I eat on a typical day is:

	Totally disagree	Moderately disagree	Disagree	Neutral	Agree	Moderately agree	Totally agree
1. Good for my physical/mental health							
2. Keeps me healthy							
3. Is nutritious							
4. Tasty							
5. Fresh							

2. Please indicate whether following statements are, as you find them, true or false: [*Use a tick*]

Statement	True	False	Dont know
Sweetpotato bread is healthier than the white bread			
Sweetpotato bread is healthier than brown/wholegrain bread			
Sweetpotato bread contains vitamin A			
Sweetpotato bread is baked/made using an orange fleshed sweetpotato			
Sweetpotato bread is good for children 6 months – 5 years			
Sweetpotato bread retains freshness just like the white bread			
Sweetpotato bread retains freshness just like the brown/wholegrain bread			
Sweetpotato bread is sold at the same price as white bread			

3. Please use the scale below to rate the importance of the following factors as relates to the bread that you first picked from the shelves today (i.e., sweetpotato bread):

[Enumerator please use the scale: -3= Totally unimportant; -2= Moderately unimportant; -1=Unimportant; 0= Neutral; 1=Important ; 2=Moderately important; 3=Very important]

The purchase of sweetpotato bread.....	-3	-2	-1	0	1	2	3
Improves the livelihoods (income) of farm households that grows orange-fleshed sweetpotato							
Improves the local production of raw material for baking bread							
Shortens transportation of raw materials for baking bread							
Creates jobs for youths through sweetpotato farming							
Makes the price of bread affordable							
Improves the length of bread storage (shelf-life)							
Increases the consumption of traditional foods							
Promotes growing of a crop that can withstand droughts (climate climate)							

4. When buying bread, what is the importance of the following attributes [Enumerator please use the scale in Q3 above]

	-3	-2	-1	0	1	2	3
Taste							
Color							
Smell							
Texture							
Packaging style							
Nutrition information							
Type of bread (white/brown-wholegrain)							
Brand							

### Part three: Background information of the respondent

1. Please complete the table below about yourself and your household:

Place/estate of residence in Nairobi	
Gender	1=Male 0=Female
Relation to HH head	1=Self 2=Spouse 3=Son/daughter 4=House help 5=Other.....
Number of persons in HH who are:	
i) <6 months	
ii) 6-23 months	
iii) 24 months – 5years	
iv) > 5years	
v) Breastfeeding	



vi) Pregnant	
Age (years)	
Education (years):	
Highest education attained	1= None 2=Primary 3=Secondary 4=High school 5=College (not Univ) 6=University or higher
Occupation	1=Salaried (full time) 2=Part time 3=Trader/business 4=Retired 5=Student 6=Job seeker 7=Other.....
Marital status	1=Single 2=Married 3=Separated 4=Other .....
Income	
<76,500 KES/month (low)	
76500- 102,500 KES/month (Medium)	
>102,500KES/month (high)	

**Part four: Nutritional information**

[Enumerator: Please circle the correct answer(s)]

- How would you describe your health in general?  
1=Excellent 2=Very Good 3=Good 4=Fair 5=Poor
- Which of the following will influence your decision to buy baked products? [Circle all that apply]  
1=Taste 2=Price 3=Healthfulness 4=Convenience
- Where did you first hear/learn about sweetpotato bread?  
1=Dietitian/Nutritionist/Health professional      5=Family member  
2=Radio/TV      6=Friends/colleagues  
3=Newspaper      7=In the store/supermarket like this  
4= Health-focused Website      8=Food company or manufacturer  
9=Other (specify.....)      10=N/A
- Do you consider sweetpotato bread a healthy food product? 1=Yes 0=No
- If Yes to Q4, why? [Circle all that apply]  
1=Does not contain bad ingredients 2=Contains certain foods/components  
3=No artificial ingredients or additives 4=Natural unprocessed/ unadulterated  
5=Simple/few ingredients      6=Organic /fresh /nutritious  
7=Other ..... 8=Don't know/refused 9=N/A

6. What informed your decision to purchase sweetpotato bread? [*Circle all that apply*]  
 1=Good for you 2=Nutritive/Health value 3=Was told by someone to try it  
 4=cooking demos 5=Like the taste 6=Ingredient used 7= other.....
7. [*If response was because of the nutritive health value*] Where did you learn about the health benefits of sweetpotato bread? [*Circle all that apply*]  
 1=Dietitian/Nutritionist/Health professional 5=Family member  
 2=Radio/TV 6=Friends/colleagues  
 3=Newspaper 7=In the store/supermarket like this  
 4= Health-focused Website/Advertisement 8=Food company or manufacturer  
 9=Other (specify.....) 99= N/A
8. What are some of the benefits of sweetpotato bread you learnt/heard? [*Circle all that apply*]  
 1=Contains Vitamin A 2=Good for health 3=Good for eye sight  
 4=Good for immunity 5=Good for children 6=Good for men/women 7=N/A
9. [*If Vitamin A is not mention*] Do you know about vitamin A? 1=Yes 0=No 2=N/A
10. If aware, what is the importance of vitamin A? [*Circle all that apply*]  
 1=Protects the body 2=Good for health 3=Good for eye sight  
 4=Good for immunity 5=Good for children 6=Good for men/women 7= Other.....8=N/A
11. What are some of the sources of vitamin A? [*Circle all that apply*]  
 1=orange foods (mango, papaya carrots etc) 2=Eggs 3=Green leafy vegetables 4=meat...  
 5=Other(specify.....) 6= Dont know 7=N/A
12. Do you normally look for information on the package when deciding to purchase or eat bread?  
 1=Yes 0=No
13. If Yes, what information do you look at on the package when deciding to purchase or eat bread?  
 [*Circle all that apply*]  
 1=Expiration date 2=Ingredients list /origin of ingredients  
 3=Servings size and amount per container 4=Calorie and other nutrition information  
 5=Statements about nutrition benefits 6=Statements about health benefits  
 7= Other..... 8=N/A
14. Apart from today, did you buy sweetpotato bread in the last one week? 1=Yes 0=No
15. If Yes: How many loaves in total did you buy in the last one week? .....99=N/A
16. What is your typical number of loaves of sweetpotato bread you buy each week, on average?.....
17. Are there times when you have wanted to buy sweetpotato bread but missed it? 1=Yes 0=No
18. If Yes, on average, how many times in one week ..... 99=N/A  
 [*1=Once, 2=Twice, 3=Thrice, 4=Four times, 5= Five times, 6=Six times, 7=Always*]

19. What are some of the beliefs that people have about the sweetpotato bread? .....  
.....

**Part C1: Laddering interview**

*[Enumerator: Randomly sample every second person that you see buying OSFP bread (taking the bread from the shelf and putting it into their shopping basket). Invite them to take part in a study on consumer perceptions of bread and get their consent.*

*Conduct the laddering interview within the supermarket and make sure that only one participant at a time is interviewed.*

*Record the ladders on separate plain sheet attached to this questionnaire]*

1. What attributes/features/characteristics made you buy the sweet potato bread?
2. Please rank the attributes/features/characteristics you have listed in the order in which you consider/would consider when purchasing the sweet potato bread

*[Enumerator: Follow up the first three attributes in order they are ranked by the respondent and for each follow up the ladders by asking the question 'why is that important' until the respondent mentions a value/personal goal]*

3. You indicated that you would consider .....  
when choosing OFSP bread, why is that important to you?

4. Why is ..... that you have just mentioned important to you?

*[Continuous until values are mentioned]*

**Thank you very much for your time!**

## **Appendix 5: Focus Group Discussion Guide**

### **An Assessment of Factors Influencing Consumption of Orange Flesh Sweet Potato Bread in Kenya**

#### **Participants consent**

All participants were asked whether they were bread consumers.

*Note: Only bread consumers were allowed to participate in the focus group discussion.*

#### **Part A – Purchase of bread**

- a) Where do you buy your bread?
- b) What comes to your mind when you think of buying bread?

#### **Part B – Knowledge about sweet potato bread**

- c) Are you aware about sweet potato bread?

*(After the responses in the above question, show the participants OFSP bread)*

- d) What would make someone not buy the sweet potato bread?
- e) What would make someone buy the sweet potato bread?

#### **Part C – OFSP bread attributes**

- f) What important attributes would you look for before buying OFSP bread?
- g) Participants list and explain preferences on product presentation (OFSP bread)
- h) What additional information would you look for before purchasing OFSP bread?

#### **Part D – Tasting of OFSP bread**

Participants taste the OFSP bread and provide individual responses on the sensory attributes

Appendix 6: Sample photograph of OFSP bread at Tusky's supermarket shelves

