FOOD SYSTEMS, SOCIO-DEMOGRAPHIC FACTORS AND THE NUTRITIONAL STATUS OF CHILDREN 6-24 MONTHS IN OBUNGA SLUMS, KISUMU, KENYA

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DECLARATION

I, Umotho Kinya Mbae, affirm that this thesis on "Food Systems, Socio-Demographic Factors and Nutritional Status of Children 6-24 months in Obunga Slums, Kisumu Kenya." is my original and unique work and it has not been presented for a degree in any other University.

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DEDICATION

I dedicate my thesis to God; all the glory belongs to Jesus. I am confident in this assurance that Jesus, who started this good work in me, will bring it to completion. The knowledge I gain will help communities in Kenya and Globally.

ABSTRACT

Kenya is grappling with many public health problems; one of the most critical is childhood malnutrition. Underweight rates are 10.1%, stunting 17.6%, and wasting 4.9 %. In Obunga slums, stunting was 40.2% for children below sixty months, underweight at 10.2%, and wasting at 9%. Globally, children between 6-24 months contribute the most to malnutrition among under-fives. Nevertheless, after 24 months, stunting, an indicator of chronic malnutrition, is irreversible. Obunga slums, compared to other slums in Kenya, registered the highest levels of stunting at 40.5% despite various interventions. Some of the risk factors that recurrently exist as determinants of nutritional status in urban slums are socio-demographic factors. Other potential factors which seem to be ignored are the food systems-related socio-demographics, which seem to be in constant aetiology. This study determined the relationship between food systems, socio-demographic factors, and the nutritional status of children between 6-24 months. Specifically, to assess the nutritional status, determine the relationship between socio-demographic factors and nutritional status, determine the relationship between the broad food system and nutritional status, and determine the relationship between the community food system and nutritional status. A cross-sectional design was adopted, and households with a child aged 6-24 months in Obunga slums were included. A sample of 189 children was selected through a simple random sampling technique. A questionnaire was used to collect data on broad food systems, community food systems, and socio-demographic factors. The anthropometric assessment was used to collect data on the nutritional status of the children. Data analysis was done through descriptive statistics and binary logistic regression. The results reveal that a total of 189 children, 108 males and 81 females, were part of the study. Prevalence of wasting was at 3.2%, overweight at 6.9%, stunting at 27.0%, and underweight at 7.4%. Socio-demographic factors: wasting was associated with the child's birthweight (A.O.R = 0.021, C.I. =0.001 -0.524) and caregiver's level of education (A.O.R = 11.431, C.I. = 1.407 - 92.857). Stunting was associated with the child's age (A.O.R = 1.099, C.I. = 1.021 -1.183) and household daily earnings (O.R. = 0.708, C.I. =0.512 -0.978). Being Underweight was associated with the occupation of the caregiver (A.O.R = 0.217, C.I. = 0.52 - 0.900). Broad food systems: Wasting was associated with the food price of fruits (A.O.R = 10.822, C.I. =1.097 -106.774), child consumption of commercially produced food complementary food (O. R=7.818, C.I. =1.056 -33.596) and commercially produced food (O.R. = 5.957, C.I. =1.56 - 33.596). Stunting was associated with listening/reading/watching promotional practices for commercial food at (O. R=0.486, C.I. = 0.237 -0.998). Underweight was associated with the price of fruits at (A.O.R =5.435, C.1. =1.367-21.610). Community Food Systems: An increase in the food sources increased the prevalence of underweight both at a (Crude O.R. =19.500, C.I. =1.61-236.61) and at an (A.O.R. = 21.331, C.I. =1.370-332.239). While frequency in the child consumption of food from restaurants/hotels increased wasting by 14 times (A.O.R of 14.52, C.I. = 1.39 -151.71 $P<0.05$). However, purchasing foods from restaurants and hotels reduced stunting by 0.13 times (A.O.R = 0.13, C.I. = 0.02 - 0.90, $P<0.05$). This study is significant, as it's the first study in Obunga slums, enumerating insight into the relationship between food systems and nutrition status. This will o help to align food systems and mitigate child malnutrition in Obunga slums and similar settings. .

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ABBREVIATIONS/ACRONYMS

AOR	Adjusted Odds Ratio
C.I.	Confidence Intervals
KDHS	Kenya Demographic Health Survey
LAZ	Length for Age Z-score
OR	Odds Ratio
UNICEF	United Nations Children's Fund
WAZ	Weight for Age Z-Scores
WHO	World Health Organization
WLZ	Weight for Length Z-Score
Z-Score	The number of standard deviations from the mean of the data point

OPERATIONAL DEFINITION OF TERMS

Broad Food Systems	The broad food systems are the macro-level food process that influences an individual's nutritional status. In this study, they include food price, food aid, food and beverage marketing. (Neff et al., 2009)
Community Food Systems	Community Food systems are the food environments (access to food stores, supermarkets, daily markets, open-air markets, and fast food and street food consumption) that influence the nutritional status of an individual (Neff et al., 2009)
Caregiver	The individual primarily and directly involved in caring for a child 6-24 months. It can be a parent, relative, or paid help.
Complementary Produced Commercial Foods	These foods are manufactured for infants between 6-24 months, other than formula, to provide an infant with nutrients not met by breast milk or formula.
Commercially Produced Foods	These are foods that are manufactured for the general population.
Food	A plant or animal-origin substance that nourishes children between 6-24 months and has essential nutrients (proteins, fats, vitamins, carbohydrates and minerals) to sustain growth and vital body processes.
Food Aid	This refers to food assistance, which can be provided as cash to help buy food or as food rations.
Food Price	This is the amount of money caregivers of children 6-24 months use to buy different kinds of food.
Food Systems	In this study, Food systems will be based on the conceptual framework by Neff et al., 2009 on Food Systems and Public Health Disparities. This shall include the Broad Food systems (Food Price, Food aid, Food and Beverage marketing) and the Community food systems (Restaurants and Street Food, Supermarkets and Markets).

Nutritional Status	This will be measured through Length for Age Z-Scores (LAZ). LAZ Z-Scores that will be below minus two standard deviations will represent stunting. Weight for Length Z-Scores (WLZ), WLZ Z-scores below minus two standard deviations will represent wasting. Weight for age Z-Score (WAZ), WAZ Z-Scores that will be below minus two standard deviations will represent underweight, WAZ Z-Scores that will be above plus two standard deviations will represent overweight, while for a child between 6-24 months.
Socio-Demographic Factors	These will be characteristics of the children aged between 6-24 months. This comprises the age in months of the child, the child's gender, birth weight of the child, household size, the education level of the primary caregiver, attendance of ante-natal care, the household head, the household's income levels, and the occupation of the primary caregiver.
Street Food	Street food is quick, convenient and inexpensive food sold in informal sectors. In this study, street food will consist of cooked food and snacks, usually obtained from street carts or served in trays or on temporary street structures.
Restaurants	Shall be the places that prepare meals, and people buy the cooked meals, or they can sit and eat on the premises. Alternatively, they can take the food with them.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The Developing world, including Kenya, grapples with many public health problems; one of the most critical is severe childhood malnutrition. At the global level, 148.1 million children are stunted, representing 22.3% of children under five (hmoumen, 2023a). At the same time, 45 million children are wasted, representing 6.8% of children under five (hmoumen, 2023a). In Africa, 43% of the children are stunted, which is quite worrying (hmoumen, 2023a).

While before, undernutrition and stunting were the major nutrition problems that Africa had to contend with amongst under-fives. The rising cases of children who are overweight have added to the burden of malnutrition, with the prevalence of children who are overweight currently at 5.6% (hmoumen, 2023a). The malnutrition trend amongst under-fives in Kenya, while reflective of the global picture, differs from the African trend in that stunting has steadily decreased from 38% in 1998 to 26% in 2014 (KDHS, 2014) and now to 17.6% in 2022 (KDHS, 2022) the prevalence of children, who were overweight and underweight reduced up to 3.2% and 10.1% respectively. However, the levels of wasting increased up to 4.9% from 4%, which might have resulted from COVID-19 (KDHS, 2022).

In the 2014 demographic health survey in Nyanza region and Kisumu County, where the Obunga slum is located, the prevalence of Underweight, wasted and stunted children was below the national level (KDHS 2014) and has remained so (KDHS, 2022.). In Obunga slums, the prevalence of stunting was 40.2%, wasting at 9%, and Underweight at 10% (Omondi & Kirabira, 2016a). Studies in Kenya and outside Kenya examining the nutritional status of children reveal that malnutrition levels are usually higher in urban slum areas than in the rest of the population (Mamulwar et al., 2014; Omondi & Kirabira, 2016). While the national and community prevalence

of stunting is calculated by focusing on children under five, children between 6-24 months usually represent the most significant majority of stunted children (Kenya National Bureau of Statistics et al., 2015a; Saaka et al., 2015), who are the focus of this article, since after 24 months of stunting is irreversible (Akombi et al., 2017; *Stunting in a Nutshell*, WHO 2015). Socio-demographic factors have been shown to influence the nutrition status of children. They include the Child's age (Ahsan et al., 2017). Maternal Formal Education (Le & Nguyen, 2020;) The Child's size at birth (Jana et al., 2023; West et al., 2018). The Child's Gender (Saaka et al., 2015). The size of the household the Child is part of (Ajao et al., 2010; Kassa et al., 2016). The complementary feeding practices (Kassa et al., 2016) and the mother's knowledge of complementary feeding practices (Abuya et al., 2012a; Fekadu et al., 2015; Saaka et al., 2015), This series of reviews demonstrates the existing literature on the relationship between sociodemographic factors and nutritional status. The reviews also give the impression that the dynamics of the study setting puts children in the slum setting at risk of chronic malnutrition, which also burdens the economy.

Focus has been given to a combination of socio-demographic factors, with little attention to food systems. A conceptual framework on food systems by (Neff et al., 2009) emphasizes the relationship between food systems and health disparities. The model provides a schematic relationship explaining that diet disparities directly influence health. Diet disparities are also influenced directly by broad food systems and community food systems (Neff et al., 2009).

Broad food systems were characterized by food price perceptions, food aid and food and beverage marketing. Food price is an essential determinant in food purchases (Neff et al., 2009). Rising food prices most affect people in poorer countries (Green et al., 2013). A critical note is that the persons most vulnerable to food prices are those with few coping mechanisms and who spend a considerable proportion of their income on food purchases. They usually include pastoralists,

people without land, and the urban poor (Brinkman et al., 2010). According to (Neff et al., 2009), the inability to buy and afford adequate and nutritious foods usually exacerbates health disparities and has a multi-generational effect. Food aid is an instrument for addressing acute and chronic malnutrition in low-income countries (Barrett & Barrett, 2006). Positive and direct relationships are seen between food for work and the incidence of wasting for children under five years, while free distribution directly and positively impacts children 0-5 years and 5-9 years of age (Quisumbing, 2003). Food and beverage marketing promotes particular brands and categories (Neff et al., 2009). Adolescents and children are targeted by intensive food and beverage marketing, as they influence household purchases through nag and pester power (Story & French, 2004). The heavy marketing toward the youth, especially children, hopes to build positive associations with brands, ensuring brand loyalty even as future adult consumers (Story & French, 2004). Food and beverage marketing has also been shown to influence complementary feeding. Mothers believe commercially advertised foods are healthy (Pries et al., 2016) and that commercially produced complementary food will make their children bright (Feeley et al., 2016). Community Food Systems, characterized by markets and supermarkets, street foods and restaurant food, influence diet disparities, which influence health disparities (Neff et al., 2009). Globally, disparities exist in the food environment in each country. In the US, large supermarkets have been found to sell a variety of cheaper foods due to their economies of scale (Neff et al., 2009; Treuhaft & Karpyn, 2010). The supermarkets are found chiefly in urban areas and are inaccessible to persons of low income and from rural regions (Neff et al., 2009; Treuhaft & Karpyn, 2010). In rural areas, more convenience stores are found amongst persons of low income and communities of colour. They usually stock more processed foods, few fresh items, and low-quality and less healthy foods than stores in high-income, predominantly white communities (Neff et al., 2009;

Treuhaft & Karpyn, 2010). Research shows that access to supermarkets reduces rates of obesity as they have more diversity of healthy foods (Larson et al., 2009). In Kenya, however, a dietary revolution is happening among supermarket shoppers, with people eating more processed foods. This has increased Body Mass Index (BMI) and fasting blood glucose (Demmler et al., 2018). While shopping in the traditional (kiosks, small shops, daily markets) did not affect adult BMI (Demmler et al., 2018). Good market access among caregivers with nutrition knowledge increases the dietary diversity of children (Chikhungu et al., 2014; Hirvonen et al., 2017; Stifel & Minten, 2017). In Malawi, access to daily markets reduced stunting in children by up to 21% (Chikhungu et al., 2014).

Compared to the food that is prepared at home. Fast food restaurants serve bigger portions of foods high in calories, sugar, fat and sodium but very low in fruits and vegetables (Neff et al., 2009; Wilcox et al., 2013). Consumption of these foods increases adolescents' and children's daily total energy intake (Powell & Nguyen, 2013). It has been associated with increased adult BMI (Larson et al., 2009) and increased risk for adult chronic disease development (Wilcox et al., 2013). On the other hand, street foods are sold in informal sectors and consist of cooked food, snacks and soft drinks (Claasen et al., 2016). Street foods are low in fibre and micronutrients but high in energy and fats (Claasen et al., 2016; Gupta et al., 2016). These foods pose serious health risks due to unhygienic preparation and handling of street foods (Alimi, 2016; Muinde & Kuria, 2005). The highest street food consumers are low-income, as persons of higher incomes usually prefer regulated fast food outlets and supermarkets (Alimi, 2016). In Kenyan slums (Viwandani and Korogocho), street food consumption is high, as it is considered cheap, and there is no need to buy fuel to prepare it (Kimani-Murage et al., 2014). While in rural areas, street foods significantly contribute to the rural household income and may replace home-cooked meals because of easy

accessibility (Claasen et al., 2016). The trend within the domain of community food systems is speculated to be potential determinants. They appear to emphasize the influence of supermarkets on adults' nutrition status. Thus, it may be of interest to study the nutritional status of children under the care of such adults. Food and restaurant linkages on nutrition status are exploited on adults but not on children; this demonstrates an existing gap in the study. This study sought to establish the relationship between food systems, socio-demographic factors and the nutritional status of children between 6-24 months of age.

1.2 Statement of the Problem

Malnutrition remains a problem in Africa. In Kenya, stunting, underweight and wasting still reflect escalating levels across low-risk environments. Stunting is usually a reflection of chronic malnutrition. With the highest percentage of stunted children between 6-24 months. Yet studies show that after 24 months, stunting is irreversible. Obunga slums have registered higher stunting levels than other slum areas in Kenya, with stunting at 40.2%, despite efforts being put in place in regard and intervention programs targeting mitigating the increasing prevalence of malnutrition. Broader food system issues need to be addressed to improve the diets of children and adolescents. Food systems are essential to delivering nutritious, safe, affordable, and sustainable diets. However, the nutritional needs of children and adolescents are often not prioritized. Obunga slums remain a high-risk setting for stunting, reflecting chronic malnutrition. Malnutrition leads to economic losses due to losses in linear growth and cognitive development while increasing the healthcare burden. Focus has been given to a combination of socio-demographic factors with little attention to food systems, including broad and community food systems. Unless empirical tests focus on other linking factors, such as food systems as possible critical determinants of nutritional status, malnutrition will continue to escalate, leading to a heavy economic burden in the country

amidst existing interventions. Socio-demographic factors are some risk factors that recurrently exist as determinants of malnutrition in urban slums. Other potential factors which seem to be ignored are the food systems-related socio-demographics, which seem to be in constant aetiology and, therefore, as moderators of other factors. In this context, broad food systems identified food price, food and beverage marketing and food aid as potential risks to nutritional status. Community food systems identify street food influence, supermarkets and open-air markets as potential determinants of nutritional status. Thus, this study established the relationship between food systems, socio-demographic factors and nutrition status of children between 6-24 months in Obunga slums, Kenya.

1.3 Objectives

1.3.1 General Objectives

To establish the relationship between food systems, socio-demographic factors and nutritional status of children between 6-24 months in Obunga slums, Kenya.

1.3.2 Specific Objectives

1. To assess the nutritional status of children between 6-24 months in Obunga slums, Kenya.
2. To determine the relationship between socio-demographic factors and nutritional status for children between 6-24 months in Obunga slums, Kenya.
3. To determine the relationship between the broad food systems and nutritional status of children between 6-24 months in Obunga slums, Kenya.
4. To determine the relationship between the community food systems and the nutritional status of children between 6-24 months in Obunga slums, Kenya.

1.3 Research Questions

1. What is the nutritional status of children between 6-24 months in Obunga slums, Kenya?
2. What is the relationship between socio-demographic factors and nutritional status for children between 6-24 months in Obunga slums, Kenya?
3. What is the relationship between the broad food system and the nutritional status of children between 6-24 months in Obunga slums, Kenya?
4. What is the relationship between the community food system and the nutritional status of children between 6-24 months in Obunga slums, Kenya?

1.4 Significance of the Study

Malnutrition, measured as stunting, wasting, and underweight is a significant challenge in the Kenyan urban slums, leading to a gradual penalty in per capita income (GNR-2022; IFPRI 2016). To meet the global targets for eradicating malnutrition in all its forms in the urban slums and reduce economic losses. New approaches must be used in tackling malnutrition. Sustainable development goal number 9 calls for investment in systems infrastructure as crucial economic growth and development drivers. Food systems are essential to this picture, as emphasized in the Global Nutrition Report (2017), The Food and Agriculture Organization Report on Food Systems and nutrition and the State of Food Security and Nutrition in the World (FAO, 2014; hmoumen, 2023b). They emphasize a need to understand the links between food systems and the quality of diets. While using different models but similar building blocks, Partners in nutrition also call for strengthening food systems. 2016-2025, the outcome documents from the 2nd International Conference in Nutrition held in Rome in 2014 (FAO, 2014). They are also in support of strengthening food systems for improved nutrition. Therefore, research is necessary for different settings and contexts to understand food systems, how to enhance them, and their impact on

nutrition status. Obunga slums record the highest prevalence of chronic malnutrition countrywide at 40.2%, above the public health cut-off of 40%. Other studies have only focused on maternal and socio-demographic factors to understand stunting. This study looks at the food systems in slum settings that might affect the child's nutrition status. The focus on a child between 6-24 months is because this is a weaning period, where children slowly transition from exclusive breastfeeding to feeding and finally to family foods. This is known as complementary feeding and is usually a very vulnerable period in a child's life; stunting after 24 months is also irreversible. Globally among children under 60 months of age, children between 6-24 months have the highest prevalence of malnutrition. This study has added to the body of knowledge by identifying how food systems and socio-demographic factors influence the nutritional status of children between 6-24 months of age in Obunga slums. It directs and guides nutrition programmers on aligning food systems, helping mitigate child malnutrition in the Obunga slums and other urban slums.

1.6. Limitation of the Study

The study was cross-sectional and may not reveal seasonal variations affecting food systems and socio-demographic factors.

CHAPTER TWO
LITERATURE REVIEW

2.1 Nutritional Status of Children in Urban Slums

The developing world, including Kenya, grapples with a myriad of public health problems; one of the most critical is severe childhood malnutrition. On the global scale, 22.3% of the children are stunted, and 6.8% are wasted (hmoumen, 2023a). Interestingly, malnutrition is no longer about under-nutrition, with 37 million children under five years overweight (hmoumen, 2023a). In Africa, stunting, an indicator of chronic malnutrition, is higher than the global levels at 30.7%, while wasting is at 6.0% and 5.3% of children under five are overweight (GNR-2022).

On the other hand, in Kenya, stunting has steadily decreased from 38% in 1998 to 26% (KDHS-2014) and is now at 17.6% (KDHS, 2022). The national prevalence of wasting is 4%, and the underweight is 11% (KDHS, 2014). While the prevalence of children under five years who are overweight has reduced from 6% to 4% (KDHS, 2014) and now to 3% (KDHS, 2022). Obunga slum is located in the Nyanza region of Kenya, specifically in Kisumu County; in both Nyanza and Kisumu, the levels of stunting, underweight, and wasting are below the national levels. However, the prevalence of children who are overweight is higher than the national level, with the Nyanza Region at 4.4%. Kisumu County is at 5.7% (KDHS, 2014). However, in the newly released demographic health survey, the number of children under five who are overweight has decreased to 2.1% (KDHS, 2022).

Kisumu County is an urban area and among the three Kenyan capital cities. Urban children in Kenya have lower levels of wasting, stunting and underweight, but the prevalence of being overweight is higher in urban places (KDHS, 2014; KDHS, 2022). This might result from improved sanitation, improved access to water and a higher household wealth index (KDHS, 2014). Studies have shown that increased income and wealth can reduce stunting (Ahsan et al.,

2017; Omondi & Kirabira, 2016) and reduce underweight prevalence (Omondi & Kirabira, 2016a). At the same time, improved sanitation reduces stunting (Ahsan et al., 2017). Poor sanitation has been known to predispose children to diarrheal diseases, and levels of malnutrition are usually higher among children who get diarrheal infections (Fekadu et al., 2015).

There exist huge disparities and inequalities among urban dwellers, with persons in slum areas being disadvantaged. Characteristics that usually protect children in urban areas from undernutrition and stunting are the ones that define slum areas. According to (Habitat, 2006), a slum household is any household with no water, poor sanitation, non-durable housing, cramped living space and full of insecurity. Studies that examined the nutritional status of children in urban slums show that the prevalence of malnutrition is usually above the public health cut-off points (Status, 1995) in children below 24 months of age (Akhtar et al., 2012; Lohia & Udipi, 2014) and also for children 60 months of age (Abuya et al., 2012a; Mamulwar et al., 2014; Olack et al., 2011; Omondi & Kirabira, 2016a).

This trend is reflected in Kenya as well. In 2008, stunting in Kibera, the largest slum in Kenya, was at 47% (Olack et al., 2011). In Viwandani and Korogocho slums in 2009-2010, stunting rates among under-fives were at 40% (Abuya et al., 2012a), yet in reference to the Kenyan Demographic Health Survey 2008, stunting in Nairobi was at 22.7%, and was at 19.8% in 2014, health survey (KDHS, 2014) In the Nyanza region, according to an August 2011 sentinel site surveillance carried out by Kisumu Medical Education Training [as cited by (Omondi & Kirabira, 2016a)], the rate of stunting in Obunga slums was 41%, while in the Kenyan Demographic Health survey, 2008 stunting in Kisumu was at 30.9%. In 2014, stunting had reduced to 18.0% (KDHS, 2014); it currently stands at 9.1% (KDHS, 2022). In most studies (Abuya et al., 2012a; Kimani-Murage et al., 2014; Omondi & Kirabira, 2016a) in urban slums in Kenya, stunting indicates chronic

malnutrition. This might be because stunting can indicate a sustained problem, not just short periods of inadequacies in diet and nutrient malabsorption and imbalances in the body. Stunting affects linear growth, brain and muscle productivity, which have been associated with lowered labour productivity. This puts stunted individuals at risk of lower incomes and poverty (Dewey & Begum, 2011; Galasso & Wagstaff, n.d.; Hoddinott et al., 2008; Lenoir-Wijnkoop et al., 2013). Childhood stunting has a long-term impact (Galasso & Wagstaff, n.d.), with associations between stunting and metabolic disorders (Dewey & Begum, 2011). The dynamics of the study setting destabilize the prevalence of malnutrition in the urban areas while also putting at risk of malnutrition children, which has long-term consequences for the economy (De Sanctis et al., 2021; Dewey & Begum, 2011) Understanding the current status of malnutrition is still warranted due to immigration and migration into the slums. Thus, this study assessed the nutritional status of children between 6-24 months in Obunga slums.

2.2 Socio-Demographic Factors and Nutritional Status of Children

Different population characteristics have an impact on the nutrition status of a child. The age of a child impacts the nutritional status of a child. The Kenyan Demographic Health Survey Report 2014 revealed that stunting is highest at 18 -24 months old, underweight peaks between 24-35 months, and wasting increases between 6-11 months. However, in Nairobi informal settlements, stunting was highest in children aged 36-47 months, while wasting peaked between 6-11 months (Olack et al., 2011). Studies focusing solely on children under 24 months of age showed that after nine months, the likelihood of being underweight increased, while stunting was likely among children over 12 months (Saaka et al., 2015). The observations may have been because children between 6-11 months tend to have inappropriate complementary feeding compared to children between 12-17 months and 18-23 months (Kassa et al., 2016). Stunting might be seen among older

children in all groups as it is usually an indicator of chronic malnutrition. Birth weight influences the future nutritional status of a child (Rahman et al., 2016). Children below 2500 grams have a higher risk of being malnourished (KDHS, 2014; Mamulwar et al., 2014). The proper attendance and utilization of antenatal care help to improve birth weight (Haque et al., 2015) and protect against stunting (Abuya et al., 2012a; Saaka et al., 2015). Studies reveal that children under five years whose mothers have completed secondary school and beyond were protected against stunting, wasting, and underweight (KDHS, 2014; Abuya et al., 2012; Ahsan et al., 2017; Mamulwar et al., 2014). However, there was an increase in the prevalence of obesity amongst these children (Kenya National Bureau of Statistics et al., 2015c). However, another study showed that mothers with secondary education and above had children who were more underweight and wasted (Mamulwar et al., 2014). (Omondi & Kirabira, 2016a) showed that formal maternal schooling did not influence stunting. Interestingly, the male child in Kenya had the highest prevalence of wasting, underweight, stunting and overweight (KDHS, 2014). This was reflected in other places, which show male children had higher rates of stunting and wasting (Abuya et al., 2012; Olack et al., 2011; Saaka et al., 2015). However, among girls (Mamulwar et al., 2014), the levels of stunting and underweight were higher. While yet another study showed that gender had no impact on stunting (Omondi & Kirabira, 2016a). As much as existing literature demonstrates significant relationships between socio-demographic factors and nutritional status, the primary focus has been children under five. This study, therefore, determined the relationship between socio-demographic factors in Obunga slums and the nutrition status of children between 6-24 months.

2.3 Broad Food Systems and Nutritional Status of Children

This section will discuss the broad food systems, including food price, food aid, food and beverage marketing, and how they affect the nutritional status of children

2.3.1 Food Price

Food price is an essential determinant in food purchase (Neff et al., 2009). Rising food prices have adversely afflicted low-income Economies (Green et al., 2013). Critical to note is that the persons most vulnerable to food prices are those with very few coping mechanisms, and a large percentage of their incomes is spent on food. They usually include pastoralists, people without land, and the urban poor (Brinkman et al., 2010). An increase in food prices usually reduces the capacity of individuals to purchase food (Campbell et al., 2010). To cope with increasing food prices, there is a reduction in both the households' energy intake and dietary diversity (Brinkman et al., 2010). Families will initially reduce the intake of animal-source foods, fruit, and vegetables, which are considered expensive; this greatly decreases the intake of particular nutrients, leading to micronutrient deficiencies (Brinkman et al., 2010). The intake of green leafy vegetables and carotene-rich foods reduced as food prices increased in India (Adhiguru & Ramasamy, 2003). In Bangladesh, a similar trend was noted; as food prices rose, rice consumption remained constant, but the intake of non-rice meals decreased (Campbell et al., 2010; Yu & Yu, 2012). In households with high expenditure on rice, the odds of child stunting increased. However, they decreased in families with high spending on non-rice food items (Campbell et al., 2010). High expenditure on rice reduced the money available to purchase animal-source food, vegetables, fruits and oils, reducing food quality (Campbell et al., 2010). In Indonesia, households that spent much of their earnings on animal-source foods had lower stunting rates (Sari et al., 2010). Food from animal sources is high-quality protein, rich in micronutrients Vitamin B_{12}, Iron, Riboflavin, Vitamin A,

phosphorous, calcium and zinc, and essential fatty acids (Campbell et al., 2010; Murphy & Allen, 2003). Intake of these foods by children reduces stunting as they boost growth (Murphy & Allen, 2003). As food prices continue increasing, the meal portion sizes reduce, and the frequency of meals decreases as well; this reduces the staples consumed, leading to macro-nutrient deficiencies and increasing the risk of acute malnutrition amongst children (Brinkman et al., 2010). Food prices have a multi-dimensional effect, as they have contributed to the one billion individuals who are Obese (Kwasek, 2012). an increase in body mass index in Children, was noted when the price of fruits and vegetables increased (Morrissey et al., 2014), while an improvement was seen on children and adolescents weight, after fruits and vegetable subsidies were implemented, (Powell & Chaloupka, 2009). Thus, this study looked at the perceptions of food price on nutritional status of children of children.

2.3.2 Food Aid

According to (Neff et al., 2009), the inability to buy and afford adequate and nutritious foods usually exacerbates health disparities and has a multi-generational effect. Food aid has been, for a very long time, an instrument for addressing acute and chronic malnutrition in low-income countries. Food aid primarily focuses on young children and women. It might have a minor impact on the overall population, but it significantly impacts the vulnerable population (Cogill, 2013).

The World Food Programme (WFP) has led food aid programs and developed a Food for Assets program focusing on two critical things. Firstly, it sorts out the most immediate needs of vulnerable populations through food and cash vouchers. Secondly, it builds the community's resilience by implementing systems and structures that ensure long-term food security (Food Assistance for Assets | World Food Programme, n.d.). In Ethiopia, forms of food aid that are in existence are food for work (FFW) and Free distribution (FD) (Quisumbing, 2003). Both influence the nutrition

status of children, where Food for work was associated with improved nutrition status for boys. At the same time, food distribution, which is unearned income, is invested in girls and results in improvements in the girls' nutrition status (Quisumbing, 2003). Therefore, this study examined the relationship between food aid and the nutritional status of children 6-24 months in Obunga slums.

2.3.3 Food and Beverage Marketing

The promotion of different brands of foods and beverages through various channels is on the rise. Adolescents and children are targeted for intensive food and beverage marketing, as they influence household purchases through nag and pester power (Huang et al., 2016). The heavy marketing directed towards the youth, especially children, hopes to build positive associations with brands, ensuring brand loyalty even as future adult consumers (Story & French, 2004). Food and beverage marketing has also been shown to influence complementary feeding, with mothers believing that commercially advertised foods are healthy (Pries et al., 2016). That complementary foods produced commercially will make their children bright (Feeley et al., 2016). In Cambodia, associations were seen between children's intake of snacks and the marketing of the snacks (Pries et al., 2016). In Kenya, children with the highest consumption of fast foods and sweetened beverages had televisions at home (Kigaru et al., 2015). Unfortunately, this pervasive marketing is of commercially produced snacks (Pries et al., 2016; Vitta et al., 2016) with little nutritional value (Powell et al., 2007). Therefore, this study examined the relationship between food and beverage marketing and the nutritional status of children 6-24 months of age.

2.4 Community Food Systems and Nutrition Status of Children

This section will discuss the community food systems, including supermarkets and the availability of markets, restaurants and street foods, and their impact on the nutritional status of children.

2.4.1 Supermarket and Availability of Markets

Massive disparities characterize food environments; supermarkets in the US have been found to sell a variety of cheaper foods due to the economies of scale (Neff et al., 2009; Treuhaft & Karpyn, 2010). The supermarkets are found chiefly in urban areas and are inaccessible to persons of low-income and rural regions (Neff et al., 2009; Treuhaft & Karpyn, 2010). In the rural areas, amongst lower income and coloured persons, there is a more significant number of convenience stores, stocking more processed food, few fresh items, low quality and less healthy foods as compared to stores in high-income, predominantly white communities (Neff et al., 2009; Treuhaft & Karpyn, 2010). Research shows that access to supermarkets reduces rates of obesity as they have healthier diets (Larson et al., 2009). In Kenya, however, a dietary revolution is happening among supermarket shoppers, with people eating more processed foods. This has increased BMI and fasting blood glucose (Demmler et al., 2018). While shopping in the traditional (kiosks, small shops, daily markets) did not affect adult BMI (Demmler et al., 2018). Good market access among caregivers with nutrition knowledge increases children's dietary diversity (Chikhungu et al., 2014; Hirvonen et al., 2017; Stifel & Minten, 2017). In Malawi, caregivers' access to daily marketplaces reduced stunting in children by up to 21% (Chikhungu et al., 2014). This study, therefore, looked at the relationship between markets and supermarkets and the nutritional status of children 6-24 months in Obunga slums, Kenya.

2.4.2 Restaurants and Street Food Availability

Compared to the food that is prepared at home. Fast food restaurants offer foods higher in calories, sugar, fat and sodium, and the food portions are bigger (Palos Lucio et al., 2020; Wilcox et al., 2013) Intake of these foods increases adolescents' and children's daily total energy intake (Powell & Nguyen, 2013). It has been associated with increased adult BMI (Larson et al., 2009). On the

other hand, street foods are sold in informal sectors and consist of cooked food, snacks and soft drinks (Claasen & Pointer, 2016). Street foods are similarly high in energy and fats but low in micronutrients and fibre (Claasen & Pointer, 2016; Gupta et al., 2016). These foods pose serious health risks due to the unhygienic preparation and handling of street foods (Alimi, 2016; Muinde & Kuria, 2005). The highest street food consumers are low-income, as persons of higher incomes usually prefer regulated fast food outlets and supermarkets (Alimi, 2016). Street food consumption in Kenya has been seen in rural Kenya, around Chuka University, and most vendors sell in unsanitary environments and have sub-optimal food handling practices (Gichunge et al., 2023). The same was reflected in Kiambu County as well, with poor handling and poor hygiene around the preparation of street food (Johnson et al., 2020). In Kenyan slums (Viwandani and Korogocho), street food consumption is high, as it is considered cheap (Kimani-Murage et al., 2014). In rural areas in South Africa, street foods significantly contribute to the rural household income. They may replace home-cooked meals because of their accessibility (Claasen & Pointer, n.d., 2016). The trend within the domain of community food systems is speculated as a potential determinant that appears to emphasize an influence of supermarkets on adult nutrition status and thus may also be of interest to determine the nutritional status of children because of the caregiver's influence. Food and restaurant linkage on nutrition status is exploited on adults but not children, demonstrating an existing study gap. The association between street food consumption and the nutrition status of children is also not well known. Therefore, this study investigated the relationship between restaurants and street foods and the nutritional status children 6-24 months in Obunga slums.

2.5 Operational Conceptual Framework

This study was based on a conceptual framework model by (Neff et al., 2009), which emphasized the relationship between food systems and health disparities. This model provides a schematic relationship that explains that diet disparities directly influence health disparities. Diet disparities are also influenced directly by broad food systems, community food systems and socio-demographic factors (Neff et al., 2009). In addition, it identifies food production exposures as direct determinants of health disparities, which makes it a moderator variable for diet disparities. In this study, the model was used to investigate the relationship between nutrition status and three building blocks, including the broad food systems characterized by food price, food aid, and food and beverage marketing; Community food systems characterized by supermarkets and markets; and restaurants and street foods; and socio-demographic factors characterized by the gender of a child, household size, religion, level of education of the mother/primary caregiver and the household income. In this context, nutrition status, which assumes the dependent variable, included anthropometric indices for a child 6-24 months as the outcome dependent variable. The three building blocks borrowed from (Neff et al., 2009) were treated as independent variables. Thus, the relationship was conceptualized, as shown in Figure 2.1.

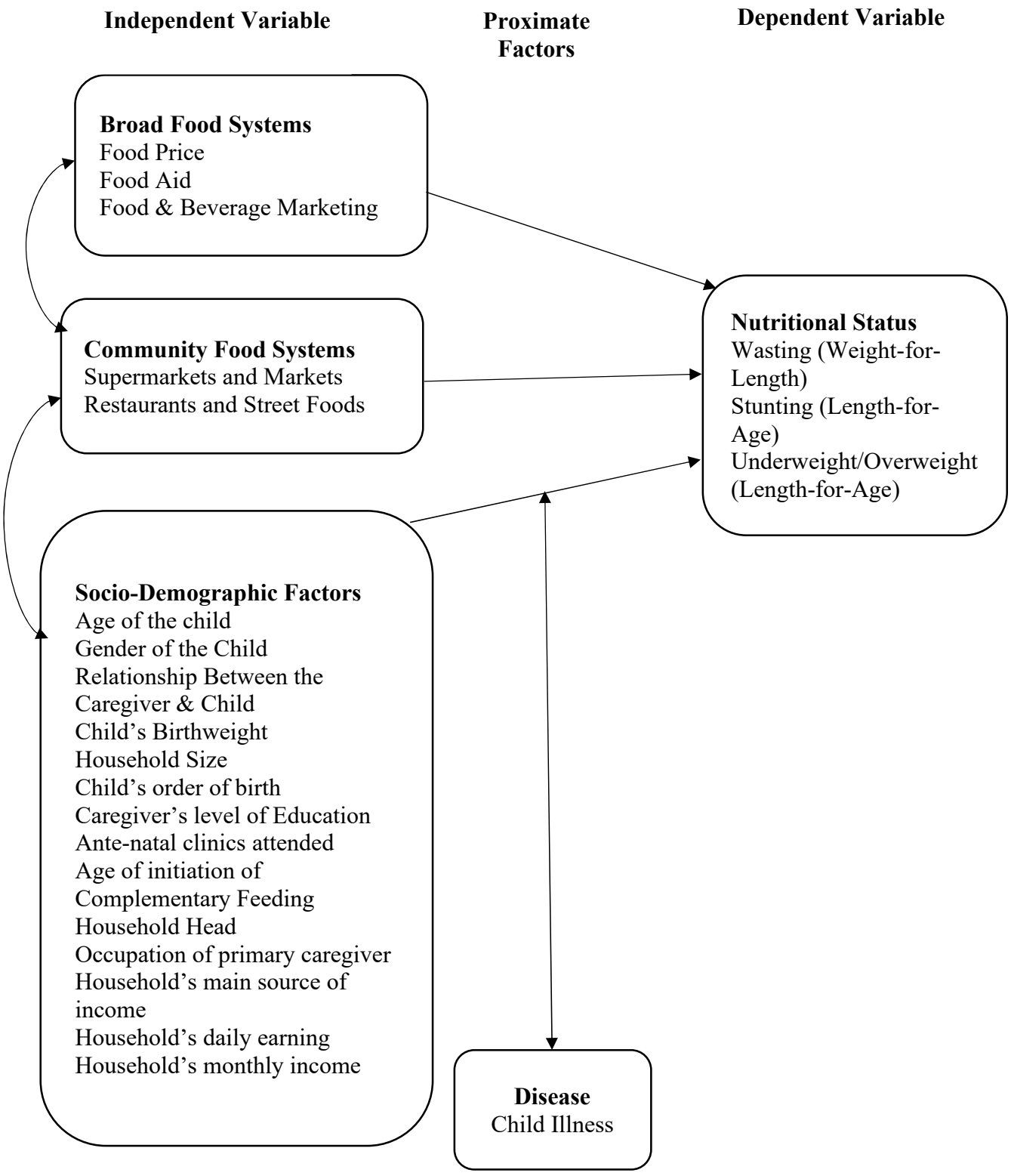


Figure 2.1: The Relationship between Food Systems, Socio-demographic Factors and Nutritional Status of Children 6-24 months, (Neff et al., 2009).

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Study Area

Obunga slums are located in Kisumu County, on the Eastwards side; the coordinates are -004’44’’ N and 34045’53E. It has a total land area of 1.39 sq. km. It encompasses five smaller regions: Kasarani, Central 1, Central 2, Kamakowa and Sega Sega. Obunga slums are located next to the Kisumu Industrial area. It has emerged due to a shortage of affordable housing in Kisumu City, and it houses between 15,000 to 20,000 persons (Seth, 2014). The major socio-economic activity in Obunga slums is fish selling (Seth, 2014).

3.2 Study Population

The study population was children between 6-24 months residing in Obunga slums, plus their caregivers. There were 274 households with children aged 6-24 months. The household was the unit of analysis, and respondents were the caregivers with children between 6-24 months.

3.2.1 Inclusion Criteria

This consisted of households with children aged 6-24 months residing in the Obunga slums, whose caregivers had voluntarily signed an informed consent form.

3.2.2 Exclusion Criteria

Households with children aged 6-24 months residing in the Obunga slums with deformities and abnormalities (congenital disorders), as these children are nutritionally vulnerable (Senevirathna & Liyanage, 2020) The deformities and congenital disorders were established through observations, caregivers' reports and child records in the Mother and Child Booklet.

3.3 Study Design

A cross-sectional study design was used. Data was collected once and analyzed. This design expedites the collection of quantitative data and facilitates the identification of the relationship between the dependent and independent variables of the study (Ferderer, 2005).

3.4 Sample Size Determination and the Sampling Procedure

3.4.1 Sample Size Determination

The sample size was determined according to Fisher et al., (1991) using the formula

$$n = \frac{Z^2(pq)}{d^2}$$

Where:

n = represented the minimum sample size (for a population > 10,000) required

Z = the standard normal deviate at the required confidence level (set at 1.96 corresponding to 95%, Confidence level adopted for this study)

p = population proportion estimated to be stunted in Obunga. This now stands at 40.2% (Okeyo, 2015)

q = 1-p

d= level of statistical significance set (5%)

Therefore, on substitution

$n= [1.96^2 \times 0.402 \times (1-0.402)]/0.05^2 = 369.40$

However, since the targeted population was 274 eligible households, the final sample size (nf) was adjusted as follows:

$nf = n \div \{1 \div (n/N)\}$

Where: nf = desired sample size (when the target population is less than 10,000) 1.742

n= desired sample size (when the target population is greater than 10,000)

N= the desired sample size (target population)

nf= 274 ÷ {1+ (274/369.40)} = 157.29

A non-response rate of 20% was added to cover the anticipated non-responses and fouled (spoilt) questionnaires (Okeyo, 2016).

157.29 (20/100) 157.29 = 188.748 ≈ 189

3.4.2 Sampling Procedure

Listing was done to ascertain the actual numbers because Obunga slums have very rapid migration in and out of the slums; persons listed must have stayed in the slums for at least one month. 274 households were listed as households with children between 6-24 months.

Simple random sampling techniques were used to select 189 respondents from 274 participants listed as households with children 6-24 months. In households with twins or two children between 6-24 months, one would be randomly selected for the study. Therefore, the other child would automatically be excluded from the study.

3.5 Data Collection Instruments

3.5.1 Questionnaire

A consolidated questionnaire with three sections was used to collect data. Section A comprised socio-demographic factors, Section B comprised broad food systems, and Section C comprised community food systems (Appendix 3).

3.5.2 Anthropometric Assessment Form

An anthropometric data collection form was used to gather information on the height and weight of the children (Appendix 2).

3.6 Data Collection Procedures

Data was collected in March 2019, and these procedures were followed.

3.6.1 Questionnaire

A one-on-one interview with the caregiver was used to administer the questionnaire. The Data was input into Kobo Collect, an open-source mobile data collection platform, and all collected data has been safely stored has Geo-points.

Data was collected on socio-demographic Factors, broad food systems, and community food systems.

3.6.2 Socio-Demographic Factors

Data was collected on the child's age, gender, birth weight, the relationship of the child with the caregiver, parity, birth spacing, household size, level of maternal education, mothers' attendance, age of complementary feeding initiation, the religion of the household, household head, weekly income level, the occupation of the mother and the father. The child's age was established through child records from the health booklet versus the day of the survey. The child's gender was established through the clinic card or observation of genitalia. Birth weight was also established through the child's health record booklet; it had two critical categories: below or above 2500g. The child's rank was assessed in terms of birth order with its other siblings. The household size was accessed by the number of individuals living in that household who cook and eat together. It had four categories: one to two persons, three to four people, five to six people, or seven people and above. The caregiver education level had three categories: primary and less education, completed secondary and tertiary education. Mothers' attendance at the antenatal clinic was determined from the clinic card. It was subdivided into four or more clinic visits or below four. The initiation of complementary feeding was determined by the age at which the child stopped

exclusive breastfeeding and began complementary feeding. It had three major categories: six months, below six months, and above six months. Depending on the predominant tribes and religions in Obunga slums, religion was divided into categories. Socio-economic data was assess by the income level of the caregivers and their current occupation, while in the household, the head was considered the person who guides and leads the household.

3.6.4 Broad Food Systems

Data was collected on food prices, food aid, and food and beverage marketing.

Food Price: Data was collected on the consumption of the twelve food groups they included: cereals and grains; roots and tubers; legumes, seeds and nuts; milk and milk products; flesh meat and meat products; fish and other seafood; organ meat; eggs; Vitamin A rich fruits; other fruits; Vitamin A rich vegetables; Dark green leafy vegetables; Other Vegetables. Data was collected on the food prices of the twelve food groups according to the caregivers' perception of the food price. Caregivers were requested to rate the price of food from the twelve groups into either low, middle, or high.

Food Aid: Data was collected on the forms of food aid, the caregivers receive and the utilization of the food aid, which will be measured by caregivers reporting if they had fed their child food aid.

Food and Beverage Marketing: Data was collected on exposure to media. This was checked by the frequency of reading newspapers, watching television, listening to the radio, and accessing social media. Data was also collected on promotional practices observed by mothers on commercially produced complementary foods since the child's birth, and if so, where they had seen or read the promotion. Finally, data were collected on the utilization of these foods, measured by caregivers reporting feeding their child any commercial food products before the interview day.

3.6.5 Community Food Systems

Data was collected from supermarkets and markets, restaurants and street foods.

Supermarkets and Markets: Data was collected on access to supermarkets and traditional markets, which included open-air markets, local shops, and mama kibanda. Data was also collected on access to the same markets.

Restaurants and Street Food: Data was collected on the availability of street foods and restaurants. Where restaurants were established eateries that sold food. Street foods were foods sold in the open air or semi-permanent structures. These foods were packaged foods or freshly cooked foods. Utilization of these foods was measured by caregivers reporting if they had given these foods to the child in the week preceding the survey

3.6.7 Anthropometric Assessment

This was measured through the recumbent length of each child. Each child's length was measured twice to the nearest 0.1cm, and measurements were repeated when there was a deviation of >±0.5 cm. This was done through an infant/child length and height wooden measuring board by UNICEF (S0114530 Portable baby/child L-hgt mea.syst/SET-2). A child would be placed between the two slanting sides on their back. The head would gently be put against the top end, and the legs gently pushed downwards by the caregiver. The foot piece was slowly moved until it pressed, and the child's soles and feet were at right angles to the legs.

Weight was then measured to the nearest 0.1g using the SECA Model 881 digital scale (SECA GmbH, Hamburg, Germany). The children would have minimal clothing to avoid errors. The weighing scale was calibrated by placing a standard 20-kilogram weight on the scale every morning to ensure the scale could accurately measure 20 kilograms. If any error was seen, the scale was adjusted. The standard weight would be placed on the scale three consecutive times to ensure

it has similar results three times, ascertaining its reliability. The anthropometric measures were done by taking two measurements of weight and two measurements of height; if the weight measure varied by plus or minus 0.1kg, it would be repeated. It would also be repeated if the height measure varied by plus or minus 0.1 cm.

3.7 Pre-testing

The pre-testing was done on 19 respondents, who accounted for 10% (Whitley, Jr. & Kite, 2012) of the calculated sample, after which appropriate adjustments were made to the tool. The pre-testing was done in the Nyalenda slums, an informal settlement in Kisumu County. The results obtained helped to rework the questionnaire and standardize it.

3.8 Validity and Reliability

Content validity, which had to do with the format of the instrument and included clarity of printing, size of type, adequacy of workspace, appropriateness of language and clarity of directions (Fraenkel & Wallen, 2000), was achieved by giving the instruments to the nutrition professionals to go through. Both face validity and content validity were ascertained.

Test re-test reliability was used to assess the consistency of a measure from one time to another. The time between one test and the other was one week. The co-efficient score for the test-reliability test was 0.83.

3.9 Measurement of Variables

3.9.1 Independent variables

Socio-demographic Factors comprise data and information on the child's age, gender, birth weight, child rank, household size, caregiver education level, mother attendance of the antenatal clinic, age of initiating complementary feeding, religion, weekly household income, monthly household income, occupation of child’s guardian, and primary source of household income.

Broad Food Systems comprise data and information on food price, food aid, and Food and beverage marketing.

Community Food Systems comprise data and information on supermarkets, markets, restaurants, and street food.

3.9.2 Dependent Variable

The nutritional status of the child was the dependent variable. Nutritional status had three categorical variables. The categorical variables were wasting, stunting, and underweight, which reflects WAZ, LAZ, and WLZ below -2 standard deviations, below the population median, and overweight, the WLZ above two standard deviations above the population median. To measure the length for age Z Scores (LAZ), the child's length and age were plotted against the WHO Length for age growth charts. To measure weight for length Z-scores (WLZ), the child's weight and age were plotted against the WHO weight for length growth charts. To measure weight for age Z-Scores (WAZ), the child's weight and age are plotted against the WHO weight for age growth charts.

3.10 Data Analysis

Data was imported from Kobo Collect to Microsoft Excel. Anthropometric data and information are entered into the ENA for SMART Software. Scores for height and nutritional status were generated based on WHO Child Growth Standards. Then, all the data was imported into the Statistical Package for Social Sciences (SPSS) Version 25 (Illinois, Chicago). Data was analyzed using descriptive statistics and presented by frequencies and proportions through tables and text. Logistic regression with Crude Odds Ratio (COR) and Adjusted odds ratio (AOR) based on a 95% level of significance was used to test the Strength and direction of the association between

nutritional status and socio-demographic factors, broad, food systems, community food systems. A p-value equal to or less than 0.05 was considered significant.

Binomial Logistic Regression was used to predict the probability that broad food systems, community food systems and socio-demographic factors could influence nutritional status.

Nutritional status was the dependent variable divided into three categories: wasting, underweight and stunting. Each Category was measured on a dichotomous scale (wasted or not wasted; stunted or not stunted; underweight or not underweight). The independent variables were, Broad Food Systems, Community Food Systems and Socio-demographic factors.,

3.11 Ethical Considerations

Maseno University School of Graduate Studies permitted the study to be carried out (Appendix 5), a permit was obtained from the National Commission for Science, Technology, and Innovation [NACOSTI] (Appendix 7), and ethical approval from Maseno University Ethics Review Committee [MUERC] (Appendix 6). The Kisumu County Office granted their approval for the study to be carried out (Appendix 8). The researcher sought the voluntary participation of all the respondents and subsequently obtained their consent. Caregivers signed informed consent To confirm their willingness for children to be part of the study (Appendix 1) before signing the informed consent. The participants were educated on the intent of the research and its benefits, and they were given the leeway to participate or withdraw from the study at any time if they wanted to. Benefits of the study to the participant included free nutrition assessment of the child, and all the malnourished children would be linked with the nearest health facility for nutrition and medical care. All the participants were guaranteed confidentiality and anonymity. Data collection was done using Kobo Collect, and after collection, it was immediately uploaded to the private account of the

researcher on the KOBO toolbox, where nobody could access it. The raw data was stored there, downloaded to SPSS, and shared only with the supervisors for guidance in data analysis to maintain confidentiality. Anonymity was assured by concealing the names of the participants and by using pseudo numbers.

CHAPTER FOUR
RESULTS

4.1 Introduction

The study findings are presented under the following sub-headings per the study objectives: Nutritional status of children between 6-24 months, the relationship between socio-demographic factors and nutritional status, the relationship between broad food systems and nutritional status, and the relationship between community food systems and nutritional status.

4.1 Nutritional Status of Children between 6-24 Months

A total of 189 children were recruited into the study, and all completed the study, where 108 (57.1%) were males and 81 (42.9%) were females aged 6-24 months. The prevalence of wasting was 6 (3.2%), and girls were more wasted as compared to boys, 4 (4.9%) and 2 (1.9%) percent, respectively. The prevalence of overweight was 13 (6.9%), and girls were still more overweight than boys, 8 (9.9%) and 5 (4.6%), respectively. The prevalence of stunting was 51 (27.0%), with stunting higher in boys at 34 (31.5%). The prevalence of underweight was 14 (7.4%), with boys more underweight at 10 (9.3%) and girls at 4 (4.9%). This is presented in Table 4.1

Table 4.1 Distribution of Children by Nutritional Status Prevalence and Sex

n = 189

	Gender					
	Female		**Male**		**Total**	
	n	**(%)**	**n**	**(%)**	**n**	**(%)**
Wasted (<-2 z-score)	4	(4.9)	2	(1.9)	6	(3.2)
Overweight (>2 z-scores)	8	(9.9)	5	(4.6)	13	(6.9)
Stunted (<-2 z-score)	17	(21)	34	(31.5)	51	(27.0)
Underweight (<-2 z-score)	4	(4.9)	10	(9.3)	14	(7.4)

4.2 Socio-Demographic Factors and Nutritional Status

4.2.1 Socio-Demographic Factors

The mean age for the 189 children in this study was 15.15 months; the minimum age was six months, and the maximum was 24 months. Table 4.2 below represents the distribution of children by the social-demographic factors.

Table 4.2 Distribution of Children by Socio-Demographic Factors

Characteristics	No	Percentage (%)
Child's Gender		
Female	81	42.9
Male	108	57.1
Relationship Between the Caregiver and the Child		
Birth mother	171	90.5
Father	7	3.7
Grandparent	2	1.1
Non-relative	2	1.1
Other relatives	6	3.2
Child's Birthweight		
Above 2500 grams	173	91.5
Less than 2,500 grams	16	8.5
Household Size		
1-2 persons	9	4.8
3-4 persons	95	50.3
5-6 persons	68	36
Seven and Above	17	9
Child's order of Birth		
First	54	28.6
Second	56	29.6
Third	46	24.3
Fourth	21	11.1
Fifth	10	5.3
Caregiver's level of Education		
None	2	1.1
Primary	94	49.7
Secondary	85	45.0
Tertiary/College	6	3.2
University	1	0.5
Ante-natal Clinics Attended		
Less than four visits	88	46.6
Four or more visits	101	53.4
Age of Initiation of Complementary Feeding		

Above six months of age	20	10.6
At six months	107	56.6
Over six months of age	62	32.8
Household Head		
Father	157	83.1
Mother	18	9.5
Grandparent	10	5.3

4.3.2 Socio-economic Related Socio-demographics

The social economic related socio-demographics included the occupation of the primary caregiver where the Non-employed caregivers stood at 79 (41.8%), while those who were self-employed were at 69 (36.5%). In regard to daily earnings, a majority of the households at 153 (78.3%) earned between Kshs. 200-800Ksh, while monthly, most households earned between Kshs. 1000 to 10,000 at 135 (71.4%), as presented in Table 4.3.

Table 4.3 Distribution of Children by Socio-demographic Factors

Characteristics	No	Percentage (%)
Occupation of the Primary Caregiver		
Employed	41	21.7
Not Employed	79	41.8
Self Employed	69	36.5
Households' Main Source of Income		
Employment	84	44.4
Self-employment	105	55.6
Households daily earning		
0-200	32	16.9
201-400	66	34.9
401- 600	62	32.8
601- 800	20	10.6
801-1000	5	2.6
Households Monthly Income		
1001- 5000	39	20.6
5001- 10,000	96	50.8
Above 10,000	54	28.6

4.3 Relationship between Socio-demographic Factors and Nutritional Status

4.3.2.1 Relationship between Socio-demographic Factors and Wasting

Wasting was significantly associated with birthweight and caregivers' education level. An increase in a child's birthweight reduced wasting by 0.21 times at an (Adjusted Odd's Ration of =0.021, C.I. = 0.001- 0.52, $p<0.05$). Concerning the caregiver's educational level, one unit increase was found to increase wasting by 11 times (Adjusted Odd's Ration of = 11.43, C.1. = 1.41 - 92.86, $p<0.05$), as presented in Table 4.4.

Table 4.4 Relationship between Socio-demographic Factors and Wasting

Variable	Sig	Crude O.R.	95% C.I.	Sig	Adjusted O.R.	95% C.I.
Age in Months	0.70	0.97	0.83 - 1.13	0.40	0.90	0.7 - 1.15
Gender	0.25	0.36	0.06 - 2.03	0.09	0.07	0.00 – 1.45
Birth Weight	.048*	0.17	0.03 - 0.98	0.02*	0.02	0.00 - 0.52
Household Size	0.25	1.89	0.64 - 5.54	0.13	3.80	0.66 - 21.74
Caregivers Education Level	0.09	2.21	0.89 - 5.49	0.02*	11.43	1.41 - 92.86
Ante-natal care	0.51	1.77	0.32 - 9.92	0.10	13.65	0.61 - 301.80
Household Head	0.00	0.00	0.00	0.00	0.00	0.00
Household's Main Income	0.58	1.62	0.29 - 9.09	0.15	8.05	0.48 - 133.82
Household's Daily Earnings	0.50	1.26	0.64 - 2.49	0.84	0.89	0.30 - 2.66
Household's Monthly Income	0.76	1.21	0.37 - 3.92	0.85	1.18	0.21 - 6.49
Primary Caregiver Occupation						
Employed	0.78		∞	0.43		∞
Not Employed	0.50	0.51	0.07 - 3.73	0.21	0.20	0.02 - 2.53
Self- Employed	0.6	0.58	0.08 - 4.30	0.67	0.54	0.033 - 8.88

*$p<0.05$

4.3.2.2 Relationship between Socio-demographic Factors and Stunting

The results reveal that the child's age is significantly associated with stunting. One unit increase in a child's age increased stunting by 1.1 times at an (adjusted odds ratio of 1.10, C.I. = 1.02 - 1.18, p <0.05. Households' daily earnings also reduced child stunting by 0.36 times but at a (crude odd's ratio of 0.71, C.I. = 0.51 - 0.98, p<0.05) as presented in Table 4.5.

Table 4.5 Relationship between Socio-demographic Factors and Stunting

Variable	Sig	Crude O.R.	95% C.I.	Sig	Adjusted O.R.	95% C.I.
Age in Months	0.03*	1.07	1.01 - 1.14	0.01*	1.10	1.02 - 1.18
Gender	0.11	1.73	0.88 - 3.39	0.09	1.93	0.91 - 4.11
Birth Weight	0.85	1.12	0.34 - 3.64	0.54	1.55	0.39 - 6.20
Household Size	0.11	0.69	0.43 - 1.09	0.47	0.82	0.47 - 1.41
Caregivers Education Level	0.38	0.79	0.47 - 1.32	0.16	0.64	0.34 - 1.20
Ante-natal care	0.68	0.87	0.46 - 1.66	0.47	0.76	0.37 - 1.59
Household Head						
Father	0.44	Ref	Ref	0.79	Ref	Ref
Grandparent	0.70	0.73	0.15 - 3.59	0.76	1.32	0.22 - 7.79
Mother	0.23	1.86	0.68 - 5.13	0.34	1.82	0.53 - 6.20
Relative	0.29	2.93	0.4 - 21.45	0.80	1.38	0.11 - 16.82
Households' Main Income	0.16	0.63	0.33 - 1.19	0.05*	0.45	0.21 - 0.99
Household's Daily Earnings	0.04*	0.71	0.51 - 0.98	0.20	0.74	0.46 - 1.18
Household's Monthly Income	0.47	0.85	0.53 - 1.34	0.81	1.08	0.56 - 2.10
Occupation of Primary Caregiver						
Employed	0.51	Ref	Ref	0.65	Ref	Ref
Not Employed	0.31	0.65	0.29 - 1.49	0.52	0.73	0.28 - 1.93
Self- Employed	0.29	0.63	0.27 - 1.47	0.36	0.62	0.23 - 1.71

*p<0.05

4.2.2.3 Relationship between Socio-demographic Factors Associated and Underweight

The caregiver's occupation significantly reduced the odds of a child being underweight by 0.22 times at an (Adjusted odds ratio of 0.22, C.I. = 0.52 - 0.90, p < 0.05) as shown in Table 4.6.

Table 4.6 Relationship between Socio-demographic Factors and Underweight

Variable	Sig	Crude O.R.	95% C.I.	Sig	Adjusted O.R.	95% C.I.
Age in Months	0.87	0.99	0.90 - 1.10	0.89	0.99	0.85 - 1.14
Gender	0.27	1.96	0.59 - 6.50	0.80	1.20	0.29 - 5.07
Birth Weight	0.42	0.52	0.11 - 2.567	0.10	0.16	0.017 - 1.45
Household Size	0.73	0.88	0.41 - 1.88	0.84	0.90	0.33 - 2.46
Caregivers Education Level	0.81	0.90	0.38 - 2.13	0.49	0.68	0.22 - 2.05
Ante-natal care	0.79	0.86	0.29 - 2.56	0.73	1.30	0.31 - 5.47
Household Head						
Father	0.68	Ref	Ref	0.37	Ref	ref
Grandparent	1.0	0.00	0.00	1.0	0.00	0.00
Mother	0.75	0.71	0.09 - 5.81	0.82	1.42	0.07 - 27.73
Relative	0.24	4.03	0.40 - 41.75	0.07	32.05	0.69 - 1489.23
Households' Main Income	0.50	1.48	0.48 - 4.60	0.59	1.53	0.33 - 7.07
Household's Daily earning	0.90	1.03	0.63 - 1.69	0.28	1.57	0.69 - 3.55
Household's Monthly Income	0.40	0.72	0.33 - 1.57	0.21	0.49	0.16 - 1.48
Occupation of Caregiver						
Employed	0.28	ref	Ref	0.11	ref	ref
Not Employed	1.0	0.00	0.00	1.00	0.00	0.00
Self- Employed	0.11	0.39	0.13 - 1.23	.035*	.217	0.05 - 0.90

***p<0.05**

4.4 Broad Food Systems and Nutritional Status

4.4.1 Food Consumption Patterns

The results show that the most consumed foods were cereals and grains, consumed by 98.9% of the children, while the least consumed was organ meats by 6.3%, as presented in Figure 4.1.

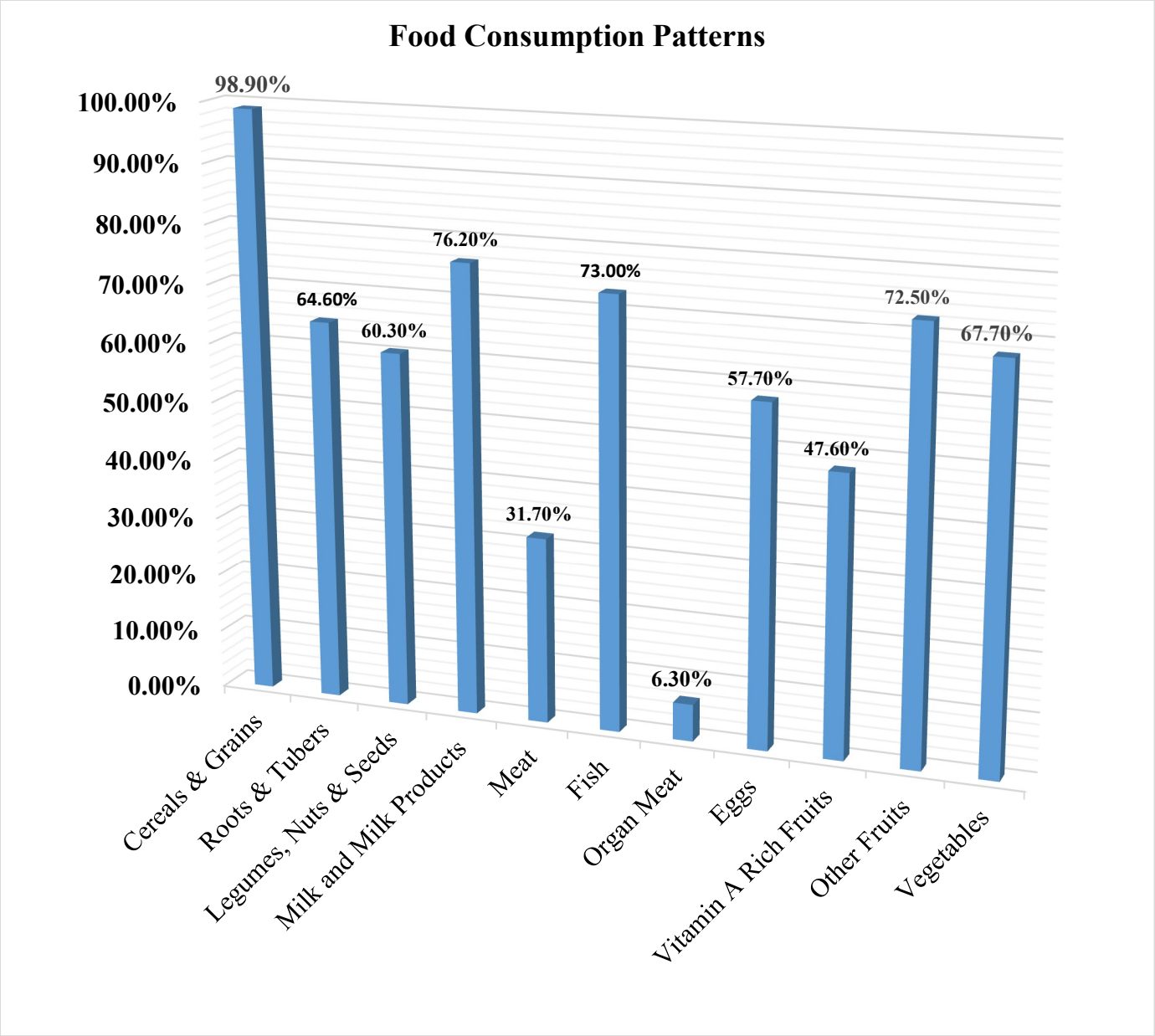


Figure 4.1 Food Consumption Patterns

4.4.2 Food Prices

The results show the food price perceptions of the caregivers on different food groups. The foods considered most expensive included organ meats, with 65.6% of the population finding them too expensive. In comparison, eggs were perceived to be low in price by 40.2% of the population, as shown in Table 4.7.

Table 4.7 Food Price Perceptions

Food Item	Price Perceptions		
	Low	Middle	High
Cereals & Grains	13 (6.9%)	115 (60.8%)	61 (32.3%)
Roots & Tubers	5 (2.6%)	67 (35.4%)	117 (6.9%)
Legumes	15 (7.9%)	115 (60.8%)	59 (31.2%)
Milk	19 (10.1%)	146 (77.2%)	24 (12.7%)
Meat	6 (3.2%)	98 (51.9%)	85 (45.0%)
Fish	5 (2.6%)	97 (51.3%)	87 (46.0%)
Organ meat	4 (2.1%)	61 (32.3%)	124 (65.6%)
Eggs	76 (40.2%)	91 (48.1%)	22 (11.6%)
Vitamin A rich Fruits	39 (20.6%)	76 (40.2%)	74 (39.2%)
Other Fruits	32 (16.9%)	89 (47.1%)	68 (36.0%)
Vegetables	26 (13.8%)	62 (32.8%)	101 (53.4%)

4.4.2.1 Food Prices Associated with Food Consumption

Price increases in some foods decreased consumption of the foods. They include roots and tubers (O.R. = 0.45, C.I. = 0.25 - 0.28, P< 0.05), Legumes (O.R. = 0.56, C.I. = 0.34 - 0.95, p<0.05), Organ meat (OR. =0.29, C.I. = 0.11 - 0.77, P< 0.05) and Eggs (O.R. = 0.44, C.I. = 0.28 - 0.70, p< 0.05). The implication was that a 1 unit increase in the price of roots and tubers reduced consumption of the roots and tubers by 0.45 times, consumption of legumes by 0.56 times, consumption of organ meat by 0.29 times, and consumption of eggs by 0.44 times. However, an increase in the price of vegetables significantly increased the consumption of vegetables (O.R = 0.43, C.I. - 1.442- 3.43). This implied that a 1-unit increase in the price of vegetables increased consumption of the vegetables, as presented in Table 4.8.

Table 4.8 Relationship between Food Prices and Food Consumption

Characteristics	Significance	Crude O.R	Confidence intervals
Cereals & Grains	0.53	2.19	0.19 - 25.08
Roots & Tubers	0.01*	0.45	0.25 - 0.83
Legumes	0.03*	0.56	0.34 - 0.95
Milk	0.32	.696	0.34 - 1.41
Meat	0.15	.668	0.38 - 1.16
Fish	0.58	.844	0.47 - 1.53
Organ meat	0.01*	0.29	0.11 - 0.77
Eggs	0.001*	0.44	0.28 - 0.70
Vitamin A rich Fruits	0.75	.939	0.64 - 1.37
Other Fruits	0.63	.893	0.57 - 1.41
Vegetables	.000*	2.22	1.44 - 3.43

*p<0.05

4.4.2.2 Relationship between Food Prices and Nutritional Status

The results revealed that, while the price of other fruits increased, it significantly contributed to wasting at an (Adjusted O.R. = 10. 82, C.I. = 1.10 - 106.77, P< 0.05), and also contributed to underweight at an (Adjusted O.R. = 5.44, C.I. = 1.35 - 21.61, P<0.05). The implication was that a 1 unit increase in the price of fruits contributed to the rise in wasting by 10.8 times and underweight by 5.4 times as presented in Table 4.9.

Table 4.9 Relationship between Food Prices and Nutritional Status

Characteristics	Sig	Crude O.R.	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
WASTING						
Cereals & Grains	0.29	2.24	0.50 - 9.98	0.44	1.84	0.38 - 8.78
Roots & Tubers	1.00	0.00	0.00	1.00	119272130.1	0.00
Legumes	0.67	1.36	0.33 - 5.62	0.54	0.52	0.06 - 4.29
Milk	0.46	1.87	0.36 - 9.82	0.51	2.73	0.14 - 52.93
Meat	0.71	1.33	0.30 - 5.96	0.95	1.06	0.15 - 7.60
Fish	0.65	0.71	0.16 - 3.09	0.17	0.20	0.02 - 1.98
Organ meat	0.88	1.13	0.23 - 5.62	0.80	0.78	0.11 - 5.43
Eggs	0.66	1.32	0.40 - 4.37	0.65	1.51	0.26 - 8.81
Vitamin A rich Fruits	0.63	1.33	0.42 - 4.12	0.15	0.24	0.03 - 1.68
Other Fruits	0.11	3.46	0.75 -16.01	0.04*	10.82	1.10 - 106.8
Vegetables	0.72	1.25	0.37 - 4.17	0.97	1.03	0.20 - 5.20

STUNTING						
Cereals & Grains	0.09	0.61	0.34 - 1.08	0.12	0.61	0.33 - 1.14
Roots & Tubers	0.15	1.59	0.84 - 2.00	0.42	1.34	0.66 - 2.75
Legumes	0.97	1.01	0.58 - 1.76	0.72	1.13	0.59 - 2.18
Milk	0.25	0.67	0.34 - 1.33	0.12	0.52	0.23 - 1.18
Meat	0.10	1.67	0.92- 3.04	0.06	1.92	0.96 - 3.82
Fish	0.74	0.90	0.50 - 1.63	0.69	0.87	0.46 - 1.67
Organ meat	0.26	1.45	0.76 - 2.78	0.50	1.29	0.62 - 2.66
Eggs	0.27	0.76	0.46 - 1.25	0.57	0.83	0.44 - 1.56
Vitamin A rich Fruits	0.44	1.19	0.77- 1.83	0.31	1.42	0.72 - 2.79
Other Fruits	0.95	1.02	0.64 - 1.61	0.62	0.84	0.41 - 1.71
Vegetables	0.39	1.22	0.77 - 1.94	0.22	1.42	0.81 - 2.49
UNDERWEIGHT						
Cereals & Grains	0.48	1.41	0.54 - 3.70	0.46	1.49	0.52 - 4.29
Roots & Tubers	0.72	1.21	0.43 - 3.45	0.67	1.31	0.37 - 4.59
Legumes	0.28	0.60	0.23 - 1.53	0.07	0.31	0.09 - 1.08
Milk	0.83	0.88	0.28 - 2.77	0.42	0.54	0.12 - 2.41
Meat	0.12	2.36	0.80 - 7.02	0.07	3.25	0.92 - 11.51
Fish	0.97	0.98	0.36 - 2.65	0.25	0.49	0.14 - 1.67
Organ meat	0.56	1.40	0.45 - 4.35	0.76	1.22	0.33 - 4.55
Eggs	0.21	1.67	0.75 - 3.72	0.18	2.19	0.70 - 6.81
Vitamin A rich fruits	0.38	1.41	0.66 - 3.04	0.24	0.48	0.14 - 1.65
Other fruits	.042*	2.63	1.04 - 6.68	0.02*	5.44	1.37 - 21.61
Vegetables	0.35	1.51	0.64 - 3.54	0.45	1.51	0.52 - 4.38

*p<0.05

4.4.3 Food Aid

4.4.3.1 Food Aid Characteristics

Most of the people, 164 (86.8%), did not receive any form of food aid at all. Out of the 25 (13.2%) who received food aid, relatives gave up to 24 (12.7%) of the food aid, with free distribution being the most given form of food aid 19 (10.1%). At the same time, 17(9%) fed their children with food aid in the week preceding the study as presented in Table 4.10.

Table 4.10 Food Aid Characteristics

Characteristics	Frequency	Percentage (%)
Food Aid Received		
Yes	25	13.2
No	164	86.8
Giver of Food Aid		
Friends	2	1.1
Relatives	24	12.7
Church	**0**	**0**
Hospital	1	0.5
NGO	**0**	**0**
Others	**0**	**0**
Kinds of Food aid		
Free distribution	19	10.1
Money	11	5.8
Food for work	2	1.1
Others	1	0.5
Food Types from Food Aid		
Supplementary foods	3	1.6
Cereals	9	10.1
Roots and Tubers	14	17.4
Pulses	12	6.3
Vegetables & fruits	7	3.7
Meat, fish, eggs & milk	2	1.1
Cooking oil	2	1.1
Others	4	2.1
Child Fed on Food Aid		
Yes	17	9

4.4.3.2 Food Aid Associated with Nutritional Status

There were zero associations between food aid and nutritional status. The results show that food aid received, the giver of food, kinds of food aid, and the types of food aid, even child consumption of food aid. It did not influence the prevalence of stunting, wasting, or underweight, as presented in Table 4.11.

Table 4.11 Relationship between Food Aid and Nutritional Status

Characteristics	Sig	Crude O.R	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
Wasting						
Food aid received	1.00	.000	∞	1.00	0.00	∞
Giver of Food Aid	1.00	.000	∞	1.00	1.00	∞
Kinds of Food Aid	1.00	.000	∞	1.00	1.00	∞
Food types from Food Aid	1.00	.000	∞	1.00	1.00	∞
Child fed on Food Aid	1.00	.000	∞	1.00	1.00	∞
Stunting						
Food Aid Received	0.72	0.84	0.31 - 2.23	1.00	694055542.3	∞
Giver of Food Aid	0.58	0.77	0.31 - 1.92	1.00	.000	∞
Kinds of Food Aid	0.52	0.79	0.38 - 1.63	0.63	0.49	0.03 - 9.10
Food types from Food Aid	0.52	0.92	0.72 - 1.18	0.55	0.76	0.31 - 1.88
Child fed on Food Aid	0.81	1.14	0.38 - 3.42	0.27	4.07	0.35 - 47.94
Underweight						
Food Aid Received	0.49	0.48	0.06 - 3.87	1.00	∞	∞
Giver of Food Aid	0.47	0.48	0.07 - 3.54	1.00	0.77	∞
Kinds of Food Aid	0.42	0.48	0.08 - 2.87	1.00	1.10	∞
Food types from Food Aid	0.36	0.70	0.33 - 1.50	1.00	0.00	∞
Child fed on Food Aid	0.80	0.76	0.09 - 6.23	1.00	∞	∞

∞= (no data was present)

4.4.4 Food and Beverage Marketing

4.4.4.1 Food and Beverage Marketing Characteristics

The results showed that people rarely read food-related adverts in newspapers at 69.3% (131), while the number of persons who watched food-related adverts on television was 22.8% (43) as presented in Table 4.12.

Table 4.12 Food and Beverage Marketing Characteristics

Characteristics	No	Percentage (%)
Frequency of Reading Food-related adverts in Newspapers		
Never	131	69.3
Rarely	56	29.6
Monthly	1	.5
Weekly	1	.5
Daily	0	0
Frequency of watching food-related adverts on Television.		
Never	38	20.1
Rarely	76	40.2
Monthly	0	0
Weekly	32	16.9
Daily	43	22.8
Frequency of listening to food-related adverts on Radio		
Never	35	18.5
Rarely	58	30.7
Monthly	3	1.6
Weekly	27	14.3
Daily	66	34.9
Frequency of listening, reading, or watching food-related content/adverts on social media		
Never	153	81.0
Rarely	25	13.2
Monthly	0	0
Weekly	3	1.6
Daily	8	4.2
Marketing on Complementary food		
Yes	53	28.0
Marketing on other Commercial food		
Yes	145	76.7
Child consumption of commercially produced complementary food products		
Yes	13	6.9
Child consumption of commercially produced food products		
Yes	50	26.5

4.4.4.2 Relationship between Food and Beverage Marketing and Nutritional Status

The results below, show the relationship between food and beverage marketing and nutritional status as presented in Table 4.13.

Table 4.13 Relationship between Food and Beverage Marketing and Nutritional Status

Characteristics	Sig	Crude O. R	Confidence Intervals	Sig	Adjusted OR	Confidence Intervals
WASTING						
Marketing Channel						
Newspaper	0.89	1.13	0.20 - 6.37	0.63	1.82	0.16 - 20.79
Television	1.00	0.00	0.00	1.00	0.00	0.00
Radio	1.00	0.00	0.00	1.00	0.00	0.00
Social Media	0.88	0.85	0.10 - 7.47	0.41	0.36	0.03 - 3.98
Marketing on Complementary food	0.24	2.66	0.52 - 13.62	0.44	2.36	0.27 - 21.07
Marketing on other Commercial food	0.70	1.54	0.18 - 13.51	0.71	0.56	0.03 – 12.0
Child consumption of commercially produced complementary food products	0.03*	7.82	1.29 - 47.46	0.57	2.00	0.18 - 22.11
Child consumption of commercially produced food products	0.04*	5.96	1.06 - 33.60	0.10	6.40	0.71 - 57.73
STUNTING						
Marketing Channel						
Newspaper	0.82	0.92	0.46 - 1.86	0.05*	0.38	0.15 - 1.001
Television	0.09	2.26	0.89 - 5.79	.002*	9.30	2.31 - 37.40
Radio	0.85	1.08	0.47 - 2.50	0.80	0.86	0.28 - 2.68
Social Media	0.77	0.88	0.38 - 2.02	0.51	1.38	0.53 - 3.61
Marketing on Complementary food	.057	0.46	0.21 - 1.023	0.25	0.59	0.24 - 1.46
Marketing on other Commercial food	.049*	0.49	0.237 - 0.998	.004*	0.21	0.07 - 0.61
Child consumption of commercially produced complementary food products	1.00	0.00	0.00	1.00	0.00	0.00
Child consumption of commercially produced food products	0.36	0.70	0.33 - 1.50	0.58	0.78	0.32 - 1.90
UNDERWEIGHT						
Marketing Channel						
Newspaper	0.86	0.90	0.27 - 2.99	0.33	0.45	0.09 - 2.24
Television	0.24	3.49	0.44 - 27.51	.036*	18.68	1.22 - 286.89
Radio	0.77	0.82	0.22 - 3.11	0.31	0.43	0.08 - 2.20
Social Media	0.26	0.31	0.04 - 2.43	0.29	0.31	0.04 - 2.71
Marketing on Complementary food	0.57	0.68	0.18 - 2.55	0.39	0.47	0.08 - 2.67
Marketing on other Commercial food	0.26	0.52	0.16 - 1.63	0.07	0.21	0.04 - 1.14
Child consumption of commercially produced complementary food products	0.27	2.49	0.49 - 12.51	.417	2.48	0.28 - 22.28
Child consumption of commercially produced food products	0.16	2.23	0.73 - 6.79	.129	2.92	0.73 - 11.63

*p<0.05

4.5 Community Food Systems and Nutritional Status

This section focused on establishing the relationship between the two major blocks of community food systems, which included supermarkets and markets, restaurants and street food, and the nutrition status of children between 6-24 months in Obunga Slums, Kenya.

4.5.1 Supermarkets and Markets

4.5.1.1 Characteristics of Supermarkets and Markets

The results show the factors caregivers consider regarding supermarkets and markets. Most people bought food from local shops (84.7%) and vegetable stalls (68.3%). While (47.6%) 90 purchased from open-air markets, only (9.5%) 18 bought from supermarkets. Supermarkets were over five kilometers away for about (6.9%) 13 of those who bought from supermarkets, while the open-air markets were over five kilometers away for (11.1%) 21 of those who purchased foods from the open-air market, as presented in Table 4.14.

Table 4.14 Supermarkets and Markets Characteristics

Characteristics	Frequency	Proportion Percent %
Source of Food		
Supermarkets	18	9.5
Open-air markets	90	47.6
Local shops	160	84.7
Local vegetable stalls	129	68.3
Distance of the supermarket from the House		
Less than 1 km	6	3.2
Less than 5km but more than 1 Km	6	3.2
More than 5km	13	6.9
N/A (Do not buy from Supermarkets)	164	86.8
Distance of the open-air market from the house		
Less than 1 km	52	27.5
Less than 5km but more than 1 Km	17	9.0
More than 5km	21	11.1
N/A (does not usually go to the open market)	99	52.4

4.5.1.2 Relationships between Supermarkets and Markets and Nutritional Status

The food sources were categorized, with one food source representing supermarkets as a place of access to food, two food sources represented food access from both supermarkets and open-air markets, three food sources represented food access from supermarkets, open-air markets and local shops, while four food sources represented food access from supermarkets, open-air markets, local shops and local vegetable stalls. The results revealed that an increase in the food sources increased the prevalence of underweight both at a (Crude O.R. =19.500, C.I. =1.61-236.61) and at an (adjusted O.R. = 21.331, C.I. =1.370-332.239) as presented in Table 4.15.

Table 4.15 Relationships between Supermarkets and Markets and Nutritional Status

Characteristics	Sig	Crude O. R	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
WASTING						
Number of Food Sources						
One source of food	0.49	*Ref*	*Ref*	0.88	*Ref*	*Ref*
Two sources of food	0.71	0.65	0.07 - 6.50	0.71	0.64	0.06 - 6.87
Three sources of food	0.90	0.84	0.05 - 14.08	0.62	0.46	0.02 - 10.12
Four sources of food	0.32	4.33	0.24 - 79.59	0.81	1.51	0.06 - 38.48
Distance of the Supermarket from the house	0.12	0.55	0.25 - 1.18	0.38	0.67	0.27 - 1.64
Distance of the market from the house	0.19	0.66	0.36 - 1.23	0.26	0.66	0.33 - 1.35
STUNTING						
Number of Food Sources						
One source of food	0.29	*Ref*	Ref	*Ref*	0.35	*ref*
Two sources of food	0.42	1.51	0.56 - 4.04	0.38	1.57	0.58 - 4.30
Three sources of food	0.52	0.65	0.17 - 2.42	0.61	0.69	0.17 - 2.88
Four sources of food	0.28	2.63	0.46 - 15.11	0.36	2.40	0.37 -15.56
Distance of the Supermarket from the house	0.55	0.87	0.55 - 1.39	0.63	0.88	0.52 - 1.49
Distance of the market from the house	0.54	1.08	0.84 - 1.39	0.88	1.02	0.77 - 1.36
UNDERWEIGHT						
Number of Food Sources						
One source of food	0.02	Ref	Ref	0.11	Ref	ref
Two sources of food	0.68	1.57	0.19 -13.31	0.56	1.95	0.21- 18.15
Three sources of food	0.40	2.69	0.26 - 27.48	0.26	4.65	0.33 - 65.61
Four sources of Food	0.02*	19.50	1.61 -236.61	0.03*	21.33	1.37 - 332.24
Distance of the Supermarket from the house	0.06	0.57	0.32 - 1.02	0.35	0.69	0.31 - 1.51
Distance of the market from the house	0.62	0.90	0.60 - 1.35	0.45	1.25	0.70 - 2.23

*p<0.05

4.5.2. Restaurants and Street Foods

4.5.2.1. Purchase of Food from Restaurants and Street Foods

The results show the factors caregivers consider regarding the consumption of restaurant and street foods. While only 14.8% of the caregivers bought food from restaurants, 84.7% bought street food. In the week preceding the survey, only 3.7% of the children aged 6-24 months had consumed food from restaurants, while 64.6% had consumed street foods as shown in Table 4.16.

Table 4.16 Restaurants and Street Foods Characteristics

Characteristics	No	Percentage (%)
Purchase of food from restaurants/hotel		
Yes	28	14.8
Frequency of food purchases from the restaurants/hotel		
Daily	1	0.5
Weekly	3	1.6
Monthly	3	1.6
Rarely	24	12.7
Never	158	83.6
Consumption of food from the restaurants/hotels in the past week		
Yes	7	3.7
Purchase of street foods		
Yes	160	84.7
Frequency of purchasing street food		
Daily	25	13.2
Weekly	113	59.8
Monthly	10	5.3
Rarely	16	8.5
Never	25	13.2
Consumption of street foods in the past week		
Yes	122	64.6

4.5.2.2 Relationship between Restaurants and Street Foods and Nutritional Status

The results show the association between restaurant and street food and the nutrition status of a child. The results reveal that buying food from restaurants or hotels and child consumption of food from restaurants or hotels in the week preceding the survey were significantly associated with

wasting and stunting. Where frequency in the child consumption of food from restaurants/hotels increased wasting by 14 times at (Adjusted Odd's Ratio of 14.52, C.I. = 1.39 -151.71 P<0.05). However, purchasing foods from restaurants and hotels reduced stunting by 0.13 times (Adjusted Odd's Ratio of 0.13, C.I. = 0.02 - 0.90, P<0.05) as shown in Table 4.17.

Table 4.17 Relationship between Restaurants and Street Foods and Wasting

Characteristics	Sig	Crude O. R	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
WASTING						
Purchase of food from restaurants/hotel	0.22	3.02	0.53 - 17.33	0.95	0.91	0.06 - 14.27
Frequency of food purchases from restaurants/hotels.	0.03*	0.45	0.22 - 0.93	0.43	0.63	0.20 - 1.97
Child consumption of food from the restaurants/hotels	.003*	17.80	2.62 - 120.93	.025*	14.52	1.39 - 151.71
Purchase of street foods	0.93	0.90	0.10 - 8.03	0.49	0.32	0.01 - 8.18
Frequency of purchasing street food	0.98	1.01	0.52 - 1.96	0.51	0.71	0.26 - 1.98
Child consumption of street foods.	0.91	1.10	0.20 - 6.18	0.92	1.12	0.11 - 11.70
STUNTING						
Purchase of food from restaurants/hotel	0.02*	0.18	0.04 - 0.77	0.04*	0.13	0.02 - 0.90
Frequency of food purchases from restaurants/hotels.	0.09	2.09	0.89 - 4.92	0.77	0.86	0.32 - 2.35
Child consumption of food from the restaurants/hotels	0.45	0.44	0.05 - 3.75	0.78	0.70	0.06 - 8.28
Purchase of street foods	0.09	2.60	0.86 - 7.88	0.07	4.60	0.89 - 23.80
Frequency of purchasing street food	0.29	0.86	0.65 - 1.14	0.36	1.25	0.77 - 2.04
Child consumption of street foods.	0.48	1.28	0.65 - 2.54	0.71	1.18	0.50 - 2.81
UNDERWEIGHT						
Purchase of food from restaurants/hotel	0.95	0.96	0.20 - 4.52	0.41	0.37	0.03 - 3.82
Frequency of food purchases from restaurants/hotels.	0.41	0.75	0.37 - 1.51	0.54	0.72	0.26 -2.02
Child consumption of food from the restaurants/hotels	0.05	5.67	0.99 - 32.32	0.07	7.41	0.88 - 62.66
Purchase of street foods	0.91	1.10	0.23 - 5.17	0.57	0.52	0.05 - 5.10
Frequency of purchasing street food	0.68	0.91	0.56 - 1.46	0.61	0.83	0.40 - 1.72
Child consumption of street foods.	0.58	1.41	0.42 - 4.67	0.55	1.63	0.33 - 8.12

*p<0.05

CHAPTER FIVE
DISCUSSION

5.1 Nutritional Status of Children between 6-24 Months

These results reveal that the prevalence of stunting at 27% is higher than the global levels, where 22.3% of children are stunted (hmoumen, 2023a). The newly released Kenya Demographic Health Survey also shows that stunting in Kenya has decreased to 18% (KDHS-2022). Data on nutrition status in the urban slums is missing, and the focus is on the urban-rural divide, where in urban areas, stunting was at 12% and 20% in the rural areas. The nutrition rural-urban divide is usually a result of food availability, higher purchasing power, access to health care, education, good sanitation, and clean water, which improve the nutrition status of children (Fagbamigbe et al., 2020; hmoumen, 2023b). However, slum areas lack these protective factors. Studies consistently show that slum areas report very high levels of malnutrition (Abuya et al., 2012b; Kimani-Murage et al., 2015; Omondi & Kirabira, 2016b). However, compared to other studies done in Obunga slums (Omondi & Kirabira, 2016a), A sentinel survey by Kisumu Medical and Education Trust, 2011, and other slums in Nairobi (Abuya et al., 2012a; Olack et al., 2011). Stunting has reduced drastically. However, the difference might be because the other studies focused on under-fives, while this study focused on children between six and twenty-four months.

The data also reveals that wasting was at 3.2%, lower than the national level of 5%, while overweight was at 6.9%, higher than the national level of 3%. (KDHS, 2022 n.d.). The rising levels of overweight children were also seen among slums in Nairobi at 9% (Kimani-Murage et al., 2015) and India, with overweight at 11% (Bhattacharyya et al., 2021). This study clearly shows that children between 6-24 months in urban slums contribute to the national burden of malnutrition, an acute situation with slum areas estimated to increase by up to 3 billion in 2050 (Bhalla, n.d.), and malnutrition contributing to a 6.9% loss in GDP (World Food Programme (WFP) et al., 2019).

Then, it becomes paramount for longitudinal studies to fully understand the causes of both the high levels of stunting and the increasing obesity levels and for interventions to be put in place to curb the rising malnutrition.

5.2 Socio-Demographic Factors and Nutritional Status of Children

The results showed that the prevalence of stunting and being underweight amongst boys was higher, while wasting and overweight was higher among girls. The findings agreed with a study by (Ahmad et al., 2018), where boys had a higher prevalence of being underweight and stunting, and wasting was higher in girls. A child's increasing age significantly contributed to an increase in stunting; this agreed with studies in similar settings, which showed that as a child's age increased, so did the prevalence of stunting increase (Ahsan et al., 2017; Khan et al., 2019; Saaka et al., 2015). In Obunga slums, wasting and underweight seemed to decrease with age, but there were no significant associations; in comparison to other studies, wasting and underweight did not follow a particular trend, and it would reduce with age (Khan et al., 2019), or increase with age (Saaka et al., 2015). The increase in stunting might be due to the late initiation of complementary feeding (Saaka et al., 2015). This is because when complementary feeding begins later than six months, children will likely become wasted and underweight. However, as they grow older and wasting and underweight are not quickly identified, they might become stunted.

Birth weight above 2500 grams was associated with reduced wasting, but no associations were seen between stunting and underweight. These results were consistent with other findings, where low birth weight increased the chances of childhood malnutrition (Abuya et al., 2012a; Hien & Kam, 2008; Khan et al., 2019; Mya et al., 2019; Rahman et al., 2016). Low birth weight predisposes children to infections (McCormick, 1985; West et al., 2018; Yasmin et al., 2001), which ultimately leads to malnutrition if infections are severe. A study by (Rahman et al., 2016)

found that modifying recognized risk factors (education level of the caregiver, socioeconomic factors) for child malnutrition did not alter the impact of low birth weight on malnutrition. Therefore, the focus should be on prenatal care to reduce malnutrition among children with low birth weight (Haque et al., 2015; Saaka et al., 2015).

On the other hand, wasting increased as the education levels of the caregiver increased. However, no associations were seen between stunting and being underweight. This was in contradiction with other studies, where increasing caregivers' level of education reduced both underweight (Chowdhury et al., 2018;) and stunting (Abuya et al., 2012; Khan et al., 2019; Mamulwar et al., 2014). However, a study in Obunga slums, Kenya (Omondi & Kirabira, 2016) and Pune slums, India (Mamulwar et al., 2014) agreed with the findings, and no associations were seen between caregivers' education level and stunting. Most caregivers, over 90.5%, were birth mothers. Maternal education has been shown to improve nutrition outcomes, as literacy skills enhance the maternal ability to detect illness and directly transfer health knowledge to future generations (Abuya et al., 2012a). The results might suggest that higher education leaves the mothers engaged with other activities and thus might not be actively involved in child care.

Maternal income has positive (Chávez-Zárate et al., 2019) and negative (Rashad & Sharaf, 2019) outcomes on child nutrition status. Maternal income increases household income, but it also reduces the maternal time that would have been spent on breastfeeding, caring for children, and preparation of healthy meals. In this study, wasting was decreased if the primary caregiver was self-employed compared to being employed and not employed. Still, no associations were found between the occupation of the primary caregiver and underweight and stunting. (Rashad & Sharaf, 2019) found out that employment among working mothers increased stunting, and (Chávez-Zárate et al., 2019; Manzione et al., 2019) found out that the type of remuneration among working mothers

reduced stunting. There is no clear evidence of the impact that the Main occupation of the primary caregiver has on the child. Still, maternal occupation seems to be both good and bad regarding the child's nutritional status. Thus, longitudinal studies need to focus on types of employment and non-employed mothers and their impact on the child's nutrition status.

5.3 Broad Food System and Nutritional Status

Food price is an essential determinant in food purchases (Lin et al., 2014). Rising food prices decrease a household's purchasing ability (Campbell et al., 2010). To cope with the increasing food prices, there is usually a reduction in both the household's energy intake and dietary diversity (Brinkman et al., 2010). This study showed that an increase in food prices was significantly associated with a reduction in the consumption of roots and tuber foods, legumes, organ meat and eggs, but the consumption of vegetables increased. The increase in vegetable consumption was contradictory to a study by (Adhiguru & Ramasamy, 2003), who found that rising food prices would reduce the consumption of vegetables but agreed with (Campbell et al., 2010; Sari et al., 2010; Yu & Yu, 2012), who showed that an increase in food prices reduced the consumption of animal-source foods. The reduction in food quality has been identified as a coping mechanism among vulnerable populations (Brinkman et al., 2010; Meerman & Aphane, n.d.; Romano et al., 2015), whereas food prices reduce diet quality and quantity (Brinkman et al., 2010; Meerman & Aphane, n.d.). The increase in vegetable consumption was possibly because In Kisumu County, where Obunga is located. The staple cereal is maize prepared as ugali (a stiff porridge commonly consumed with a meat stew, fish or vegetables) or as *githeri* (a mixture of maize and beans). The increased food price led to reduced consumption of legumes, roots and tubers and animal-source foods. It is then assumed that vegetables became the primary accompaniment for ugali.

This study also found that increasing the price of fruits was significantly associated with wasting and being underweight. High food prices have been associated with undernutrition (Headey & Alderman, 2019; Meerman & Aphane, n.d.). In Bangladesh, high expenditure on rice, compared to non-rice items, increased the odds of child stunting. At the same time, a reduction was seen in households where rice expenditure was low (Campbell et al., 2010). High spending on rice reduced the money available to purchase animal-source food, vegetables, fruits and oils, reducing food quality (Campbell et al., 2010). In Indonesia, households that spent a large percentage of their income on animal-source foods had a lower prevalence of stunting (Sari et al., 2010). Food from animal sources is a high-quality protein, rich in micronutrients Vitamin B_{12}, Iron, Riboflavin, Vitamin A, phosphorous, calcium and zinc, and essential fatty acids (Campbell et al., 2010; Murphy & Allen, 2003). Intake of these foods by children reduces stunting, as they boost growth, micronutrient status and cognitive development in children (Murphy & Allen, 2003). As food prices continue increasing, the meal portion sizes reduce, and the frequency of meals decreases as well; this reduces the staples consumed, leading to macro-nutrient deficiencies and increasing the risk of acute malnutrition amongst children (Brinkman et al., 2010). It is fascinating to note that rising fruit and vegetable prices have also been linked to higher children's body mass indices that are higher (Morrissey et al., 2014), while subsidies on fruits and vegetables were shown to improve children's and adolescents' weight outcomes (Powell & Chaloupka, 2009)

Food aid has been an instrument for addressing acute and chronic malnutrition in low-income countries (Barrett & Barrett, 2006). While it has a minimal impact on the general population, the effects on vulnerable populations are significant (Cogill, 2013). In this study, the number of persons receiving food aid was relatively low, at less than 15%. With relatives being the major contributors to food aid, cereals, pulses, roots, and tubers are the food most received from food

aid. While there were different forms of food aid, free food distribution was the most common. In this study, food aid did not impact children's nutritional status. However, a study (Quisumbing, 2003) showed that food aid, provided as food for work and free distribution, improved under-five weight.

Food and Beverage marketing promotes particular brands and food categories (Neff et al., 2009), with children being intensively targeted by food marketing and advertisements (Story & French, 2004). This study shows that caregivers' exposure to commercially produced food products was high at over 75% (145) compared to exposure to commercially produced complementary food products, which stood at 28% of the population. The trend was similar to other studies that have been done both on commercially produced food products and commercially produced complementary food products (Pries et al., 2016; Vitta et al., 2016). Exposure to food commercials has increased Obesity among children, adolescents, and adults (Rosiek et al., 2015). In this study, however, stunting was also decreased amongst children whose caregivers listened, read, or watched promotional practices on commercial foods. However, watching television food-related adverts increased the underweight prevalence. This agreed with (Trofholz et al., 2019), as watching television was associated with poor dietary quality. Children consumed more unhealthy foods, including sugar-sweetened beverages, chips, and crackers, leading to poor weight outcomes. The results of this study showed that feeding children commercially produced food complementary foods and commercially produced foods contributed to increasing wasting. This might be because most commercial snacks and food products are of low nutritional quality (Cairns et al., 2013; Feeley et al., 2016; Powell et al., 2007; Pries et al., 2016; Vitta et al., 2016).

5.4 Community Food Systems and Nutritional Status

In this study, most caregivers bought food from the local shops and vegetable stalls around the homes, which were easily accessible by foot. The presence of supermarkets and markets has been shown to affect nutrition outcomes differently among adults. In high-income countries, the presence of supermarkets reduced obesity (Larson et al., 2009; Neff et al., 2009; Treuhaft & Karpyn, 2010). While in low-income countries, supermarkets increase obesity (Demmler et al., 2018; Khonje et al., 2020). In Obunga slums, in this study, it was seen that access to markets, supermarkets, and local retailers increased the prevalence of underweight, which was in contrast with other studies that showed access to daily markets decreased stunting (Chikhungu et al., 2014; Hirvonen et al., 2017). The results were also in total contrast to a study in rural Kenya by (Debela et al., 2020), which showed that purchasing food from supermarkets reduced stunting, underweight and wasting. In Zambia, purchases from local retailers also increased child height (Khonje et al., 2020). The contrasts are seen because supermarkets have been shown to improve variety and food diversity. However, they sell more processed foods than traditional markets (Khonje et al., 2020). Thus, caregiver knowledge of purchasing might have led to the negative effect of markets and supermarkets on weight for age z-scores in Obunga slums.

Street foods have been considered time-saving and relatively cheap, as they can be bought in small quantities. However, they are usually inadequate due to poor nutrient density and might not be safe; street food consumption was high, with over 80% of caregivers purchasing it. This was in line with data from Kenyan urban slums (Kimani-Murage et al., 2015). However, very few caregivers purchased food from hotels at less than 15%. Child consumption of restaurant/hotel food in the week preceding the survey increased wasting, but interestingly, the purchase of restaurant foods slightly reduced stunting. These results reveal the need for a longitudinal study

that would be able to understand why there is an enormous increase in wasting. While high Street food consumption was not associated with either positive or negative outcomes on nutrition status. In other studies, however, consumption of street foods has been shown to worsen nutrition outcomes in children (Prasodjo et al., 2017). These might be due to their unhygienic preparation and handling of the foods (Alimi, 2016).

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of Findings

The study had a total of 189 children, 108 males and 81 females. Obunga slums, The mean age for the 189 children in this study was 15.15 months; the minimum age was six months, and the maximum was 24 months. The prevalence of stunting was 27%. The prevalence of overweight (6.9%), underweight was at (7.4%), and the wasting prevalence was at (3.2%).

Socio-demographic factors: wasting was associated with the child's birthweight (A.O.R = 0.021, C.I. =0.001 -0.524) and caregiver's level of education (A.O.R = 11.431, C.I. = 1.407 - 92.857). Stunting was associated with the child's age (A.O.R = 1.099, C.I. = 1.021 -1.183) and household daily earnings (O.R. = 0.708, C.I. =0.512 -0.978). Being Underweight was associated with the occupation of the caregiver (A.O.R = 0.217, C.I. = 0.52 - 0.900).

Broad food systems: Wasting was associated with the food price of fruits (A.O.R = 10.822, C.I. =1.097 -106.774), child consumption of commercially produced food complementary food (O. R=7.818, C.I. =1.056 -33.596) and commercially produced food (O.R. = 5.957, C.I. =1.56 - 33.596). Stunting was associated with listening/reading/watching promotional practices for commercial food at (O. R=0.486, C.I. = 0.237 -0.998). Underweight was associated with the price of fruits at (A.O.R =5.435, C.1. =1.367-21.610).

Community Food Systems: An increase in the food sources increased the prevalence of underweight both at a (Crude O.R. =19.500, C.I. =1.61-236.61) and at an (A.O.R. = 21.331, C.I. =1.370-332.239). At the same time, frequency in the child consumption of food from restaurants/hotels increased wasting by 14 times (A.O.R of 14.52, C.I. = 1.39 -151.71 $P<0.05$). However, purchasing foods from restaurants and hotels reduced stunting by 0.13 times (A.O.R = 0.13, C.I. = 0.02 - 0.90, $P<0.05$).

6.2 Conclusion

The prevalence of stunting and overweight was higher than the national average. At the same time, the underweight and wasting levels were lower than the national averages.

Socio-demographic factors that impacted nutrition status included an increase in a child's birth weight reduced wasting. In contrast, the caregivers' level of education increased wasting. An increase in the child's age increases stunting. At the same time, household earnings had reduced the odds of stunting. Children of self-employed caregivers reduced the odds of being underweight.

In the Broad food systems category, the increases in the price of fruits increased wasting and levels of underweight, while feeding children commercially produced food products and complementary foods increased wasting. Watching food-related adverts on television increased both stunting and underweight.

In the community food systems category. Increasing the food sources increased the prevalence of being underweight. At the same time, the frequency of consumption of street foods also increased wasting. However, purchasing this food from hotels/restaurants reduced stunting.

6.3 Recommendations

6.3.1 Recommendations for Practice

1. Creating livelihood programs, which help increase the households' daily income, as this study showed the increases in the daily income, helped to reduce stunting.
2. Nutrition education to encourage the consumption of fruits, despite price increases, helping to reduce the prevalence of wasted and underweight children.
3. Nutrition education encourages mothers to reduce feeding children from restaurants or hotels, as consumption of these foods increases stunting.

6.3.2 Recommendations For Policy

1. Policies to help provide subsidies that would reduce the price of fruits are essential, as this will improve both underweight and wasting.
2. Regulate the marketing of commercially produced food products on television to reduce the prevalence of stunted and wasted children.

6.3.3 Recommendations for Future Research

1. Longitudinal studies can focus on the long-term effect of broad food systems (food prices; food and beverage marketing) on the nutritional status of children 6-24 months.
2. Longitudinal studies can focus on the long-term effect of community food systems (markets, supermarkets, and street foods) on the nutritional status of children 6-24 months.

REFERENCES

1. *2022 Global Nutrition Report—Global Nutrition Report*. (n.d.). Retrieved October 4, 2023, from https://globalnutritionreport.org/reports/2022-global-nutrition-report/
2. Abuya, B. A., Ciera, J., & Kimani-Murage, E. (2012a). Effect of mother's education on child's nutritional status in the slums of Nairobi. *BMC Pediatrics*, *12*(1), 1–10.
3. Abuya, B. A., Ciera, J., & Kimani-Murage, E. (2012b). Effect of mother's education on child's nutritional status in the slums of Nairobi. *BMC Pediatrics*, *12*(1), Article 1.
4. Adhiguru, P., & Ramasamy, C. (2003). *Agricultural-based interventions for sustainable nutritional security*.
5. Ahsan, K. Z., Arifeen, S. E., Al-Mamun, Md. A., Khan, S. H., & Chakraborty, N. (2017). Effects of individual, household and community characteristics on child nutritional status in the slums of urban Bangladesh. *Archives of Public Health*, *75*(1), 9. https://doi.org/10.1186/s13690-017-0176-x
6. Ajao, K. O., Ojofeitimi, E. O., Adebayo, A. A., Fatusi, A. O., & Afolabi, O. T. (2010). Influence of family size, household food security status, and child care practices on the nutritional status of under-five children in Ile-Ife, Nigeria. *African Journal of Reproductive Health*, *14*(4 Spec no.), 117–126.
7. Akhtar, K., Haque, M., Islam, M., Yusuf, M., Sharif, A., & Ahsan, A. (2012). Feeding Pattern and Nutritional Status of Under Two Years Slum Children. *Journal of Shaheed Suhrawardy Medical College*, *4*(1), 3–6. https://doi.org/10.3329/jssmc.v4i1.11994
8. Akombi, B. J., Agho, K. E., Hall, J. J., Merom, D., Astell-Burt, T., & Renzaho, A. M. N. (2017). Stunting and severe stunting among children under-5 years in Nigeria: A

multilevel analysis. *BMC Pediatrics*, *17*(1), 15. https://doi.org/10.1186/s12887-016-0770-z

9. Alimi, B. A. (2016). Risk factors in street food practices in developing countries: A review. *Food Science and Human Wellness*, *5*(3), 141–148. https://doi.org/10.1016/j.fshw.2016.05.001
10. Barrett, C. B., & Barrett, C. B. (2006). *Food aid's intended and unintended consequences*. https://doi.org/10.22004/AG.ECON.289062
11. Bhalla, N. (n.d.). *World's slum populations set to surge as housing crisis bites | Context*. Retrieved June 30, 2023, from https://www.context.news/socioeconomic-inclusion/worlds-slum-populations-set-to-surge-as-housing-crisis-bites
12. Bhattacharyya, M., Roy, S., Sarkar, A., Sinha, R., Mallick, A., & Bandyopadhyay, S. (2021). Burden of malnutrition among school-going children in a slum area of Kolkata: A matter of concern. *Journal of Family Medicine and Primary Care*, *10*(8), 2940. https://doi.org/10.4103/jfmpc.jfmpc_2472_20
13. Brinkman, H.-J., de Pee, S., Sanogo, I., Subran, L., & Bloem, M. W. (2010). High Food Prices and the Global Financial Crisis Have Reduced Access to Nutritious Food and Worsened Nutritional Status and Health. *The Journal of Nutrition*, *140*(1), 153S-161S. https://doi.org/10.3945/jn.109.110767
14. Cairns, G., Angus, K., Hastings, G., & Caraher, M. (2013). Systematic reviews of the evidence on the nature, extent and effects of food marketing to children. A retrospective summary. *Appetite*, *62*, 209–215. https://doi.org/10.1016/j.appet.2012.04.017
15. Campbell, A. A., de Pee, S., Sun, K., Kraemer, K., Thorne-Lyman, A., Moench-Pfanner, R., Sari, M., Akhter, N., Bloem, M. W., & Semba, R. D. (2010). Household Rice

Expenditure and Maternal and Child Nutritional Status in Bangladesh. *The Journal of Nutrition*, *140*(1), 189S-194S. https://doi.org/10.3945/jn.109.110718

16. Chávez-Zárate, A., Maguiña, J. L., Quichiz-Lara, A. D., Zapata-Fajardo, P. E., & Mayta-Tristán, P. (2019). Relationship between stunting in children 6 to 36 months of age and maternal employment status in Peru: A sub-analysis of the Peruvian Demographic and Health Survey. *PLOS ONE*, *14*(4), e0212164. https://doi.org/10.1371/journal.pone.0212164
17. Chikhungu, L. C., Madise, N. J., & Padmadas, S. S. (2014). How important are community characteristics in influencing children′s nutritional status? Evidence from Malawi population-based household and community surveys. *Health & Place*, *30*, 187–195. https://doi.org/10.1016/j.healthplace.2014.09.006
18. Chowdhury, T. R., Chakrabarty, S., Rakib, M., Saltmarsh, S., & Davis, K. A. (2018). Socio-economic risk factors for early childhood underweight in Bangladesh. *Globalization and Health*, *14*(1), 54. https://doi.org/10.1186/s12992-018-0372-7
19. Claasen, N., & Pointer, R. (n.d.). *Cite as: Claasen, N., van der Hoeven, M., and Covic, N 2016. Food environments, health*. 37.
20. Cogill, B. (2013). Making the most of food aid to help prevent child and maternal deaths. *Global Health: Science and Practice*, *1*(2), 141–144. https://doi.org/10.9745/GHSP-D-13-00084
21. De Sanctis, V., Soliman, A., Alaaraj, N., Ahmed, S., Alyafei, F., & Hamed, N. (2021). Early and Long-term Consequences of Nutritional Stunting: From Childhood to Adulthood: Early and Long-term Consequences of Nutritional Stunting. *Acta Bio Medica Atenei Parmensis*, *92*(1), 11346. https://doi.org/10.23750/abm.v92i1.11346

22. Debela, B. L., Demmler, K. M., Klasen, S., & Qaim, M. (2020). Supermarket food purchases and child nutrition in Kenya. *Global Food Security*, *25*, 100341. https://doi.org/10.1016/j.gfs.2019.100341

23. Demmler, K. M., Ecker, O., & Qaim, M. (2018). Supermarket Shopping and Nutritional Outcomes: A Panel Data Analysis for Urban Kenya. *World Development*, *102*, 292–303. https://doi.org/10.1016/j.worlddev.2017.07.018

24. Dewey, K. G., & Begum, K. (2011). Long-term consequences of stunting in early life: Long-term consequences of stunting. *Maternal & Child Nutrition*, *7*, 5–18. https://doi.org/10.1111/j.1740-8709.2011.00349.x

25. Fagbamigbe, A. F., Kandala, N. B., & Uthman, A. O. (2020). Demystifying the factors associated with rural–urban gaps in severe acute malnutrition among under-five children in low- and middle-income countries: A decomposition analysis. *Scientific Reports*, *10*(1), 11172. https://doi.org/10.1038/s41598-020-67570-w

26. FAO, W. (2014). Conference outcome document: Rome declaration on nutrition. *Second International Conference on Nutrition. Rome: FAO and WHO*.

27. Feeley, A. B., Ndeye Coly, A., Sy Gueye, N. Y., Diop, E. I., Pries, A. M., Champeny, M., Zehner, E. R., & Huffman, S. L. (2016). Promotion and consumption of commercially produced foods among children: Situation analysis in an urban setting in Senegal. *Maternal & Child Nutrition*, *12*(S2), 64–76. https://doi.org/10.1111/mcn.12304

28. Fekadu, Y., Mesfin, A., Haile, D., & Stoecker, B. J. (2015). Factors associated with nutritional status of infants and young children in Somali Region, Ethiopia: A cross-sectional study. *BMC Public Health*, *15*(1), 846. https://doi.org/10.1186/s12889-015-2190-7

29. *Food Assistance for Assets | World Food Programme*. (n.d.). Retrieved April 4, 2022, from https://www.wfp.org/food-assistance-for-assets

30. *Fr308.pdf*. (n.d.). Retrieved February 28, 2022, from https://dhsprogram.com/pubs/pdf/fr308/fr308.pdf

31. Galasso, E., & Wagstaff, A. (n.d.). *The Economic Costs of Stunting and How to Reduce Them*. 57.

32. Gichunge, C., Ogachi, S., Kiboi, W., & Mukhwana, E. S. (2023). Vending environment and hygiene practices of street food vendors in an out of campus food environment in Kenya. *International Journal Of Community Medicine And Public Health*, *10*(3), 1005–1010. https://doi.org/10.18203/2394-6040.ijcmph20230614

33. Green, R., Cornelsen, L., Dangour, A. D., Turner, R., Shankar, B., Mazzocchi, M., & Smith, R. D. (2013). The effect of rising food prices on food consumption: Systematic review with meta-regression. *BMJ*, *346*(jun17 1), f3703–f3703. https://doi.org/10.1136/bmj.f3703

34. Gupta, V., Downs, S. M., Ghosh-Jerath, S., Lock, K., & Singh, A. (2016). Unhealthy Fat in Street and Snack Foods in Low-Socioeconomic Settings in India: A Case Study of the Food Environments of Rural Villages and an Urban Slum. *Journal of Nutrition Education and Behavior*, *48*(4), 269-279.e1. https://doi.org/10.1016/j.jneb.2015.11.006

35. Habitat, U. N. (2006). State of the World's Cities 2006/7. *New York: United Nations*, *292*.

36. Haque, S. R., Tisha, S., & Huq, N. (2015). Poor birth size a badge of low birth weight accompanying less antenatal care in Bangladesh with substantial divisional variation: Evidence from BDHS-2011. *Birth*, *1*(2476), 33–38.

37. Headey, D. D., & Alderman, H. H. (2019). The Relative Caloric Prices of Healthy and Unhealthy Foods Differ Systematically across Income Levels and Continents. *The Journal of Nutrition*, *149*(11), 2020–2033. https://doi.org/10.1093/jn/nxz158

38. Hien, N. N., & Kam, S. (2008). Nutritional Status and the Characteristics Related to Malnutrition in Children Under Five Years of Age in Nghean, Vietnam. *Journal of Preventive Medicine and Public Health*, *41*(4), 232. https://doi.org/10.3961/jpmph.2008.41.4.232

39. Hirvonen, K., Hoddinott, J., Minten, B., & Stifel, D. (2017). Children's Diets, Nutrition Knowledge, and Access to Markets. *World Development*, *95*, 303–315. https://doi.org/10.1016/j.worlddev.2017.02.031

40. hmoumen. (2023a, May 18). *UNICEF-WHO-The World Bank: Joint Child Malnutrition Estimates (JME) — Levels and Trends – 2023 edition*. UNICEF DATA. https://data.unicef.org/resources/jme-report-2023/

41. hmoumen. (2023b, July 12). *State of Food Security and Nutrition in the World (SOFI) 2023*. UNICEF DATA. https://data.unicef.org/resources/sofi-2023/

42. Hoddinott, J., Maluccio, J. A., Behrman, J. R., Flores, R., & Martorell, R. (2008). Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. *The Lancet*, *371*(9610), 411–416. https://doi.org/10.1016/S0140-6736(08)60205-6

43. Huang, C. Y., Reisch, L. A., Gwozdz, W., Molnár, D., Konstabel, K., Michels, N., Tornaritis, M., Eiben, G., Siani, A., Fernández-Alvira, J. M., Ahrens, W., Pigeot, I., & Lissner, L. (2016). Pester power and its consequences: Do European children's food

purchasing requests relate to diet and weight outcomes? *Public Health Nutrition*, *19*(13), 2393–2403. https://doi.org/10.1017/S136898001600135X

44. Jana, A., Dey, D., & Ghosh, R. (2023). Contribution of low birth weight to childhood undernutrition in India: Evidence from the national family health survey 2019–2021. *BMC Public Health*, *23*(1), 1336. https://doi.org/10.1186/s12889-023-16160-2
45. Johnson, M., Samuel, I., Irene, O., & Paul, K. (2020). Food safety knowledge and practices of street food vendors in selected locations within Kiambu County, Kenya. *African Journal of Food Science*, *14*(6), 174–185. https://doi.org/10.5897/AJFS2020.1929
46. Kassa, T., Meshesha, B., Haji, Y., & Ebrahim, J. (2016). Appropriate complementary feeding practices and associated factors among mothers of children age 6–23 months in Southern Ethiopia, 2015. *BMC Pediatrics*, *16*(1), 131. https://doi.org/10.1186/s12887-016-0675-x
47. Kenya National Bureau of Statistics, Ministry of Health/Kenya, National AIDS Control Council/Kenya, Kenya Medical Research Institute, & National Council for Population and Development/Kenya. (2015a). *Kenya Demographic and Health Survey 2014*. http://dhsprogram.com/pubs/pdf/FR308/FR308.pdf
48. Kenya National Bureau of Statistics, Ministry of Health/Kenya, National AIDS Control Council/Kenya, Kenya Medical Research Institute, & National Council for Population and Development/Kenya. (2015b). *Kenya Demographic and Health Survey 2014*. http://dhsprogram.com/pubs/pdf/FR308/FR308.pdf
49. Kenya National Bureau of Statistics, Ministry of Health/Kenya, National AIDS Control Council/Kenya, Kenya Medical Research Institute, & National Council for Population

and Development/Kenya. (2015c). *Kenya Demographic and Health Survey 2014*. http://dhsprogram.com/pubs/pdf/FR308/FR308.pdf

50. Khan, S., Zaheer, S., & Safdar, N. F. (2019). Determinants of stunting, underweight and wasting among children < 5 years of age: Evidence from 2012-2013 Pakistan demographic and health survey. *BMC Public Health*, *19*(1), 358. https://doi.org/10.1186/s12889-019-6688-2
51. Khonje, M. G., Ecker, O., & Qaim, M. (2020). Effects of Modern Food Retailers on Adult and Child Diets and Nutrition. *Nutrients*, *12*(6), Article 6. https://doi.org/10.3390/nu12061714
52. Kigaru, D. M. D., Loechl, C., Moleah, T., Macharia-Mutie, C. W., & Ndungu, Z. W. (2015). Nutrition knowledge, attitude and practices among urban primary school children in Nairobi City, Kenya: A KAP study. *BMC Nutrition*, *1*(1), 44. https://doi.org/10.1186/s40795-015-0040-8
53. Kimani-Murage, E. W., Muthuri, S. K., Oti, S. O., Mutua, M. K., van de Vijver, S., & Kyobutungi, C. (2015). Evidence of a Double Burden of Malnutrition in Urban Poor Settings in Nairobi, Kenya. *PLOS ONE*, *10*(6), e0129943. https://doi.org/10.1371/journal.pone.0129943
54. Kimani-Murage, E. W., Schofield, L., Wekesah, F., Mohamed, S., Mberu, B., Ettarh, R., Egondi, T., Kyobutungi, C., & Ezeh, A. (2014). Vulnerability to Food Insecurity in Urban Slums: Experiences from Nairobi, Kenya. *Journal of Urban Health*, *91*(6), 1098–1113. https://doi.org/10.1007/s11524-014-9894-3
55. Kwasek, M. (2012). Threats to food security and common agricultural policy. *Економика Пољопривреде*, *59*(4), 701–713.

56. Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood Environments. *American Journal of Preventive Medicine*, *36*(1), 74-81.e10. https://doi.org/10.1016/j.amepre.2008.09.025

57. Le, K., & Nguyen, M. (2020). Shedding light on maternal education and child health in developing countries. *World Development*, *133*, 105005. https://doi.org/10.1016/j.worlddev.2020.105005

58. Lenoir-Wijnkoop, I., Jones, P. J., Uauy, R., Segal, L., & Milner, J. (2013). Nutrition economics – food as an ally of public health. *British Journal of Nutrition*, *109*(5), 777–784. https://doi.org/10.1017/S0007114512005107

59. Lin, B.-H., Ver Ploeg, M., Kasteridis, P., & Yen, S. T. (2014). The roles of food prices and food access in determining food purchases of low-income households. *Journal of Policy Modeling*, *36*(5), 938–952. https://doi.org/10.1016/j.jpolmod.2014.07.002

60. Lohia, N., & Udipi, S. A. (2014). Infant and child feeding index reflects feeding practices, nutritional status of urban slum children. *BMC Pediatrics*, *14*(1), 290. https://doi.org/10.1186/s12887-014-0290-7

61. Mamulwar, M., Rathod, H., Jethani, S., Dhone, A., Bakshi, T., Lanjewar, B., Jadhav, S., & Bhawalkar, J. (2014). Nutritional status of under-five children in urban slums of Pune. *International Journal of Medicine and Public Health*, *4*(3), 247. https://doi.org/10.4103/2230-8598.137710

62. Manzione, L., Kriser, H., Gamboa, E., Hanson, C., Mulokozi, G., Mwaipape, O., Hoj, T., Linehan, M., Torres, S., Hall, P., West, J., & Crookston, B. (2019). Maternal Employment Status and Minimum Meal Frequency in Children 6-23 Months in Tanzania.

International Journal of Environmental Research and Public Health, *16*(7), 1137. https://doi.org/10.3390/ijerph16071137

63. McCormick, M. C. (1985). The Contribution of Low Birth Weight to Infant Mortality and Childhood Morbidity. *New England Journal of Medicine*, *312*(2), 82–90. https://doi.org/10.1056/NEJM198501103120204
64. Meerman, J., & Aphane, J. (n.d.). *IMPACT OF HIGH FOOD PRICES ON NUTRITION*. 21.
65. Morrissey, T. W., Jacknowitz, A., & Vinopal, K. (2014). Local Food Prices and Their Associations With Children's Weight and Food Security. *Pediatrics*, *133*(3), 422–430. https://doi.org/10.1542/peds.2013-1963
66. Muinde, O. K., & Kuria, E. (2005). Hygienic and Sanitary Practices of Vendors of Street Foods in Nairobi, Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, *5*(8), 01–14. https://doi.org/10.18697/ajfand.8.1060
67. Murphy, S. P., & Allen, L. H. (2003). Nutritional Importance of Animal Source Foods. *The Journal of Nutrition*, *133*(11), 3932S-3935S. https://doi.org/10.1093/jn/133.11.3932S
68. Mya, K. S., Kyaw, A. T., & Tun, T. (2019). Feeding practices and nutritional status of children age 6-23 months in Myanmar: A secondary analysis of the 2015-16 Demographic and Health Survey. *PLOS ONE*, *14*(1), e0209044. https://doi.org/10.1371/journal.pone.0209044
69. Neff, R. A., Palmer, A. M., McKenzie, S. E., & Lawrence, R. S. (2009). Food Systems and Public Health Disparities. *Journal of Hunger & Environmental Nutrition*, *4*(3–4), 282–314. https://doi.org/10.1080/19320240903337041

70. Okeyo, David. O. (n.d.). *Factors Influencing nutritional status of children under five years in Obunga informal settlements in Kisumu City Kenya. A Post Graduate Research Dissertation.*

71. Olack, B., Burke, H., Cosmas, L., Bamrah, S., Dooling, K., Feikin, D. R., Talley, L. E., & Breiman, R. F. (2011). Nutritional Status of Under-five Children Living in an Informal Urban Settlement in Nairobi, Kenya. *Journal of Health, Population and Nutrition*, *29*(4), 357–363. https://doi.org/10.3329/jhpn.v29i4.8451

72. Omondi, D. O., & Kirabira, P. (2016a). *Socio-Demographic Factors Influencing Nutritional Status of Children (6-59 Months) in Obunga Slums, Kisumu City, Kenya*.

73. Omondi, D. O., & Kirabira, P. (2016b). *Socio-Demographic Factors Influencing Nutritional Status of Children (6-59 Months) in Obunga Slums, Kisumu City, Kenya*.

74. Palos Lucio, A. G., Sansores Martínez, D. N.-H., Olvera Miranda, C., Quezada Méndez, L., & Tolentino-Mayo, L. (2020). Nutritional Quality of Fast Food Kids Meals and Their Contribution to the Diets of School-Aged Children. *Nutrients*, *12*(3), 612. https://doi.org/10.3390/nu12030612

75. Powell, L. M., & Chaloupka, F. J. (2009). Food Prices and Obesity: Evidence and Policy Implications for Taxes and Subsidies. *Milbank Quarterly*, *87*(1), 229–257. https://doi.org/10.1111/j.1468-0009.2009.00554.x

76. Powell, L. M., & Nguyen, B. T. (2013). Fast-Food and Full-Service Restaurant Consumption Among Children and Adolescents: Effect on Energy, Beverage, and Nutrient Intake. *JAMA Pediatrics*, *167*(1), 14. https://doi.org/10.1001/jamapediatrics.2013.417

77. Powell, L. M., Szczypka, G., Chaloupka, F. J., & Braunschweig, C. L. (2007). Nutritional Content of Television Food Advertisements Seen by Children and Adolescents in the United States. *Pediatrics*, *120*(3), 576–583. https://doi.org/10.1542/peds.2006-3595

78. Prasodjo, N. W., Pandjaitan, N. K., Kinseng, R. A., & Khomsan, A. (2017). Structural Analysis of Food Choice Practices for Children under Five Years Old at Rural Communities West Java. *Sodality: Jurnal Sosiologi Pedesaan*, *5*(1).

79. Pries, A. M., Huffman, S. L., Adhikary, I., Upreti, S. R., Dhungel, S., Champeny, M., & Zehner, E. (2016). High consumption of commercial food products among children less than 24 months of age and product promotion in Kathmandu Valley, Nepal. *Maternal & Child Nutrition*, *12*(S2), 22–37. https://doi.org/10.1111/mcn.12267

80. Quisumbing, A. R. (2003). Food Aid and Child Nutrition in Rural Ethiopia. *World Development*, *31*(7), 1309–1324. https://doi.org/10.1016/S0305-750X(03)00067-6

81. Rahman, M. S., Howlader, T., Masud, M. S., & Rahman, M. L. (2016). Association of Low-Birth Weight with Malnutrition in Children under Five Years in Bangladesh: Do Mother's Education, Socio-Economic Status, and Birth Interval Matter? *PLOS ONE*, *11*(6), e0157814. https://doi.org/10.1371/journal.pone.0157814

82. Rashad, A. S., & Sharaf, M. F. (2019). Does maternal employment affect child nutrition status? New evidence from Egypt. *Oxford Development Studies*, *47*(1), 48–62. https://doi.org/10.1080/13600818.2018.1497589

83. Research Institute (IFPRI), I. F. P. (2016). *Global Nutrition Report 2016 From Promise to Impact Ending Malnutrition by 2030* (0 ed.). International Food Policy Research Institute. https://doi.org/10.2499/9780896295841

84. Romano, D., Carraro, A., Romano, D., & Carraro, A. (2015). *Price Shocks, Vulnerability and Food and Nutrition Security among Rural and Urban Households in Tanzania*. https://doi.org/10.22004/AG.ECON.207281

85. Rosiek, A., Maciejewska, N., Leksowski, K., Rosiek-Kryszewska, A., & Leksowski, Ł. (2015). Effect of Television on Obesity and Excess of Weight and Consequences of Health. *International Journal of Environmental Research and Public Health*, *12*(8), 9408–9426. https://doi.org/10.3390/ijerph120809408

86. Saaka, M., Wemakor, A., Abizari, A.-R., & Aryee, P. (2015). How well do WHO complementary feeding indicators relate to nutritional status of children aged 6–23 months in rural Northern Ghana? *BMC Public Health*, *15*(1), 1157. https://doi.org/10.1186/s12889-015-2494-7

87. Sari, M., de Pee, S., Bloem, M. W., Sun, K., Thorne-Lyman, A. L., Moench-Pfanner, R., Akhter, N., Kraemer, K., & Semba, R. D. (2010). Higher Household Expenditure on Animal-Source and Nongrain Foods Lowers the Risk of Stunting among Children 0–59 Months Old in Indonesia: Implications of Rising Food Prices. *The Journal of Nutrition*, *140*(1), 195S-200S. https://doi.org/10.3945/jn.109.110858

88. Senevirathna, D., & Liyanage, P. G. (2020). Nutritional status of physically disabled children. *International Journal of Scientific and Research Publications (IJSRP)*, *10*(8), 224–226. https://doi.org/10.29322/IJSRP.10.08.2020.p10430

89. Seth. (2014, March 19). *Life in Obunga*. Ndoto. https://ndoto.org/life-in-obunga/

90. Status, W. P. (1995). The use and interpretation of anthropometry. *WHO Technical Report Series*, *854*(9).

91. Stifel, D., & Minten, B. (2017). Market Access, Well-being, and Nutrition: Evidence from Ethiopia. *World Development*, *90*, 229–241. https://doi.org/10.1016/j.worlddev.2016.09.009

92. Story, M., & French, S. (2004). Food Advertising and Marketing Directed at Children and Adolescents in the US. *International Journal of Behavioral Nutrition and Physical Activity*, *1*(1), Article 1. https://doi.org/10.1186/1479-5868-1-3

93. *Stunting in a nutshell*. (n.d.). Retrieved March 27, 2023, from https://www.who.int/news/item/19-11-2015-stunting-in-a-nutshell

94. *The DHS Program—Kenya Demographic and Health Survey 2022—Key Indicators Report (English)*. (n.d.). Retrieved June 22, 2023, from https://dhsprogram.com/publications/publication-PR143-Preliminary-Reports-Key-Indicators-Reports.cfm

95. Treuhaft, S., & Karpyn, A. (2010). *The grocery gap: Who has access to healthy food and why it matters*. PolicyLink.

96. Trofholz, A. C., Tate, A., Loth, K., Neumark-Sztainer, D., & Berge, J. M. (2019). Watching Television while Eating: Associations with Dietary Intake and Weight Status among a Diverse Sample of Young Children. *Journal of the Academy of Nutrition and Dietetics*, *119*(9), 1462–1469. https://doi.org/10.1016/j.jand.2019.02.013

97. Vitta, B. S., Benjamin, M., Pries, A. M., Champeny, M., Zehner, E., & Huffman, S. L. (2016). Infant and young child feeding practices among children under 2 years of age and maternal exposure to infant and young child feeding messages and promotions in Dar es Salaam, Tanzania. *Maternal & Child Nutrition*, *12*(S2), 77–90. https://doi.org/10.1111/mcn.12292

98. West, J., Kelly, B., Collings, P. J., Santorelli, G., Mason, D., & Wright, J. (2018). Is small size at birth associated with early childhood morbidity in white British and Pakistani origin UK children aged 0–3? Findings from the born in Bradford cohort study. *BMC Pediatrics*, *18*(1), 22. https://doi.org/10.1186/s12887-018-0987-0

99. Whitley, Jr., B. E., & Kite, M. E. (2012). *Principles of Research in Behavioral Science: Third Edition* (0 ed.). Routledge. https://doi.org/10.4324/9780203085219

100. Wilcox, S., Sharpe, P. A., Turner-McGrievy, G., Granner, M., & Baruth, M. (2013). Frequency of consumption at fast-food restaurants is associated with dietary intake in overweight and obese women recruited from financially disadvantaged neighborhoods. *Nutrition Research*, *33*(8), 636–646. https://doi.org/10.1016/j.nutres.2013.05.007

101. World Food Programme (WFP), The New Partnership for Africa's Development (NEPAD), United Nations Economic Commission for Latin America and the Caribbean (ECLAC), & African Union (AU) (Eds.). (2019). *The Cost of Hunger in Africa: The Social and Economic Impact of Child Undernutrition in Kenya*. World Food Programme (WFP). https://wfp.sharepoint.com/sites/LRCDissemination/Catalogue/Docs/ENGLISH/WFPel%20095.pdf

102. Yasmin, S., Osrin, D., Paul, E., & Costello, A. (2001). Neonatal mortality of low-birth-weight infants in Bangladesh. *Bulletin of the World Health Organization*, *79*, 608–614.

103. Yu, B., & Yu, B. (2012). *From Plot to Plate: Linking Agricultural Productivity and Human Nutrition in Bangladesh*. https://doi.org/10.22004/AG.ECON.126803

APPENDICES

Appendix 1: Consent Form

FOOD SYSTEMS, SOCIO-DEMOGRAPHIC FACTORS AND NUTRITIONAL STATUS OF CHILDREN 6-24 MONTHS IN OBUNGA SLUMS, KENYA

PART 1: Informed Consent for Caregivers of Children 6-24 Months in Obunga Slums Kenya

My name is Umotho Kinya Mbae, an MSc Student in Community Nutrition and Development at Maseno University. I am undertaking a study in the Obunga slum that focuses on Food systems, Socio-Demographic Factors, and the Nutritional Status of Children 6-24 Months in Obunga Slums in Kisumu, Kenya. You have been selected because you reside in Obunga and have a child between 6-24 months. I will ask you some questions and take your child's anthropometric measurements (height & weight). Please let me know what you don't understand, and I will explain further. The interview will take a maximum of 45 minutes, and no injury will come upon you or your child. There will be no monetary compensation that will be rewarded. The information I will collect is sensitive and shall not be shared with anyone apart from the research team; you and the child will be issued a unique number to protect you. At the end of the study, I will share the findings with you through the health facility and the county government to facilitate intervention programs. The results shall also be shared through publications and conferences. You may choose not to participate in this study with your child, and you are free to withdraw from the research at any point. In case you have any questions now or later. You can contact my supervisors or me.

Researcher: Umotho Kinya Mbae, Tel: 0715497787 or Email: umothombae@gmail.com.
Supervisor: Dr Christine Agatha**,** Tel: 0721847364 or Email: acatieno@yahoo.com
Supervisor: Dr David Omondi Okeyo, Tel 0723471371 or Email: jandigwa@yahoo.co.uk

The Maseno University Ethics Review Committee (MUERC) has reviewed and approved this proposal. If you wish to find out more about MUERC, you can contact them at
The Secretary, Maseno University Ethics Review Committee, Private Bag, Maseno; Telephone numbers: 057-51622, 0722203411, 0721543976, 0733230878; Email address: muerc-secretariate@maseno.ac.ke; muerc-secretariate@gmail.com.

PART II: CERTIFICATE OF CONSENT

Certificate of Consent

I consent voluntarily for my child and me to participate in this study.
Name of witness_____ OR Thumb print of participant
Signature of witness _____
Date _____

A copy of this Informed Consent Form has been provided to the parent or guardian of the participant.
Umotho Kinya Mbae
Date_____ Signature_____

Appendix 2: Anthropometric Assessment Form

Height: Measure 1_____ Measure 2_____

Weight: Measure 1_____ Measure 2_____

Appendix 3: Questionnaire

Questionnaire no: _____ Date: _____ Village_____

SECTION A: SOCIO-DEMOGRAPHIC AND ECONOMIC DATA

	Question	**Responses**	**Choices**
1.	Age of the child in months		
2.	Gender of the child	Male Female	1 2
3.	Child's size at birth	Less than 2500g Above 2500g	1 2
4.	Relationship of the caregiver with the child	Birth mother Father Sibling Grandparent Other relatives Non-relative	1 2 3 4 5 6
5.	The child who is being assessed is which number in the order of birth	1 2 3 4 5 Above 5	1 2 3 4 5 6
6.	Household size	1-2 3-4 5-6 Seven and Above	1 2 3 4
7.	Primary Caregiver, level of Education	Primary education and less Completed High school education and Above	1 2
8.	Ante-natal clinic attendance	4 or more visits Less than 4 visits	1 2
9.	Initiation of complementary feeding	Below 6 months At six months Above six months of age	1 2 3
10.	What is the religion of the household	Christian Muslim Traditional Other	1 2 3 4
11.	Who is the household head?	Father Mother Grandparent Other	1 2 3 4

12.	What is the weekly Income level of the household?	0-1000 1001- 5000 5001-10,000 Above 10,000	1 2 3 4
13.	What is the occupation of the primary caregiver?	Employed Not Employed Self Employed	1 2 3
14.	Was the child unwell in the past seven days?	Yes No	1 2

SECTION B: FOOD SYSTEMS
BROAD FOOD SYSTEMS
Food Price

1.	**Has the child consumed foods from the following food groups in the past week?**		
a.	**Cereals and Grains** (maize and maize products, rice, spaghetti, noodles, indomie, wheat, and wheat products)	Yes No	1 2
b.	**Roots and Tubers** (Irish potatoes, sweet potatoes, green bananas, arrowroot, and cassava)	Yes No	1 2
c.	**Legumes/Nuts/seeds**(beans, *ndengu, Kunde* (cowpeas), *njahe* (black beans), *mbaazi*, lentils	Yes No	1 2
d.	**Milk and Milk products** (milk, yoghurt, *maziwa mala*, cheese, butter, cream)	Yes No	1 2
e.	**Flesh meat and meat products** (beef, goat, pork, mutton, chicken, fish)	Yes No	1 2
f.	**Fish and other seafood** (*Omena*, tilapia, *fulu*, Nile perch)	Yes No	1 2
g.	**Organ meat** (*matumbo* (tripe), heart, liver, kidneys)	Yes No	1 2
h.	**Eggs** (chicken, duck, quail)	Yes No	1 2
i.	**Vitamin A rich fruits** (ripe mango, ripe papaya)	Yes No	1 2
j.	**Other fruits** (oranges, bananas, melons, pineapples, guava)	Yes No	1 2
k.	**Vitamin A rich Vegetables and Dark Green Leafy Vegetables** (pumpkin, carrots, spinach, tomatoes, kales, spider plant, amaranth, jute mallow, black nightshade, cassava leaves)	Yes No	1 2
l.	**Other vegetables** (tomatoes, onions, cabbage, eggplant)	Yes No	1 2

2.	**Generally, how would you rate food prices from the following categories?**		
a.	**Cereals and Grains** (maize and maize products, rice, spaghetti, noodles, indomie, wheat and wheat products)	Low Very Low Middle High Very High	1 2 3 4 5

b.	**Roots and Tubers** (Irish potatoes, sweet potatoes, green bananas, arrowroot, and cassava)	Low Very Low Middle High Very High	1 2 3 4 5
c.	**Legumes/Nuts/seeds**(beans, *ndengu*, Kunde (cowpeas), *njahe* (black beans), *mbaazi*, lentils	Low Very Low Middle High Very High	1 2 3 4 5
d.	**Milk and Milk products** (milk, yoghurt, *maziwa mala*, cheese, butter, cream)	Low Very Low Middle High Very High	1 2 3 4 5
e.	**Flesh meat and meat products** (beef, goat, pork, mutton, chicken, fish)	Low Very Low Middle High Very High	1 2 3 4 5
f.	**Fish and other seafood** (*Omena*, tilapia, *fulu,* Nile perch)	Low Very Low Middle High Very High	1 2 3 4 5
g.	**Organ meat** (*matumbo* (tripe), heart, liver, kidneys)	Low Very Low Middle High Very High	1 2 3 4 5
h.	**Eggs** (chicken, duck, quail)	Low Very Low Middle High Very High	1 2 3 4 5
i.	**Vitamin A rich fruits** (ripe mango, ripe papaya)	Low Very Low Middle High Very High	1 2 3 4 5
j.	**Other fruits** (oranges, bananas, melons, pineapples, guava)	Low Very Low Middle High Very High	1 2 3 4 5

k.	**Vitamin A rich Vegetables and Dark Green Leafy Vegetables** (pumpkin, carrots, spinach, tomatoes, kales, spider plant, amaranth, jute mallow, black nightshade, cassava leaves)	Low Very Low Middle High Very High	1 2 3 4 5
l.	**Other vegetables** (tomatoes, onions, cabbage, eggplant)	Low Very Low Middle High Very High	1 2 3 4 5

Food aid

No	Question	Choices	Response	Skip
1.	Do you get any form of food aid?	Yes No	1 2	Go to 2
2.	Who gives you food aid?	Friends Relatives Church Hospital NGO Others	1 2 3 4 5 6	
3.	Which kind of food aid do you get?	Food Money Food for work Food for cash Others	1 2 3 4 5	Go to 4
4.	Which foods do you usually get from food aid?	Supplementary foods Cereals Cooking oil	1 2 3	
5.	Did you feed your child any food given to you by food aid yesterday?	Yes NO	1 2	.

Food and beverage marketing

No	Question	Choices	Response
1.	How often do you read food-related articles in newspapers?	Never Rarely Monthly Weekly Daily	1 2 3 4 5
2.	How often do you watch food-related adverts or content on television?	Never Rarely Monthly Weekly Daily	1 2 3 4 5

3.	How often do you listen to food-related content/adverts on the radio?	Never Rarely Monthly Weekly Daily	1 2 3 4 5
4.	How often do you listen to, read, or watch food-related content/adverts on social media (Facebook, Instagram, WhatsApp, Twitter)	Never Rarely Monthly Weekly Daily	1 2 3 4 5
5.	Have you listened to, read, or watched any promotional practices on commercially produced complementary food?	Yes No	1 2
6.	Have you listened to, read, or watched any promotional practices on commercially produced food products?	Yes No	1 2
7.	Did you feed your child any of the commercially produced complementary food yesterday?	Yes No	1 2
8.	Did you feed your child any of the commercially produced food products yesterday?	Yes No	1 2

COMMUNITY FOOD SYSTEMS

Supermarkets and Markets

No.	Question	Response	Choices	Skip
1.	Where do you buy your food from	Supermarkets Open-air markets Local shops *Mama Kibanda*	1 2 3 4	Go to 2 Go to 3
2.	How many kilometres is the supermarket from the house?	Less than 1km Less than 5km but> 1km More than 5km	1 2 3	
3.	How many kilometres is the open-air market from the house?	Less than 1km Less than 5km but> 1km More than 5km	1 2 3	

Restaurants and Street foods

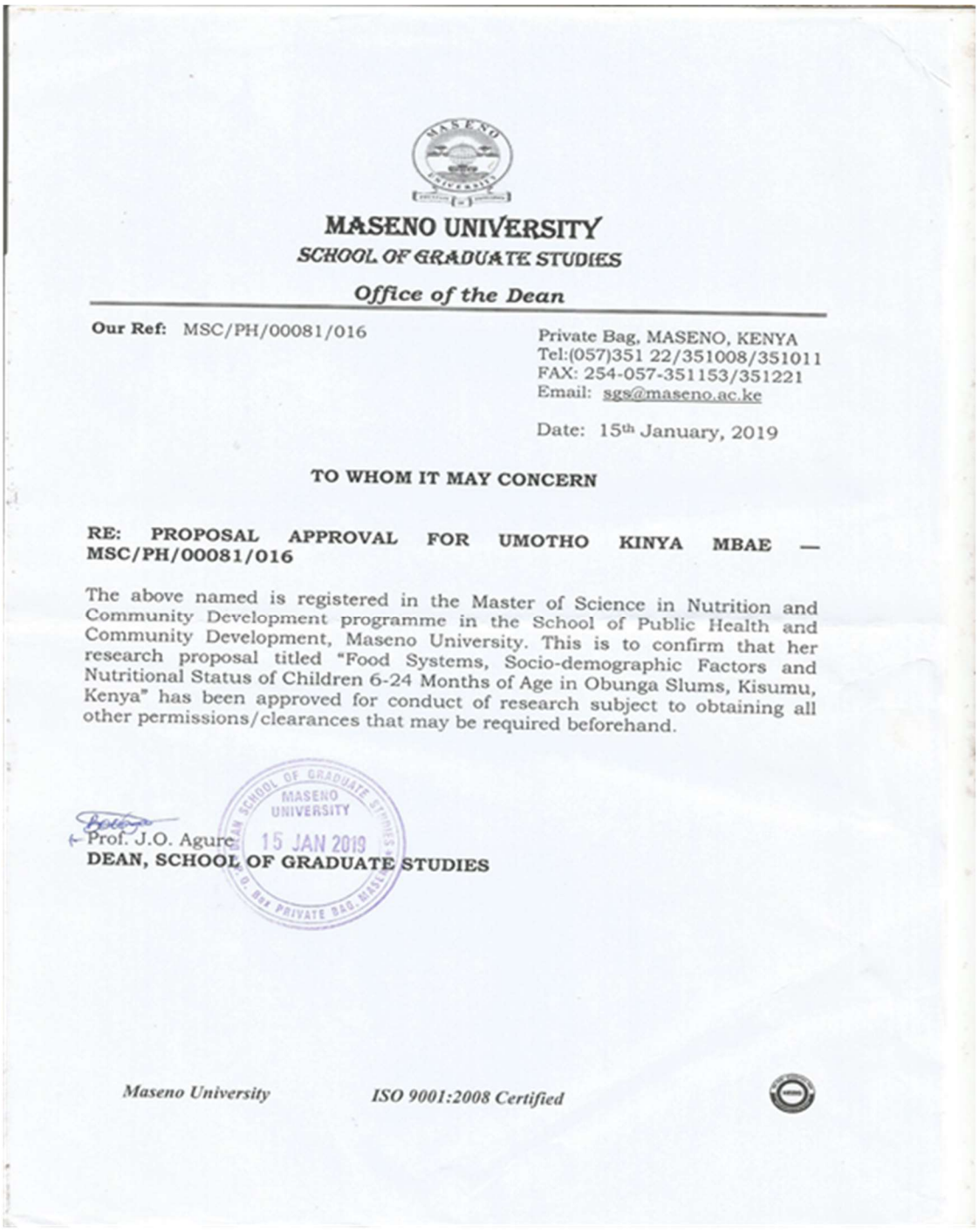
No.	**Question**	**Response**	**Choices**
1.	Do you usually buy food from any restaurants/hotels?	Yes No	1 2
2.	How often do you buy food from restaurants/hotels?	Daily Weekly Monthly Rarely Never	1 2 3 4 5

3.	Do you usually buy street foods?	Yes No	1 2
4.	How often do you buy street food	Daily Weekly Monthly Rarely Never	1 2 3 4 5

Appendix 4: Map of Obunga Slums

Map of Kisumu Municipality: Main areas, Sub-locations, and Informal Settlements

Appendix 5: School of Graduate Studies Proposal Approval



MASENO UNIVERSITY

SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: MSC/PH/00081/016

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 15th January, 2019

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR UMOTHO KINYA MBAE — MSC/PH/00081/016

The above named is registered in the Master of Science in Nutrition and Community Development programme in the School of Public Health and Community Development, Maseno University. This is to confirm that her research proposal titled "Food Systems, Socio-demographic Factors and Nutritional Status of Children 6-24 Months of Age in Obunga Slums, Kisumu, Kenya" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

MASENO UNIVERSITY 15 JAN 2019

Prof. J.O. Agure
DEAN, SCHOOL OF GRADUATE STUDIES

Maseno University *ISO 9001:2008 Certified*

Appendix 6: Maseno Ethical Review Approval

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221
Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 5th February, 2019

TO: Umotho Kinya Mbae
PG/MSc/PH/00081/2016
Department of Nutrition and Health
School of Public Health and Community Development
Maseno University
P. O. Box, Private Bag, Maseno, Kenya

REF: MSU/DRPI/MUERC/00659/19

RE: Food Systems, Socio-Demographic Factors and Nutritional Status of Children Aged 6 to 24 Months in Obunga Slums, Kisumu, Kenya. Proposal Reference Number MSU/DRPI/MUERC/00659/19

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 5th day of February, 2019 for a period of one (1) year. This is subject to getting approvals from NACOSTI and other relevant authorities.

Please note that authorization to conduct this study will automatically expire on 4th February, 2020. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 15th January, 2020.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 15th January, 2020.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

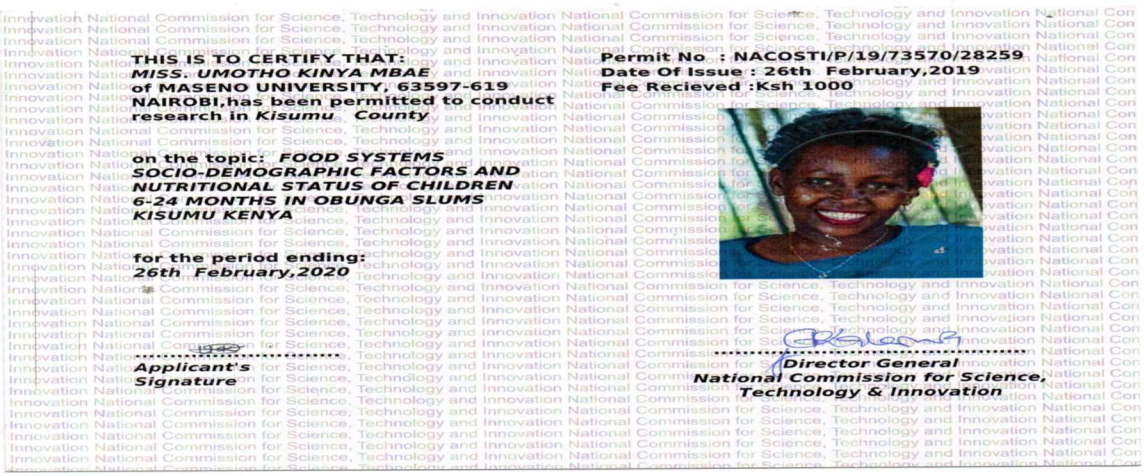
Thank you.

Dr. Bernard Guyah
Ag. Secretary,
Maseno University Ethics Review Committee

Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED

Appendix 7: NACOSTI License



THIS IS TO CERTIFY THAT:
MISS. UMOTHO KINYA MBAE
of MASENO UNIVERSITY, 63597-619
NAIROBI,has been permitted to conduct
research in *Kisumu County*

on the topic: *FOOD SYSTEMS SOCIO-DEMOGRAPHIC FACTORS AND NUTRITIONAL STATUS OF CHILDREN 6-24 MONTHS IN OBUNGA SLUMS KISUMU KENYA*

for the period ending:
26th February,2020

.....
Applicant's Signature

Permit No : NACOSTI/P/19/73570/28259
Date Of Issue : 26th February,2019
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

Appendix 8: Kisumu County Authorization

THE PRESIDENCY

MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telegrams: 'DISTRICTER',
Kisumu
Telephone: 2021809/Fax:2025809
When replying please quote
Email:dccksmcentral@gmail.com

OFFICE OF THE DEPUTY COUNTY COMMISSIONER
KISUMU CENTRAL SUB-COUNTY
P O BOX 1921
KISUMU

Ref: ADM 4/8/VOL.XI/78

Date: 7th March, 2019

The Assistant County Commissioner
Winam Division

All Chiefs
Kisumu Central Sub-County

RE: RESEARCH AUTHORIZATION- UMOTH KINYA MBAE

This is to inform you that the above named person is a student from Maseno University and has been authorized to carry out a research on ***"Food Systems Socio-demographic factors and nutritional status of children 6-24 months in Obunga Slums"*** in Kisumu Central Sub-County

The research will run till **28th August, 2019.** You are therefore asked to give her the necessary support as and when appropriate.

REBECCA WAKAPE
FOR: DEPUTY COUNTY COMMISSIONER
KISUMU CENTRAL SUB-COUNTY.

Copy to:

Umoth Kinya Mbae
Maseno University
Private Bag
KISUMU