

**AN ASSESSMENT OF FOOD SECURITY IN URBAN HOUSEHOLDS WITH
CHILDREN UNDER FIVE YEARS OF AGE: THE CASE OF NAIROBI, KENYA**

BY

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KENYA**

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DECLARATION

I hereby declare that this is my original work and has not been presented to any other university for the award of any degree



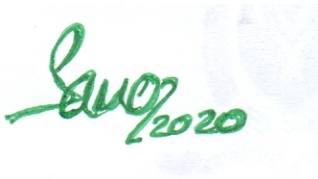
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DEDICATION

I dedicate this research project to my parents Dr. Thadeus Obari and Mrs. Immaculate Ojaamong together with my siblings (Adung'o, Isiah, Akwii, Amoit, Asere, and Ojaamong). Special dedication to my cousins the late Elizabeth O. Naududu and the late Collins Nathan Einstein Ojaamong. May their souls RIP.

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ABSTRACT

This research sought to assess the state of food security in urban households with children under five years of age, with Nairobi County as a case study. While utilizing data from a parent study by the Hungry Cities Partnership Project, this study was guided by three research questions: (1) what are the demographic and economic characteristics of households with children below five years in Nairobi?; (2) what is the state of food security in urban households with children under five years of age in Nairobi?; and (3) what demographic and economic dynamics influence the state of food security in urban households with children below five years in Nairobi? Two hypotheses relating the household size and household's Lived Poverty Index with its food security status was also tested. This study was based on the Ecological Systems Theory adopted from the field of psychology. Data were obtained from the parent study's database using the query "*what was the household member's age at his/her last birthday?*" and this led to the establishment of a sample size of 479 households. Data were analyzed through the use of descriptive statistics, Kruskal Wallis test, the Chi-Square test, and calculating the food security status of the surveyed households. The Kruskal Wallis test was applied during the testing of the hypotheses. This analysis revealed household size, household structure, and the employment status of household heads as the demographic characteristics of the study households while household income, LPI, reliance on non-market food sources, and their experience on unaffordable food prices were the identified households' demographic characteristics. 41.4% of the study households were also found to be food secure and 58.6% food insecure. Further analysis revealed that six out of the seven identified demographic and economic characteristics of the study households had a significant impact on their food security. The two null hypotheses were also rejected and this led to the conclusion that the demographic and economic characteristics of the study households significantly impact their food security status. Therefore, it was recommended that the Kenyan government and other stakeholders should utilize a holistic approach when addressing food security issues in urban households. For future research, the study suggested that a similar study should be conducted in Nairobi and other cities of Kenya for comparative purposes, especially in the present socio-economic developments in urban areas and the pandemic that has struck the world.

LIST OF ABBREVIATIONS

AGORA	Access to Global Online Research on Agriculture
FAO	Food and Agriculture Organization
HCP	Hungry Cities Partnership project
HDDS	Household Dietary Diversity Score
HFIAP	Household Food Insecurity Access Prevalence
HFIAS	Household Food Insecurity Access Score
KNBS	Kenya National Bureau of Statistics
LPI	Lived Poverty Index
MAHFP	Months of Adequate Household Food Provisioning

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study Problem

Food security is a crucial part of our day-to-day lives as it greatly impacts the quality of people's lives (International Food Policy and Research Institute, 2020). Food insecurity can be experienced due to high poverty conditions, natural calamities such as drought and famine, economic crisis, water scarcity, and climate change that affects food production and distribution (Food and Agriculture Organization, n.d.). Food security also affects other aspects of life. For instance, persons and/or households regarded to be food insecure have higher chances of suffering from hunger, malnutrition, over nourishment and other physical or mental food-related illnesses (Gundersen & Ziliak, 2015; Hadley & Crooks, 2012). Food insecurity can also cause a decline in economic growth, wars and food-related conflicts, extreme poverty levels, environmental degradation and political instability (Fawole et al., 2015).

Africa has registered high food insecurity cases for long. As of 2020, it was approximated that one in 4 people in Africa were severely food insecure (FAO, 2020) and more severe food insecurity cases were from sub-Saharan Africa. This severity continues to increase despite having intervention programs. The East African region has registered the highest cases of undernourishment as approximately 20% of the people were undernourished, with most being children. These statistics are worrying, especially with regards to the efforts of achieving SDG 2 that targets to achieve zero hunger and promote food security with proper nutrition in all populations.

Urban areas express unique characteristics regarding food security with the most outstanding characteristic being that a household's purchasing power determines their food security status (Matuschke, 2009). In the past, urban areas were perceived to be 'rich' and thus, the urban population could access any type of foods that they desired. This, together with the existence of diverse food items in towns, promoted the notion that urban populations were food secure unlike the rural population. This, however, is not true because there are parts of the urban population that struggle to adequately meet their food security and dietary needs. Thus, common cases of obese

and/or overweight adults living under the same roof with underweight and malnourished children are witnessed (Food and Agriculture Organization, 2020). This scenario is attributed to the excessive consumption of unhealthy foods due to the existing food swamps and food deserts within urban areas. In such struggling situations, families strive to meet their satiety and/or craving needs and, more often, ignore their nutritional needs.

Rural-urban migration and high birth rates in towns have increased the need to provide quality food to the increasing urban population. Furthermore, urbanization brings new food preferences and methods of preparing foods (Food and Agriculture Organization, 2020). Ruel et al. (2017) highlighted that most urban households allocate approximately 50% of their income to their food budget. The situation is worse for poor urban households who, together with having limited finances to meet their food needs, also face the challenges of poor sanitation, poor living conditions, and limited access to essential social amenities and services that further worsens their food security status.

The situation is even sensitive for urban households that house children below the age of five. At this age, children solely depend on their parents or guardians for the provision of their basic needs, including nutritious food. Thus, anything that affects their parents or guardians' ability to meet their food security needs will affect them too. For instance, if a household head is poor, loses their job, becomes sick or experiences a reduction in their income, they will struggle to feed their families and the children will suffer directly from these circumstances (Haque, 2017). That is why in most urban areas, children in low-income households suffer from hunger, malnutrition, poverty consequences and other food-related and food-borne illnesses.

According to KNBS (2019b), Kenya has over 5 million children below the age of five. Out of this population, over 1.8 million children dwell in urban areas; with Nairobi accounting for over 500,000 of this population. In the future, this number will continue to increase. This signifies the importance of studying food security in urban households with children under five years. Without proper nutrition that is secured through proper food security, the physical, mental and cognitive advancements in children is negatively affected (Huang et al., 2010).

1.2 Statement of the Research Problem

Urban food security is an integral aspect of the rapidly urbanizing population and as such joins the list of other urban growth and development challenges. With increasing urban population, the population of children under five years continues to grow by birth, migration and immigration processes. These children can only be nutritionally healthy if the households they live in are food secure (Mutisya et al., 2015; Hobbs & King, 2018; Gundersen & Ziliak, 2015). Whereas a growing literature of studies on urban households' food security exists, there is need to gain more insights on the dynamics of food security in urban households with children under five years of age.

Some studies have addressed this gap by focusing on urban informal settlement households with young children. Other studies have focused on varying socioeconomic aspects, including the age of household heads, household income and neighborhood characteristics. While addressing these aspects, some researchers have specifically focused on households with young children between ages 6 and 23 months in informal settlements (Mutisya et al., 2015; Goudet et al., 2019; Wambura & Marnane, 2019; Wanyama et al., 2019). Others have solely based their research on low-income neighborhoods, while others have carried out comparative food security studies on households with children in rural and urban settings (Tomayko et al., 2017). Furthermore, some researchers have focused on households with unique populations such as those suffering from HIV/AIDS or minority ethnic groups (Pienaar et al., 2017).

Although some researchers have done studies on households with children under five years, their studies have been based in cities within developed countries or rural areas within developing countries. Other studies aimed at suggesting ideal food security intervention programs (Gundersen & Ziliak, 2014; Li et al., 2014; Kanyuira, 2010). Thus, there is need to conduct more research aimed at understanding food security in urban households with children under five years, whether in low-income or high-income neighborhoods. Therefore, this study will contribute information to this gap through assessing the state of food security in urban households with children under five years of age using Nairobi as a case study. To realize this objective, the study utilized an existing database from the Hungry Cities Partnership Project as expounded in the methodology chapter.

1.3 Research Questions

1. What are the demographic and economic characteristics of households with children under five years of age in Nairobi?
2. What is the state of food security in households with children under five years of age in Nairobi?
3. What demographic and economic dynamics influence the state of food security in households with children under five years of age in Nairobi?

1.4 Research Objectives

1. To examine the demographic and economic characteristics of households with children under five years of age in Nairobi.
2. To determine the state of food security in households with children under five years of age in Nairobi.
3. To assess the demographic and economic dynamics that influence the state of food security among households with children under five years of age in Nairobi.

1.6 Research Hypotheses

1. H₀: Household size does not significantly influence the food security status of households with children under five years of age in Nairobi.
H₁: Household size significantly influences the food security status of households with children under five years of age in Nairobi.
2. H₀: A households' Lived Poverty Index does not significantly influence the food security status of households with children under five years of age in Nairobi.
H₁: A households' Lived Poverty Index significantly influences the food security status of households with children under five years of age in Nairobi.

1.7 Justification of the Study

As reported by KNBS (2019a), Nairobi has the highest population of children under five years compared to other counties. Furthermore, the National Council for Population and Development (2013) estimated that by the year 2030, Kenya will have an average of 2.6 children per woman. Therefore, meeting the food security needs of these children is important. As discussed by Mutiah

& Istiqomah (2017), the existence of a wide variety of food items in Nairobi makes many people assume that it is food secure. However, this is not the case because Nairobi as an urban area is also characterized by food swamps and food deserts that impact a household's food security.

Children below five years solely depend on healthy foods for them to achieve proper growth physically, mentally and psychologically (Huang et al., 2010; Johnson & Markowitz, 2018). Inadequate access to healthy and nutritious food items has subjected children to food-related diseases such as malnutrition, undernourishment and being underweight (Gundersen & Ziliak, 2015; Hadley & Crooks, 2012). Furthermore, children subjected to food insecurity are likely to develop chronic complications such as asthma. Nutrition deficiency due to food insecurity also alters the productivity of children, slows down their mental development and affects their general growth and learning processes.

As such, understanding the food security status of households with children below five years is necessary because children at this age have most of their meals within their homes. This implies that any factor that will impact a household's food security negatively will subject the children in such households to food insecurity. This study, therefore, will aid in understanding food security in urban households with children below the age of five. The information generated will be beneficial to the relevant government ministries and non-governmental entities in designing, planning and implementing food security intervention programs and policies that are sensitive to households with children.

1.8 Significance of the Research to Sustainable Urban Development

Urban food security is an integral aspect of sustainable urban development. Understanding the state of food security in urban households with children below the age of five is important because sustainable urban development is an inclusive concept that should incorporate child-friendly cities and planning. In addition, as ingrained in the definition of sustainable development, taking care of the needs of future generations is important and this includes the food security needs of children under five years of age. This study is significant to sustainable urban development as it provides a city-wide understanding of the food security status of urban households with a special focus on households with children under five years of age. According to Sayeed (2014), food security

determines the general health of all individuals, including the physical, mental and psychological development of children. As urban areas aim at achieving sustainability in other sectors, the sustainability of urban food systems is also essential as an integral component of sustainable urban development.

1.9 Scope and Limitations of the Study

The focus of the study was on the food security status of urban households with children under five years of age in Nairobi because, at this age, children experience unique challenges of micro-nutrient deficiency, malnutrition, obesity and delayed development when faced with food insecurity. Such challenges will further impact their quality of life in the future. Furthermore, the scope of this study was within the scope of a larger project – the Hungry Cities Partnership Project that analyzed the status of food security in Nairobi (See Owuor, 2018). This dictated the study's research design as data was obtained by querying the parent study's databases (discussed in the methodology section). This, in turn, dictated the study's sample size which was limited to only households with children below the age of five in Nairobi.

1.10 Operational Definitions and Concepts

Food security: The state where all individuals have social, physical and economical access to nutritious, sufficient and safe foods that fulfills their dietary needs and food preferences for a healthy and active life at all times (International Food Policy and Research Institute, 2020).

Household food security: A state where a household can secure enough food to meet the dietary needs of all its members, whether through producing or purchasing these food items (Food and Agriculture Organization, 2010).

Household: A person or a group of people staying in the same homestead or compound and share similar cooking arrangements (KNBS, 2019a).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, a detailed discussion of the literature review informing the study is provided. The literature review was guided by the University of Southern California (2020) writing guide. Both empirical and theoretical literature was identified using the keywords *food security*, *urban household food security*, *determinants of household food security*, *urban household food provisioning*, and *child food security* in the search criteria. The search was mainly conducted in JSTOR, PubMed, Springer, Google Scholar, Taylor & Francis, AGORA and the University of Nairobi repository databases. This yielded scholarly and peer-reviewed articles whose ideas were integrated to build this chapter in various thematic areas.

2.2 The Concept of Food Security

During its inception in the 1970s when the world was experiencing food crisis, food security was mainly concerned with an adequate supply of food items to affected populations. As discussed by Food and Agriculture Organization (2003), this focus slowly shifted to incorporate accessibility of food items by the vulnerable populations. In 1986, the concept evolved to incorporate the temporal nature of food insecurity. This is because some people may experience food insecurity due to high poverty levels while others face food insecurity due to temporary circumstances such as natural calamities. By the mid-1990s, the concept incorporated safety concerns and nutritional aspects of food. It was in 2001 that the concept was revised and its definition factored in all the key components that cut across the whole food system. This definition addresses the issues of food accessibility, availability, utilization and stability, which are now referred to as the key components or dimensions of food security (Food Climate Research Network, 2018).

Food accessibility is concerned with all people having the necessary resources to allow them acquire food that meets their dietary and nutritional values. These resources could be income (if a person is purchasing food), land (if a person is cultivating his/her food), or one's ability to obtain relief food in case someone relies on food aid. Food availability addresses issues of adequate supply of food to populations for their consumption. To achieve food availability, there must be

sufficient production and equal distribution to all people. Food utilization focuses on the ability of individuals to consume food in a manner that will benefit them in terms of health and nutrition. Food utilization is determined by one's health, how the food is prepared and consumed, the food's nutritional value, and the safety of the food. Food stability focuses on how people access nutritious foods all the time without experiencing any temporary states of limited food. Food stability is affected by natural calamities, political instability and other economic factors like the loss of jobs (Food and Agriculture Organization, 2008).

While considering these components, the factors affecting food security have been studied at different levels. At the individual level, one's health status, food consumption patterns and nutritional status can affect their state food security. At the household level, the income level, demography, culture and feeding practices might affect its state of food security. At the regional level, factors such as availability, accessibility, stability, distribution and the state of peace dictate the food security of people. At the global level, political issues, changes in the economy, geographic location, natural calamities, societal, and cultural factors influence the food security status of the world (Napoli, 2011). To understand these levels of food security, different methods and measures have been developed to assess food security.

2.3 Assessment of Household Food Insecurity

Despite the advancement in food security research, no single standard measure exists to assess food security given its complex nature. It is a multi-dimensional concept that is affected by different aspects, including the economic, financial, social, health, educational and culture of an individual or household. Therefore, while assessing food security, researchers apply more than one method to allow them to factor in all the aspects dictated by their research question. It can be analyzed at the national, individual, or household level (Haysom & Tawodzera, 2018; Escamilla et al., 2008) using six main methods that are discussed hereafter.

2.3.1 Anthropometric Measures of Food Security

This measure was developed because of the reasoning that poor dieting due to food insecurity is linked to the nutrition and health status of an individual (Napoli, 2011). As discussed by Escamilla et al. (2008), during an assessment, the weight, height, age, and body size of an individual are

recorded alongside their food consumption, provisioning and preparation patterns. This information is then analyzed and interpreted to identify the cases of wasting, malnourishment, underweight and stunting among the participants. This method is preferred when conducting local or nationwide surveys as it is relatively cheap. It also utilizes standard weight and height measures which enhance accuracy and can be applied to a large population.

One shortcoming of this anthropometric method, however, is that it measures food insecurity indirectly since it relates the health status of an individual to his/her food security status. This kind of relationship locks out other important food insecurity aspects like the consumption of high fat or highly processed foods that result in increased weight and/or obesity. In this scenario, obese persons will qualify to be food secure when their weight is tallied against their height (Haysom & Tawodzera, 2018). Other aspects such as diseases might affect the weight or height of a child who comes from a food secure household and this may result in misleading information. The method also fails to account for mild food insecurity issues (Jones et al., 2013).

2.3.2 FAO Measures of Food Security

As discussed by Keenan et al. (2001), this method is used to estimate the population that is experiencing hunger and undernourishment nationally. Data from national food balance sheets are analyzed to approximate the calorie intake of every individual. From this data, the cut-off points of calories (relative to a country) are developed and this allows the researchers to estimate the population that is facing hunger or is undernourished. This method is preferred when conducting national food security surveys because it is cheap and the data required can be easily generated. Its disadvantages, however, are that depending on calorie data, it might give misleading information, especially when the method is applied to poor populations exhibiting obesity conditions due to high-calorie intake. It also does not account for the quality of diets in households under study. Concerns have also been raised about the established cut-off index which does not cover those populations that suffer severe food deficiency.

2.3.3 Household Income and Expenditure Surveys

This method allows assessment to be conducted at a household level by inquiring about the approximate amounts of cash that the household used to acquire food items within a specific period

(days, weeks, or months). Thus, the household member being interviewed will provide information on the amount spent to purchase food items (whether in the home or outside the home), any food items that have been gifted/used as a form of payment to a household member, and any food items that are grown for consumption in the household. This information is analyzed and the food items are converted into kilocalories. To evaluate the dietary energy available for the household, the total calorie is divided by the specified period and the household population (Escamilla et al., 2008; Napoli, 2011; Haysom & Tawodzera, 2018).

This method is preferred by many researchers as it reveals the quality of diets in many households and thus, one can easily tell which households are food insecure. Furthermore, the method helps to evaluate the efficacy of food and nutrition intervention programs (Fiedler et al., 2008). Its disadvantage, however, is that it only focuses on the food items available and not the foods consumed by the household. This locks out information on wasted foods and may include food items that are available in the household currently but were not acquired during the period of interest, say a week ago. The method also heavily depends on one's memory and assumptions are made during analysis which may lead to misleading results. The method also locks out information on foods that are consumed from street food vendors, a sector that is very critical to most populations in the urban areas.

2.3.4 Coping Strategy Index

Households may experience food shortages or they may lack sufficient funds to meet their dietary needs. This prompts them to device coping strategies which are measured using the coping strategy index. Some of the identified coping strategies include changing one's dietary intake to include a completely different food; using all means possible to increase food quantities within a household; reducing the population of people that are fed in the household; and employing food rationing, for instance, having two meals instead of three meals in a day. During an assessment, the responses of each household are noted and given a score. Those households that register high scores are considered to employ better coping strategies and those with low scores are considered to be struggling with coping when faced with food shortages (Maxwell et al., 2008).

This method is advantageous as it is easy to implement because the questions are simple. It also provides quality data on vulnerability and adequacy, in case intervention programs have been implemented within certain households. Its disadvantage, however, is that it may provide misleading information in cases where households report on reducing food portions yet they still can be categorized as food secure. Another disadvantage is that it limits comparison studies in different localities because people across the world employ diverse coping strategies that are unique to their locality (Maxwell & Caldwell, 2008).

2.3.5 Dietary Intake Assessment

In this method, the diversity of diets and nutritional value of these diets within households is assessed. This can be measured through the food frequency scores which seeks to assess the types of foods/food groups consumed within a specific period (FAO, 2018); dietary diversity scores which seeks to assess how able a household is to access a variety of food items as evident in their diets (FAO, 2013); and/or food variety scores which assesses the mixture of food types a person has consumed within a specified period. High diversity scores indicate better food security status together with nutritional adequacy of the individual or household.

The advantage of the dietary intake assessment methods is that they allow for research to be conducted per household or per individual as guided by the objectives of a study. They are also cheap and can be implemented in all populations regardless of their literacy levels and this reduces data errors (FAO, 2018). Their disadvantages, however, are that they heavily rely on the memory of an individual; the methods may exhibit underreporting when food items identified do not fall in any category of the questionnaire; and misleading results may be reported in instances where a certain food item is given the same score when consumed as a single dish or in a mixture of dishes (Haysom & Tawodzera, 2018).

2.3.6 Food Insecurity Experience-Based Measurement Scales

Here, the psychosocial and physical experiences of food security are assessed through various scales such as Months of Adequate Household Food Provisioning, Household Food Insecurity Access Prevalence, Household Food Security Survey Module and the Household Food Insecurity Access Scale. These methods are mostly utilized during household surveys as they reveal the

calorie intake and dietary qualities of households together with the psychosocial factors that may determine their food security. The methods are advantageous as they measure the levels of food consumption both in recent and past times. Despite this advantage, the methods lock out the concept of food safety which is very important when assessing food security. It may also prove difficult to generalize results in populations that exhibit different cultures (Haysom & Tawodzera, 2018) across regions/countries.

2.3.7 Towards a Mixed Method Approach

Given the advantages and shortcomings of its assessment measures, researchers often opt to utilize more than one method in analysis to achieve more accurate results. Based on these methods, a household might be termed as food secure, mildly food insecure, moderately food insecure, and extremely food insecure. Those households classified to be extremely food insecure require intervention programs to help them meet their food security needs. Food insecurity can also be classified into different types depending on its duration or frequency of occurrence (Food Climate Research Network, 2018). For instance, chronic food insecurity is experienced when individuals/people fail to address their food consumption needs for periods longer than six months. Seasonal food insecurity might be experienced during certain seasons such as during drought seasons or when a country experiences low crop yields. Transitory food insecurity may occur when a population temporarily fails to address their food security needs because of sudden changes such as conflicts, wars, job loss and a reduction in income.

2.4 Urbanization and Food Security

There exists a nexus between urban growth and food security as revealed by Matuschke (2009), Szabo (2015) and Ruel et al. (2017). The urbanization process largely occurs from rural-urban migration. The urban population further grows by natural increase through birth. It is logical that wherever people are, there is a need to address their food and nutrition requirements to ensure their survival as this is core to urban areas' development and sustainability. Certain countries, especially those still developing, experience rapid rates of urbanization due to rural-urban migration that is fueled by the need to get work and be economically empowered.

Since the urban areas fail to meet the economic and residential needs of all urban people, informal settlements tend to develop and house those struggling to survive. It is these informal settlements that give rise to urban poverty because such areas are subjected to poor housing conditions together with strained access to basic social amenities and services (Huchzermeyer et al., 2014). Since urban populations heavily depend on their purchasing power to address their food security needs, poor populations within informal settlements are likely to suffer from food insecurity (Matuschke, 2009). Therefore, it can be concluded that the urbanization process and urban poverty affect food security in all its aspects, that is, food accessibility, availability, safety, utilization and stability.

2.4.1 Urbanization and Food Availability

The urbanization process has led to the conversion of and invasion into fertile and arable land to support the construction of commercial and residential infrastructure. People also encroach on riverine areas and swamps and this affects water ecosystems that are integral to supporting biodiversity and food production. For example, Nairobi has lost most of its green spaces, productive land and water catchment areas to urbanization. Land-use changes also occur when urban sprawl is witnessed and peri-urban areas are converted into residential and industrial areas. This shows that there is an actual competition between the urbanization process and agricultural production within and around urban centers (Matuschke & Kohler, 2014).

Considering profitability, more landowners around urban areas resolve to invest in real estate businesses. When this happens, the production of food items on a large scale within and around urban areas reduces and this affects food availability. Despite this reduction, the urban population will still require food. Such food items are then outsourced from rural areas and even outside the country. This outsourcing contributes to food price increases (due to transportation and value addition costs) within urban areas. Thus, poor populations that cannot afford quality foods will tend to suffer from food insecurity (Ruel et al., 2017; Matuschke, 2009).

Urbanization has also increased the demand for water that is utilized in industries and households. This, when not done sustainably, deprives the much-needed water for agricultural production, especially in and around cities. Furthermore, excessive extraction of water from water bodies for urban use affects fisheries, an important contributor to food security (Matuschke, 2009). Urban

areas are also major water polluters. Water pollution renders water downstream unfit for agricultural production. It also introduces toxic chemicals into the food chain and this alters the safety of foods produced.

2.4.2 Urbanization and Food Access

Two factors (transportation and income) determine how urban dwellers access food. Since a large percentage of urban dwellers are largely net buyers when meeting their food security needs, transportation of food items is crucial in enhancing urban food security. Many governments have upgraded their country's road and railway networks to ease food transportation from rural areas to towns. This has enhanced the physical accessibility to a variety of food items by urban dwellers (Szabo, 2015). Despite transport improving the abundance of foods in urban centers, income has been a limiting factor to the urban poor. Matuschke (2009) explains that food accessibility in urban areas highly relies on food prices.

Therefore, many households allocate a great percentage of their revenue to their food budget. As discussed by Smith (2001), populations within informal settlements utilize almost all of their cash in buying food and this is still not adequate to meet their food security needs. Unemployed poor populations further face difficulties in financially meeting their food security needs as they have no stable source of income. That is why some urban poor populations incorporate unhealthy coping mechanisms such as skipping meals or consuming a single food item because of high food prices, or completely go hungry for days because they are unable to purchase or grow food.

2.4.3 Urbanization and Food Safety

Urban food items have to be transported from production areas to markets and/or households. During transportation, the safety of these foods might be compromised as contamination may occur along the food chain. Contamination might be through mixing and transportation of these food items together with harmful chemicals such as pesticides or during value addition processes (Thomas, 2014). The quality of such foods might also deteriorate during transportation, especially if the food items are perishable.

The urbanization process has also encouraged the establishment of street food businesses within urban areas that provide food to the working and busy urban populations. Almost all urban centers in the world have street food vendors operating their businesses both during the day and at night. Their population is even large in urban areas within developing countries, where even unlicensed street food vendors continue to operate. Matuschke & Kohler (2014) and Ruel et al. (2017) noted that most people in urban areas no longer prepare their foods. This signifies that many urban dwellers consume food items prepared outside their homes by street food vendors, restaurants, hotels and schools, in the case of children and teachers. As highlighted by Matuschke (2009), the safety of such foods might be compromised during preparation because such businesses are mainly conducted for profit-making.

There have been instances where some food vendors utilize cheap chemical additives during food preparation and this alters the safety of such foods. Reports on food poisoning have been witnessed following the consumption of unsafe foods (Burt et al., 2003). Many urban dwellers have also witnessed servings of spoilt food which mainly occurs due to lack of proper storage and refrigeration of cooked and perishable foods. Contamination by chemicals might also occur due to limited storage spaces and the lack of appropriate storage facilities within restaurants and hotels. The situation is even worse for informal settlements where food vendors supply food through hawking and lack access to basic social amenities, mainly sanitation and water facilities. Other food vendors trade in prohibited food items such as wild and donkey meat. Some food vendors also utilize excess chemical preservatives when preserving food and this alters the safety of such food items.

2.4.4 Urbanization and Food Stability

Urban centers rely on food production from rural areas and food importation from other countries. As discussed by Ruel et al. (2017) and Matuschke (2009), this requires fast and efficient transport systems that can be relied on daily. Transport systems can, however, be affected in various ways and this, in turn, affects food stability within urban areas. For instance, natural calamities such as floods and landslides might make rural roads impassable and this hinders the transportation of food items to urban centers. Other disturbances such as wars, disease pandemics, politics, natural

hazards and extreme weather events are also known to alter the supply of food items to urban areas (Szabo, 2015).

Road and railway transport in developing countries are still of sub-standard levels (Matuschke & Kohler, 2014), with some rural roads being seasonal. This further slows down the transportation of food to urban areas and the poor populations are the ones who suffer most due to unstable food supply. Thus, the over-reliance on outsourcing food items has exposed urban centers to an unstable supply of food items. With food instability being experienced, hikes in the prices of food make it hard for the urban poor to afford nutritious foods.

2.4.5 Urbanization and Food Utilization

Food utilization is the right use of food biologically that requires a diet packed with sufficient energy and the essential nutritional requirements. Food utilization is influenced by the availability of water and sanitation facilities, together with one's knowledge on how to prepare, process and store these foods. With rapid urbanization rates being experienced in developing countries, informal settlements have developed which lack adequate water and sanitation facilities. This, in turn, has affected hygiene and food preparation practices. For instance, food vendors within informal settlements experience strained access to water and sanitation facilities. Poor populations within urban areas resolve to consume low-quality foods or highly processed foods due to financial constraints. They do so to meet their satiety needs rather than their nutritional needs. This negatively impacts food utilization within poor urban populations. It further exposes poor populations to food poisoning, micro-nutrient malnutrition (Bricas, 2019) and other threatening food-related illnesses.

Despite having vast knowledge on nutrition and proper dieting, most urban populations rely on processed food items, refined sugars, and fast foods because such foods are cheaper and readily available, compared to whole or unprocessed and other local foods. For a long time, the eating of refined and processed food items was considered a high-class thing and local foods (such as dark green leafy vegetables) were despised (Szabo, 2015) among urban dwellers in developing countries. This greatly contributed to over nourishment and obesity cases within rich urban populations and undernourishment among the urban poor of developing countries (Matuschke &

Kohler, 2014). This scenario is different for developed countries where higher cases of obesity are registered among the urban poor (Ruel et al., 2017). It is only due to health reasons that the urban population went back to consuming whole food items and local foods.

2.5 Urban Food Security in Sub-Saharan Africa

Most sub-Saharan countries are still classified as developing and they continue to register rapid rates of urbanization. Today, the urban population comprises high-income, middle-income and low-income individuals. Urban food security has gained importance following the realization of its contribution to the health of urban populations (Maxwell, 1998). The presence and effects of food deserts and food swamps within urban areas have also prompted researchers to carry out studies on urban food security. Initially, studies on food security in the region mainly focused on rural areas (Crush & Riley, 2018). However, recent studies are shading light on urban food security in the region.

Although efforts geared towards addressing urban households' food insecurity have been employed, sub-Saharan Africa still records high cases of food insecurity. As of 2016, it was approximated that 27.4% of Africans were severely food insecure. A large population of this percentage was from the sub-Saharan Africa region as reported by FAO (2016). By the year 2016, the East African region had also registered the highest cases of undernourishment (approximately 20% of the population), with most of them being children. As of 2009, a report by FAO (n.d.) reported that approximately 73 million people in the region are categorized as food-insecure. Populations in sub-Saharan Africa also suffer from a micro-nutrient deficiency and this has greatly fueled the development of malnutrition and other food-related complications.

The food systems in cities of sub-Saharan Africa have not attained sustainability yet. This is because urban populations grow very little food and heavily rely on outside food supplies. Thus, any slight change or impact on food supply will render many urban households to be food insecure. Such over-reliance on outside food sources also increases the carbon footprint of urban centers, further making it unsustainable. A large population in sub-Saharan Africa are also food insecure due to low income. A study by Martin et al. (2016) noted that food demands in sub-Saharan Africa are anticipated to increase to over 60% by the year 2050 yet the region cannot feed itself currently.

However, if governments invest in crop irrigation and cropping intensity, then sub-Saharan Africa will boost its food security status.

As reported by FAO (n.d.), both natural and manmade factors cause food insecurity in the region. Drought, wars and conflicts are the major causes of food insecurity. These factors directly affect the production, distribution and access of food items. Wars and conflicts also displace a lot of people from their original lands meaning that they cannot practice agriculture, an important economic activity in sub-Saharan Africa. When productivity is low, people are forced to depend on food aid that is difficult to access since transport networks are also paralyzed. Countries that have suffered from food insecurity due to wars and conflicts include Somalia, South Sudan, Ethiopia and DRC Congo. Climate variations and global warming have also contributed to food insecurity as they have disrupted planting and harvesting seasons. With most countries in the region heavily relying on rain-fed agriculture, the rapid change of the time and length of rainy seasons has affected food production (Fawole, 2015). Other manmade causes of food insecurity in the region include politics, trade, chronic poverty and disturbed fragile ecosystems that are struggling to support crop agriculture and the rearing of animals for food production.

2.6 Urban Food Security in Kenya

Kenya portrays similar food security issues similar to countries in the sub-Saharan Africa region. Kenya's urban food security heavily relies on agricultural production in rural areas. Without supply from rural areas, urban areas would register high food insecurity scores. As reported by Owuor (2018), almost 70% of Nairobi urban households are food insecure. Even though urban farming is being practiced to help address food insecurity, Gallaher et al. (2013) documented that the informal settlers of Nairobi are disadvantaged as they lack land to practice urban farming. Therefore, people have improvised ways such as sack gardening to aid in the production of vegetables. Other factors such as demographic changes, income, poverty, climate change and access to social amenities also affect food security status of urban households.

High populations of children live in food-insecure households as is evident in the informal settlements located in urban areas in Kenya. Thus, unique cases of child food insecurity are evident in urban areas of Kenya. A report by FAO (n.d.) indicated that approximately 60% of children in

urban areas of Kenya suffer from child food insecurity. This has exposed such populations to malnutrition, underweight, micro-nutrient deficiency and other food-related illnesses (Mutisya et al., 2015; Fotso et al., 2011). More specifically, children who are orphans are exposed to more severe cases of food insecurity. Strategies, however, are being implemented to reduce these negative impacts by encouraging food production through urban farming and regulating the prices of food in the market to enhance affordability.

2.7 Determinants of Urban Household Food Security

2.7.1 Household Income

Income is integral to urban households' food security (Anand et al., 2019; Mutiah & Istiqomah, 2017). Low income may force households to consume less nutritious foods that are readily available just to meet their satiety value, skip meals or even purchase food items whose safety has been compromised because they are cheaper. This scenario is especially evident in low-income neighborhoods in informal settlements as highlighted by Tuholske et al. (2018). Those households with higher income have a variety of food items to purchase since they can afford it and thus, they are considered food secure.

Household income has further affected child food security status and nutrition in most urban households. In poor populations within informal settlements, children are often subjected to a mono diet of carbohydrate foods because income is limiting and such starchy foods are readily and cheaply available (Haque, 2017; 2014; Drammeh et al., 2019). This causes nutrition deficiency and thus, affects the food security status of children. In well-off urban areas within developing countries, some children might be subjected to a diet rich in processed and fast foods. This, similarly, causes micro-nutrient deficiency and promotes the development of childhood obesity. In developed countries, obesity is often witnessed among the poor populations that consume cheap fast foods (Ke & Forde-Jones, 2015). An interesting study by Hassan (2007) revealed that families with high income indeed experienced high levels of child food insecurity because this income is largely directed to other commercial activities thereby neglecting the food needs of the household. This is because the income of such households was being controlled by the male gender who are business-oriented.

2.7.2 Age of Household Head

Some researchers argue that a household having a younger head is more food secure than a household with an older head. This is because younger heads are energetic and are still physically fit to work longer hours and obtain cash that is integral in meeting their food needs (Haque et al., 2017; Jensen et al., 2013; Mutisya et al., 2015; Mutiah & Istiqomah, 2017; Drammeh et al., 2019). On the other hand, the productivity of older heads is greatly reduced. However, it can be argued that older heads are more experienced and wiser and thus, they can make wiser decisions that will promote food security in their households. For instance, older heads might utilize their wisdom to provide healthy foods in their households and only offer junk or processed foods occasionally. This is unlike new families who might resolve to frequently consume fast and processed foods because it is considered a wealthy and classy thing to do.

2.7.3 Education Level and Employment Status of Household Head

Studies have shown that households with heads who have attained tertiary education tend to be food secure since these household heads can make sound decisions on what food items the household should consume (Anand et al., 2019; Tuholske et al., 2018). This view is also echoed by the study of Mutiah & Stiqomah (2017) which revealed that a large percentage of households classified as food secure had heads that attained tertiary education. Drammeh et al. (2019) noted that educated heads make better decisions when it comes to feeding their family balanced diets that meet their nutrition needs.

Educated heads also have access to better employment opportunities due to their qualifications and are productive while at it and thus, earn better income that is essential to food security in the urban context (Mutiah & Stiqomah, 2017). Anand et al. (2019) reported that households having employed heads are food secure unlike those with unemployed heads or those who survive on daily jobs which are obtained by luck. Furthermore, households with working individuals have higher dietary diversity scores. This indicated that they were food secure, unlike households with unemployed mothers.

2.7.4 Household Size

Large households have more mouths to feed but may have limited income. This translates to food insecurity as witnessed in households within informal settlements (Mutiah & Istiqomah, 2017; Anand et al., 2019). A household might also be composed of individuals of different ages and health needs. Thus, without meeting the nutritional needs of all household members, such households are considered food insecure (Tuholske et al., 2018). In Africa, large urban households mainly comprise young individuals and children who cannot contribute income to the household. Therefore, the household will tend to consume less nutritious foods just to meet their satiety value and ignore their nutritional needs. This then leads to child food insecurity and nutrition deficiency (Drammeh et al., 2019).

2.7.5 Gender of Household Head

It has been proved that households headed by males are food secure unlike the female-headed ones. This is attributed to the gender discrimination existing in urban workplaces (Drammeh et al., 2019). Often, women are locked out on work opportunities which their male counterparts can easily access. Without work, female-headed households will lack adequate income to meet their food security needs. In addition, females are paid less than male workers despite occupying the same job position. This results in reduced income in female-headed households. The situation is even worse for female-headed households that comprise young children as its members. The study of Hassan (2007), however, provides contradicting views as it revealed that male-headed households were food insecure. He reasoned that because the males were tasked with making family decisions, more income was invested in businesses and little income was allocated to the household's consumption.

2.7.6 Reliance on Non-Market Food Sources

It is only a small percentage of urban dwellers that achieve food provisioning through non-market food supplies. This includes urban farmers who grow and cultivate food for their consumption. This cultivation can be on a small scale in the form of kitchen gardens or done on a large scale within peri-urban areas. As reported by RUAF Foundation (n.d.), urban farming has, for a long time, been prohibited in urban areas. Some urban areas like Nairobi had policies that penalized offenders who practiced urban farming activities such as the keeping of livestock. However, this

is changing as governments and stakeholders are realizing the importance of urban farming. Currently, almost all cities in Sub-Saharan Africa encourage urban farming to enhance food provisioning and promote food security.

Urban farming has a great potential in enhancing food provisioning in urban areas given the fact that it is done in areas close to urban centers and thus, freshness and quality of food items is guaranteed. Urban farming also allows participants to sell surplus produce and obtain income which is key in improving their food security and provisioning status. If done sustainably, urban farming will reduce over-reliance on external food sources by urban dwellers (Kamiyama et al., 2016). For such sustainability to be achieved, urban farming challenges such as pollution of soils and water sources, competition for land with the development of infrastructure, and lack of political goodwill to support urban agriculture should be addressed. This would greatly change the face of food systems in urban areas.

Other non-market sources of food that boost food provisioning in urban households include rural food transfers, food favors from relatives and close friends, food-for-work payments, meals served in offices and schools, and food merry-go-rounds. These alternative sources play a significant role in enhancing food provisioning mostly when households are straining to meet their food security needs, for instance, because of income reduction, loss of jobs and calamities that hinder households from purchasing food items comfortably (Kamiyama et al., 2016).

2.8 Annotation of Key Empirical Studies Informing the Study

This section was introduced to guide the researcher in identifying research gaps that exist in the key empirical literature. As explained by the Ashford University Writing Center (2019), an annotated bibliography summarizes important scholarly articles that are relevant to one's project. This is illustrated in Table 2.1.

Table 2.1: Summary of Empirical Literature Review

Author (Year)	Study Area/ Study Population	Objective	Data Collection Method and Analysis	Findings	Conclusion
Haque et al. (2017)	Bangladesh Children (6-59 months old)	Identify factors promoting child hunger within households already declared to be food insecure	Derived from an existing food security surveillance dataset Descriptive statistics Logistic regression analysis	Household's asset index, women's education status, gender of household head and a household's food security status determine the state of child hunger in households	Most children in food-insecure households are prone to child hunger
Jensen et al. (2013)	United States of America Households with children	Examine the characteristics, prevalence and severity of food insecurity	Administration of questionnaires Descriptive statistics	Unemployment, low education levels of household heads, and disability of household heads affected households' food security Low-income households that received food aids from national programs were food secure compared to their counterparts	Employment, education status and disability status of household heads influence a household's food security status
Tomayko et al. (2017)	United States of America	Assess the differences in the dietary patterns and food insecurity status of American Indian families with children in rural and urban areas	Cross-sectional survey, Focused-group discussion and Key informant interviews Descriptive statistics regression analysis	Higher food insecurity was registered in urban households compared to rural households More urban households consumed processed diets	There exist different dietary patterns in urban and rural households
Nickanor et al. (2018)	Namibia	Assess the supermarket systems and the status of	Baseline survey Interviews	Supermarkets have had both positive and negative	Strategies addressing food insecurity or promoting the supply of healthy foods in

	Supermarkets and urban households	food security in urban households	Descriptive statistics	impacts on the food security status of households in Namibia Most study households are food insecure	supermarkets must be implemented
Pottier (2015)	Kampala, Uganda Urban households	Understand the coping mechanisms of study households	Interviews Descriptive statistics	Coping mechanisms include decreasing the amounts of staple foods consumed, shifting diets to include cheaper food items, reliance on rural food transfers, and reducing meal frequencies	Urban households should be supported to help them improve and address their food security issues
Chagomoka et al. (2017)	Ouagadougou, Burkina Faso Urban households	Understand the importance of urban and peri-urban agriculture to food security	Interviews Descriptive statistics	Peri-urban households that practiced crop farming reported high cases of food security	A complex relationship between food security and urban/peri-urban farming exists
Acharya (2016)	Tanzania Urban households	Understand the concepts of food security and malnutrition	Household surveys Bivariate statistics	Income, the education of household heads, and ability to access rural food transfers are significant in the food security and malnutrition status of urban households The health of children under five years of age is wholly dependent on their household's food security status	Intervention measures should emphasize on educating mothers on the importance of food security and how to address/prevent malnutrition in children

Agbadi et al. (2017)	Accra, Ghana	Examine whether the level of household food security meets the goals of WHO recommended child diet	Baseline survey Descriptive statistics and Regression analysis	Even though 80% of the households were food secure, kids in such households did not receive the minimum acceptable diet as listed in the WHO standards	Residing in a food secure household does not necessarily guarantee that a child will receive foods that meet their dietary needs
Mulu & Mengistie (2017)	Sekela District, Ethiopia	Compare the nutritional status of children in households that were termed to be food secure and food insecure	Administration of questionnaires and Anthropometric measurements Regression analysis	Children in food-insecure households registered stunted growth, underweight and wasting	Intervention measures should focus on improving a household's food security status and improving nutrition among children
Hassan (2007)	Garissa District, Kenya	Compare the determinants of child food security in urban and rural households.	Administration of questionnaires and Anthropometric measurements Chi-square test, Regression analysis and Descriptive statistics	Given the low levels of education; the heads' education status, employment status and income were not significant in determining child food security within the households	The investment of capital in other aspects of the economy and not food has rendered many households food insecure
Owuor (2018)	Nairobi, Kenya	Assess the food security status of urban households and its determinants	Field interviews and administration of questionnaires Cross-tabulation and assessment of food security indicators	Only 30% of Nairobi urban households were food-secure with 25% of the households being severely food insecure	Many Nairobi's urban households are food insecure
Fotso et al. (2011)	Nairobi, Kenya	Assess how the various dimensions of household poverty contribute to malnutrition among children	Focused field interviews Univariate, multivariate and bivariate analysis	Food poverty highly contributes to stunted growth among children Undernutrition is associated with asset and subjective poverty	Tackling the various kinds of poverty should be done to address malnutrition accordingly
Mutisya et al. (2015)	Nairobi, Kenya	Examine the nexus between	Focused group discussion and field interviews	Household food insecurity contributed to	Household food insecurity and household wealth

	household food security and a household's health status and its contribution to stunting among children (6-23 months)	Descriptive statistics	stunting among children	status interact with each other to determine the levels of malnutrition among children
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2.9 Research Gaps

Most studies addressing the food security status of households with children have focused on the socio-economic aspects of households and the neighborhood characteristics in rural areas; or urban areas outside cities that are still growing and thus, have less dense urban populations. Other studies have focused on informal settlement households with infants and toddlers (Mutisya et al., 2015; Goudet et al., 2019; Wambura & Marnane, 2019; Wanyama et al., 2019). Some research has explored food security in low-income neighborhoods, while others have compared the food security status of rural and urban households with children (Tomayko et al., 2017). Other studies have focused on households with children that are headed by a unique population of individuals, for instance, those suffering from HIV/AIDS or people from a unique race or ethnicity (Pienaar et al., 2017). Looking at these previous studies, it can be concluded that urban households with children below five years have been given little consideration in the research world. Thus, the study aimed at contributing more knowledge to this research gap by examining the food security status of urban households with children under five years of age in Nairobi.

2.10 Theoretical Framework

Although there exist various theories such as the dependency theory, urbanization theory, neo-Malthusian theory, modernization and human ecology theory that have been employed in discussing concepts of food security (Scanlan, 2003), this study utilized the ecological systems theory to explain the variables informing the study. The ecological systems theory was considered the most suitable because it relates to how the various aspects of food security influence urban households with children. This theory was developed in the year 1979 by one psychologist Urie Bronfenbrenner who explained that a child's growth and development are determined by various factors acting together either directly or indirectly. These factors could be immediate factors that directly affect a child such as the family where the child grows in or external factors such as wars and natural calamities that will have ripple effects and affect the child's development indirectly (Bronfenbrenner, 1992).

As discussed by Ryan (2001), Bronfenbrenner structured five environments (microsystem, mesosystem, ecosystem, macrosystem and chronosystem) that influence the development of a child. The microsystem is the immediate environment that a child directly interacts with. This

could be his/her family, childcare facilities, school and immediate neighborhood where the child is brought up. At this level, Bronfenbrenner explained that a bi-directional influence exists as both the child and the immediate environment can affect each other. For instance, the family can influence how a child behaves but children can also influence how a family behaves. The mesosystem is the structure where the different aspects of the microsystem interact to impact the growth of a child. For instance, a child may pick up certain behaviors from his/her parents at home and also mimic the behavior of his/her teachers in school. This, in turn, determined how they will develop.

The ecosystem is the environment that, despite the child does not interact with it directly, affects their development to a great extent. For instance, the work schedule of the parents might be too tight to the extent that they lack time to interact with their child. With minimal parental guidance in such circumstances, such a child might develop certain behaviors that would not surface if parental guidance was involved. The macrosystem consists of laws, customs, and cultural beliefs that exhibit rippling effects that affect the development of a child. For instance, culture may dictate that during meal servings, the male heads get the biggest share and are served first before the children eat. Thus, when food is inadequate, children in such households might receive small servings and this will eventually affect their physical development, especially when the food served does not adequately meet their nutritional needs. The chronosystem consists of time dimensions and transitions that affect child development. This could include the death of a parent or environmental transitions that produce new conditions that will determine how a child grows (Ryan, 2001).

The ecological systems theory has been mainly used to describe human behavior in the field of psychology. Given its multidisciplinary nature (Greder, 2000), the theory has also been modified and used by various researchers in discussing certain food security concepts. For instance, by using this theory, Mammen et al. (2008) illustrated that the family operates in a nest-like system and that the resources they possess (including their income) together with the geographical area they stay in influences their food security status. LaPierre et al. (2012) also based their study on this theory where they illustrated how the income and coping strategies of old women in poor neighborhoods influenced the quality of their diet and their food security status. By using this theory, Greder

(2000) and Carter et al. (2012) explained how low-income households managed to address their food security requirements and how social and environmental factors affect household food insecurity respectively.

In this study, the environments depicted in the theory have been modified to incorporate the various factors that determine food security in the study households. These factors do not act independently as they interact with each other at various levels to influence food security in urban households with children. This is consistent with the basic principle of ecological systems theory that holds that factors influencing one's growth are interdependent and are not mutually exclusive (LaPierre et al., 2012). Rooting on the ecological systems theory, this next section illustrates the conceptual framework that guided the study.

2.11 Conceptual Framework

Figure 2.1 illustrates the conceptual framework that guided the study. For clarity purposes, the plain arrows show how the study variables influence the households' food security status while the solid grey arrows represent the interactions within these variables. Furthermore, the households' food security status is explained by their HFIAS, HFIAP, HDDS and MAHFP scores. The households' structure, size and composition, and the employment status of the household heads comprise their demographic characteristics. The households' source of income, income range, LPI, reliance on rural food transfers, and reliance on urban farming comprise their economic characteristics.

Being the study's focus, the food security status occupies the microsystem. From literature (Jensen et al., 2013), food-secure households tend to have a low HFIAS score, and high scores of MAHFP and HDDS. Various factors directly or indirectly interact at different levels to influence the food security status of urban households with children under five years. Literature has shown that demographic characteristics like household structure, size, and composition have an impact on a household's food security status. Fotso et al. (2011) explained that a large household size and composition is prone to higher levels of food insecurity compared to those households with few individuals. Households with employed are also better off since the employed heads can have an income that will be invested in meeting the household's food security needs. Worse food insecurity

cases are witnessed in households with a higher child population and the household heads temporarily or totally lack employment. This is because this child population is not economically productive and still need to access nutritious foods.

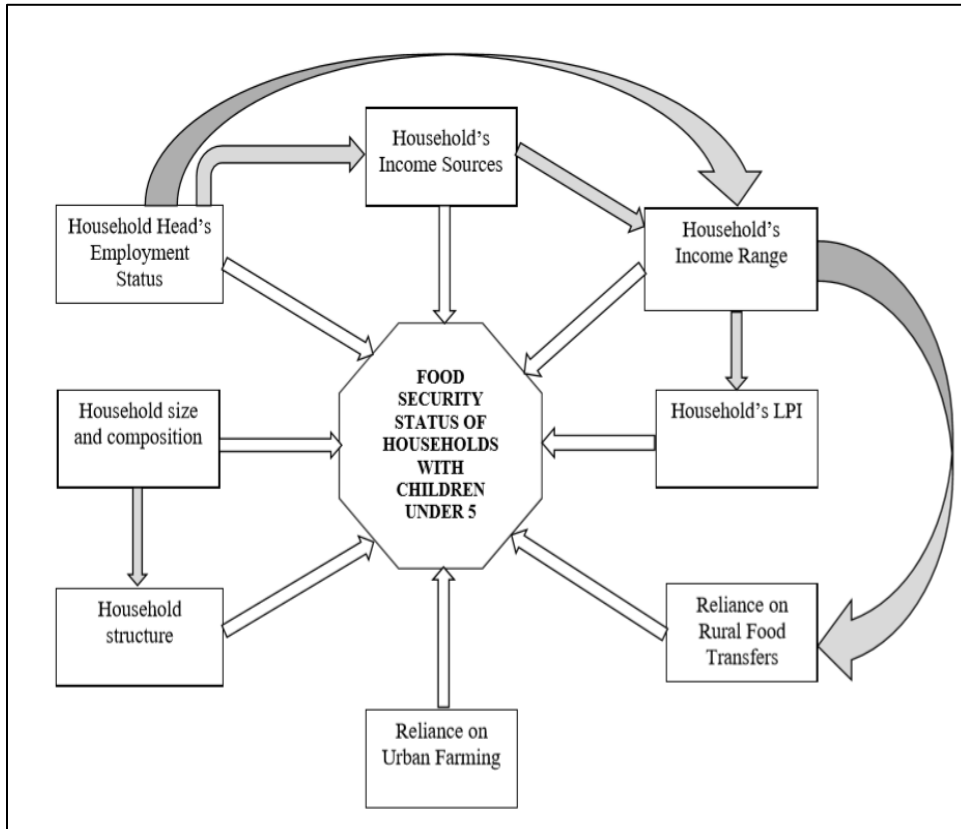


Figure 2.1: Conceptual Framework
Source: Researcher

Economic characteristics such as reliance on rural food transfers and urban farming affect the food security status in urban households with children under five years. From literature, households that practice urban farming are food secure unlike those that solely depend on food purchasing to meet their food security needs. As a coping mechanism, some households also rely on rural food transfers to meet their food security needs, especially when faced with financial constraints. Other economic characteristics such as a household’s income range and sources of income influence its food security status such that those with higher income or several sources of income are financially empowered to meet their food security needs in an urban setting. A household’s LPI refers to the frequency of going without certain basic needs. From literature (Mattes et al., 2016), households with higher LPI scores are food insecure.

These economic and demographic characteristics impact on each other indirectly in various ways. For instance, a household's size and composition influences its structure. The employment status of a household head also influences the household's income sources and income range which, in turn, influences the household's LPI. The household's income range also has an impact on the household's reliance on rural food transfers. Often, households within a low-income range rely more on rural food transfers as their main coping mechanism when faced with food insecurity in an urban setting.

CHAPTER THREE

STUDY AREA AND STUDY METHODOLOGY

3.1 Introduction

This chapter provides a detailed description of both the study area and the research methodology. The study area is the city of Nairobi. As such, the section on study area presents Nairobi's historical perspective, population dynamics, food system, poverty dynamics, employment and income, and access to basic infrastructure. Next, the section on methodology presents the research design and methodology, the parent study's methodology, sampling design, source of study variables, methods of data analysis, and the ethical considerations of the study.

3.2 Study Area

3.2.1 Historical Perspective

Nairobi is among the 47 counties in Kenya and the capital city of the country. The expansion of Nairobi started after independence. Initially, it was a small transport centre and town occupying 18km² of land in the early 1900s. With time, different races started gaining numbers in the town and this led to the division of the city along racial lines. Asians, Africans and Europeans were allocated different residential areas, with the Africans occupying the least attractive eastern parts of the city (Owuor et al., 2017). After independence, Nairobi's population grew and this prompted the expansion of the city boundaries to cover Dagoretti, Langa'ta, Karen and the Nairobi National Park. At this stage, Nairobi occupied an area of 680km². This growth and expansion continued to be experienced over the years (Sagga, 2008). Today, Nairobi covers approximately 696km² of land. It is bordered by four counties (Kiambu, Machakos, Murang'a and Kajiado) that currently form part of the larger Nairobi Metropolitan area. Nairobi City County is currently divided into 11 administrative sub-counties. These are Dagoretti, Kamukunji, Embakasi, Lang'ata, Kasarani, Kibra, Westlands, Makadara, Mathare, Starehe and Njiru (see Figure 3.1).

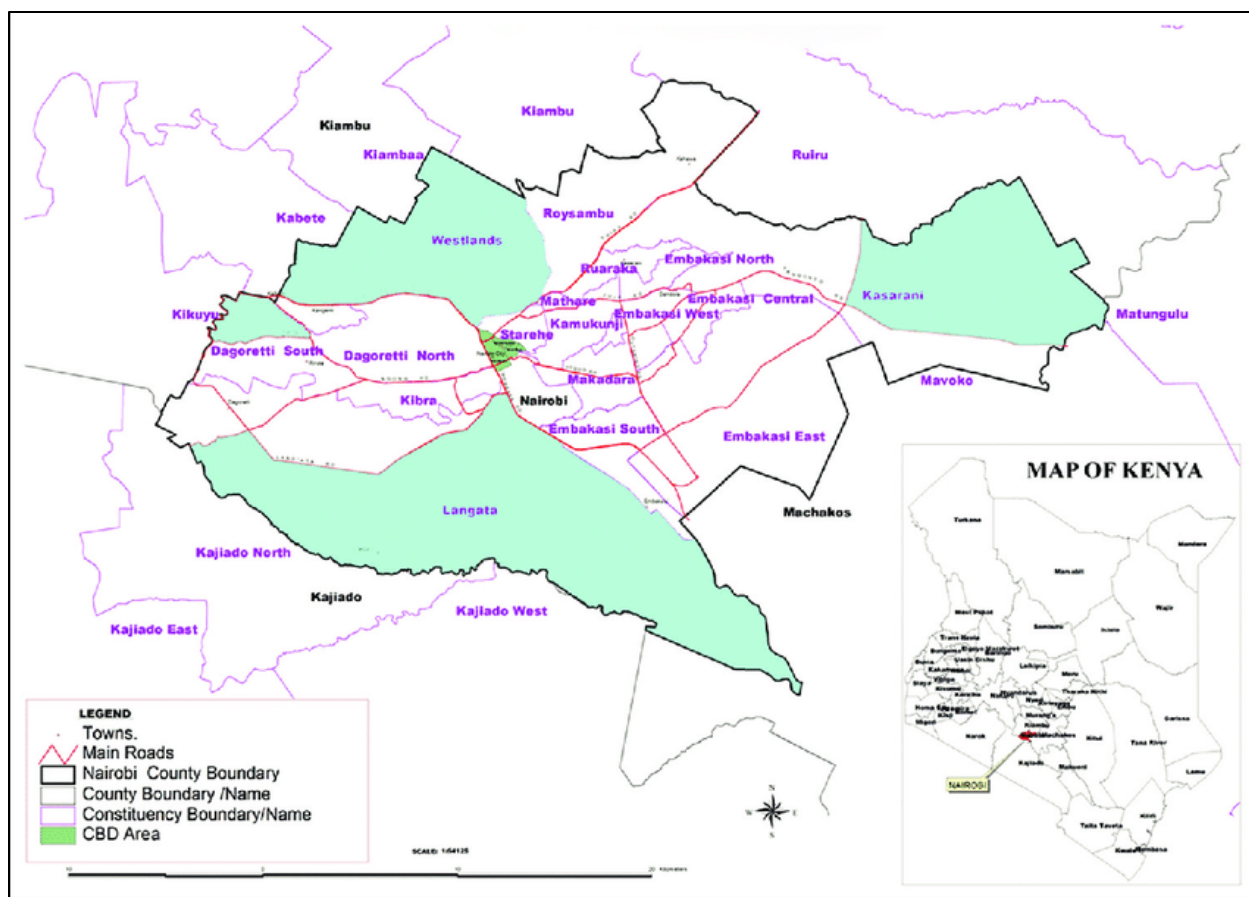


Figure 3.1: Nairobi City County Administrative Sub-Counties

Source: https://www.researchgate.net/figure/Figure-1-Map-of-Nairobi-City-County-fig1_336790572

3.2.2 Population Dynamics

The population in Nairobi was low before independence due to the restricted movement of Africans to Nairobi. It was only those individuals who worked for white settlers that were allowed to stay in the area during that time. However, after independence, rapid population growth was witnessed. For instance, Nairobi’s population grew from 267,000 people in 1963 to half a million in 1971 and to 2.2 million in 1999 and to 4.4 million people in 2019 (KNBS, 2019a). This is attributed to rural-urban migration and natural increase by birth and immigration. Embakasi sub-County has the highest population with 988,746 people, while Kibira is the least populated with 185,768 people. Nairobi has a population of over 500,000 children below five years (KNBS, 2019b); the second-highest population after that of youths. Out of the children under five years population, 264,099 are males and 260,888 are females. Table 3.1 shows the population dynamics in Nairobi by administrative sub-counties.

Table 3.1: Nairobi City County Population Dynamics

Sub-County	Total Population	Population of Children Under Five Years of Age
Embakasi	988,746	125,958
Kasarani	780,619	97,672
Njiru	626,451	80,678
Dagoretti	434,177	53,989
Westlands	308,839	28,730
Kamukunji	268,269	33,987
Starehe	210,411	20,302
Mathare	206,550	25,357
Lang'ata	197,472	17,915
Makadara	189,526	20,248
Kibra	185,768	20,151
TOTAL	4,396,828	524,987
Source: KNBS (2019b)		

3.2.3 Food System

Nairobi residents rely on food importation from neighboring counties, rural areas and other countries. Only a few food items (kale, maize, beans, chicken, goats and cows) are produced and/or reared within Nairobi (KNBS, 2019c). Fruits are sourced from Machakos, Kisii and Meru counties of Kenya and from Tanzania and Uganda. Tomatoes are sourced from Taita Taveta County and Tanzania. Once these food items are imported, they are transported to known markets (Wakulima, Marikiti, Gikomba, Kibera and Kangemi) in Nairobi where middlemen negotiate their sales (Owuor et al., 2017). Other food vendors then come to these markets to purchase food items in bulk from where they sell to people in other areas of Nairobi.

Meat consumption has grown as most Nairobi households purchase meat items from local butcheries and from the City Market located in the Central Business District. These meat and meat products are sourced from designated slaughterhouses located in Dagoretti, Kiamaiko, Kiserian and Shauri Moyo (Alarcon et al., 2017). Other processed foods are purchased from local shops, wholesale retailers and supermarkets mainly due to food safety reasons. Supermarkets are mainly frequented by the middle and high-income populations in Nairobi. Currently, some of the famous supermarkets in Nairobi include Carrefour, Quickmart, Chandarana, Eastmatt and Naivas.

Low-income populations purchase most of their dry food items and cereals from wholesale retailers as this is a cheaper way of obtaining large quantities of food. Otherwise, small quantities of dry foods are often purchased from local shops and informal food vendors within the residential neighborhoods. Research has noted the significance of informal food sector to urban food security, especially in low-income neighborhoods (Ogubi et al., 2019). The informal food sector allows people to buy food items in small portions and on credit, thereby allowing households to meet their daily food security needs despite having a low income. Even while doing so, it has been noted that most of Nairobi's low-income populations aim at meeting their satiety needs rather than their nutritional needs when it comes to purchasing food items. That is why undernourishment and malnutrition are more pronounced in the informal settlements of Nairobi compared to other areas.

For a long time, urban farming was prohibited in the city of Nairobi. It is only recently that the city enacted laws that permitted urban farming (Nairobi County Urban Agriculture Bill, 2014). The competition for land with other economic activities (such as the construction of industries and residential areas), has also discouraged investors from heavily investing in urban farming. Thus, most people grow crops and rear animals for their consumption. As revealed by KNBS (2019c), urban farming activities in Nairobi related to food production include aqua-farming, livestock production and food crop production on both large and small scales. These farming activities, sometimes, are supported by irrigation. Mostly maize, beans and kale are grown in Nairobi. Other animal food items that are mostly reared include chicken, cows (for milk and meat products), goats, sheep, pigs, rabbits and fish in fish ponds. Most of these items are produced for individual household consumption (as recorded in 24,030 households) while fewer households (6,956 households) produce them for commercial purposes (Nairobi County Integrated Development Plan, 2018).

3.2.4 Poverty Dynamics

Given the rapid rates of urbanization experienced in Nairobi, informal settlements have sprung up and they house a majority of the poor urban populations. Just like other cities and towns, informal settlements in Nairobi have developed just next to or behind the high-income residential neighborhoods. They house approximately 60%-80% of the Nairobi urban population. Some of the legal and illegal informal settlements in Nairobi as highlighted by Owuor et al. (2017) include

Gitara, Kangemi, Mihang'o, Githogoro, Majengo-Pumwani, Mji-wa-Huruma, Kibera, Mukuru, Mathare and Kaloleni. Given the rapid growth of these slum areas, most of their population lack or have limited access to social services like garbage collection, water and sanitary facilities. Together with the limited space in slum areas, the lack of or inadequate access to social amenities has exposed most people in informal settlements to various levels of food insecurity. This is because many of them cannot cultivate food due to the lack of land. In case crop farming is done, its safety is threatened by pollution from sewage and solid wastes.

3.2.5 Employment and Income

Being a city that has embraced diversity in all its aspects, Nairobi comprises individuals of diverse ages that engage in various socio-economic activities to survive. KNBS (2019c) reported that over 1.8 million individuals aged between 15 to 65 years comprise Nairobi's labor force. The majority of this population work within the informal sector (Owuor et al., 2017). They engage in various jobs such as street vending, operating small and medium-sized businesses, and self-employment in the artisan industry, among others. As discussed by Rodriquez-Toress (2010), the average monthly income in Nairobi is Ksh 13,602. On the other hand, over 1.5 million people do not work due to various reasons such as full-time school attendance, being housewives, retirement and the inability to completely contribute to the labor force due to one's age (young and/or old) or disability status. Interestingly, only 422,288 individuals between 15 and 65 years are considered to be seeking job opportunities (KNBS, 2019c).

3.2.6 Access to Basic infrastructure

Most of the urban population (90.6%) in Nairobi dwell in rental houses which are mostly managed by private business owners. These rental houses can either be bungalows, flats, apartments or single stand houses made of a variety of materials such as mud, iron sheets, wood and stones. It is only a small portion of Nairobi residents that own houses (9.3%) (KNBS, 2019c). As described by Mwau et al. (2019), there exist three different classes of rental housing in Nairobi, that is, low-cost, middle-income and high-income rental housing. Almost 70% of Nairobians live in low-cost rental housings that are of different types such as shacks (single-room units that are 100ft²), tenements (5-10 walk-up storeys), low-cost public housing that is ageing and mixed shelters (a

combination of tenements and shacks in upper storeys). This signifies that the income in most households of Nairobi is partly allocated to settling rental costs.

Most people in Nairobi rely on piped water, borehole water and water from vendors to ensure that they meet their household water needs. Out of these three sources, piped water was registered as the most popular source of water in Nairobi as reported by KNBS (2019c). Despite it being popular, many Nairobi residents often witness cases of dry taps for days, weeks and even months, especially during dry seasons. Cases of water rationing have also been witnessed in most households. Therefore, piped water has its challenges that push people to buy water from water vendors. Some residential areas provide their tenants with a combination of borehole and city county piped water as a way of coping with water rationing in the city. Such tenants get to pay more for their water compared to other Nairobi residents who wholly depend on piped water.

A large percentage of the Nairobi population depends on LPG gas as their cooking fuel. The second most utilized cooking fuel in Nairobi is paraffin (26.5% of the households). Other fuel types such as electricity, charcoal and firewood are utilized in cooking but in small quantities (KNBS, 2019c). A study by Ndolo (2017) in Nairobi informal settlements revealed that most low-income households heavily rely on charcoal and kerosene as their cooking energy because they are efficient and can be afforded in small quantities. This is so despite charcoal and kerosene being considered as unclean sources of energy. Electricity is the main lighting fuel in most urban households. Only a few houses (1.6%) utilize paraffin for lighting, especially in informal settlements because it can be bought in small amounts or on credit.

3.3 Study Methodology

3.3.1 The Study Design

The study utilized data from an existing dataset of the Hungry Cities Partnership (HCP) Project. The HCP Project (<https://hungrycities.net/>) conducted city-wide surveys on urban food security in Mexico City; Nanjing; Kingston; Cape Town; Bangalore; Maputo; and Nairobi. This study uses the Nairobi survey dataset. Therefore, there is a need to understand the parent study's design and methodology (Doolan & Froelicher, 2009).

The HCP Nairobi survey was conducted in May 2016. To generate a sample that represented the whole city, the HCP survey was carried out in 23 administrative sub-locations that were randomly selected across the 23 administrative locations and eight Nairobi administrative divisions. The multi-stage proportional-to-population size (PPS) random sampling method was employed in selecting the sampled households (see Owuor, 2018: 5-8 for more methodological details). In total, 1,434 households were included in the study and data collected from them using android tablets and Open Data Kit (ODK) Collect App.

3.3.2 Determination of Study Sub-Sample and Variables from HCP Nairobi Database

The main objective of this study was to assess food security status of urban households with children under five years of age. As such, the study generated a sub-sample of all the 479 households, from the dataset, with children under five years. This was achieved by use of two filter variables from the HCP Nairobi Household Member File (HHMF) database. These were Variable 12d (household member's age) and Variable 12b (household relationship to household head). The resultant household IDs of the 479 households was then linked to the HCP Nairobi Household File (HHF) database to allow for household-level analysis. Table 3.2 presents a summary of the HCP survey sampled areas and the distribution of households having children below five years within the sampled sub-locations. On the other hand, Figure 3.2 illustrates the spatial distribution of households that were sampled during data collection.

Table 3.2: Determination of Study Sub-Sample

Division*	Sampled Sub-locations in HCP survey	No. of sampled households in HCP survey	Generated sub-sample
Dagoretti	Kawangware, Kenyatta/Golf Course and Riruta	313	118
Kibera	Karen, Lindi and South C	144	52
Embakasi	Embakasi, Komarock and Umoja	317	106
Makadara	Hamza, Makongeni and Hazina	158	62
Central	Huruma, Pangani and Ngara East	200	66
Kasarani	Zimmerman and Roysambu	117	24
Pumwani	Uhuru, Shauri Moyo and Bondeni/Gorofani	98	28
Westlands	Highridge, Kileleshwa and Spring Valley	87	23
Total		1,434	479

*Administrative units are as per the 2009 Kenya Population and Housing Census

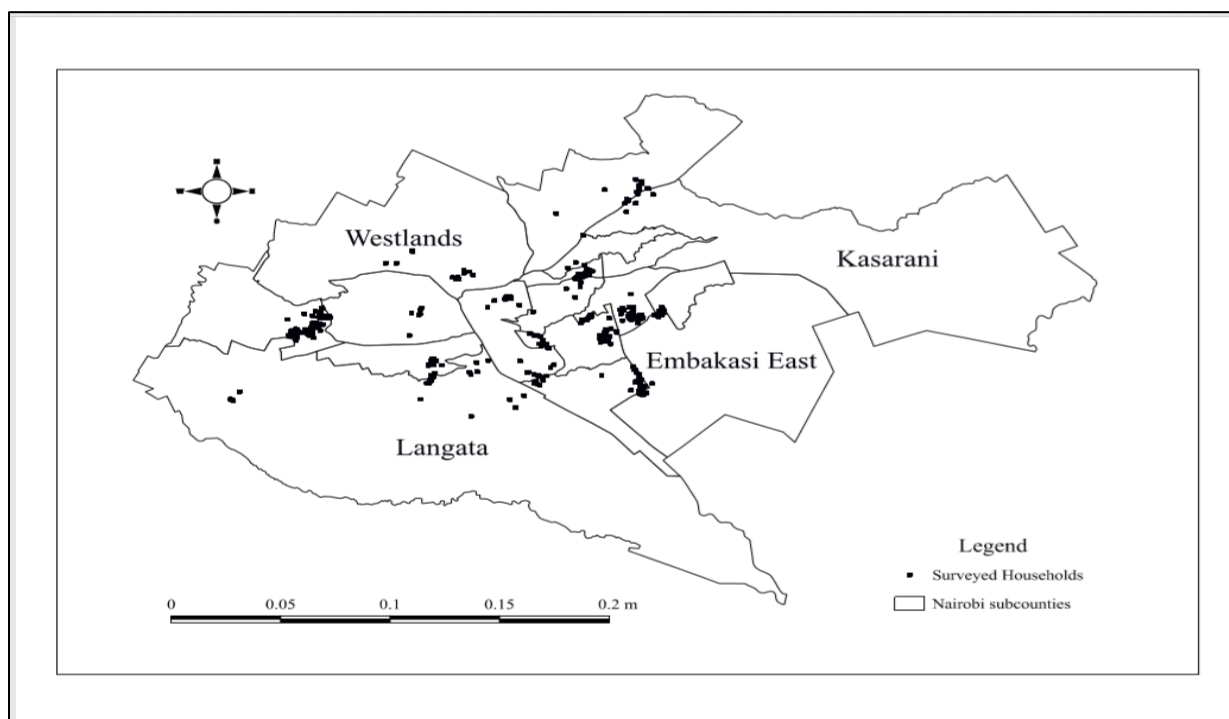


Figure 3.2: Spatial Distribution of Sampled Households within Nairobi Sub-Counties
 Source: Researcher (Based on HCP Dataset)

The determination of study variables was guided by the study’s specific objectives. The HCP survey collected data on all the food security dimensions (utilization, accessibility, availability and stability); food sources; household demographics; household data; social grants; and urban-rural linkages. Therefore, only variables that were relevant to the study’s objectives were selected as summarized in Table 3.3.

Table 3.3: Determination of Study Variables

Study Variable	Source variable from HCP survey Household Member (HHMF) and Household (HHF) Files
Household Demographic Characteristics	
Household structure	HHF VDQ14: Household structure
Household size and composition	HHF VCQ121a: Number of household members HHMF V12c: Gender of household member HHMF V12d: Household member age
Employment status of household head	HHF VDQ15a: Employment status and income source of household head
Household Economic Characteristics	
Household income and Lived Poverty Index (LPI)	HHF VDQ15a & b: Household income sources and income range

	HHF VDQ18a-f: Household member experience of inconsistent access to cooking fuel, food, medical care, clean water, electricity, and cash income
Household reliance on non-market food sources	HHF VFQ24a: Rural food transfer
Household experience of unaffordable food prices	HHF VAQ4 & 5: If any member of household went without certain types of food because of the price of food or unaffordable food price
Households State of Food Security	
Household Food Insecurity Access Scale (HFIAS) Scores and Household Food Insecurity Access Prevalence (HFIAP)	HHF VAQ1a-j: Frequency-of-occurrence questions on household food insecurity conditions
Household Dietary Diversity Score (HDDS)	HHF VAQ2: Types of food any member of household consumed
Months of Adequate Household Food Provisioning (MAHFP)	HHF VAQ3a & b: Months when household member did not have enough to eat
Source: HCP Nairobi Dataset	

3.2.5 Methods of Data Analysis

Various data analysis techniques were applied to achieve the study objectives, to determine the households state of food security, to determine the households Lived Poverty Index (LPI) and to test the study hypotheses. First, frequency distributions were used to present and describe most of the study variables, including the characteristics of the study households. The frequency distributions were presented using tables and graphs. Second, the measures used to analyze households state of food security (HFIAS, HFIAP, HDDS, and MAHFP) were calculated. Third, the Lived Poverty Index was calculated to compliment the use of monthly income in data analysis. Fourth, the Chi-Square test and Kruskal Wallis test were employed to identify the specific demographic and economic characteristics that significantly determine the food security status of the study households.

3.2.6 Measures of Household Food Security

3.2.6.1 Household Food Insecurity Access Scale (HFIAS) Score

HFIAS scores were derived from 9 frequency-of-occurrence questions that were asked over a recall period of the past four weeks of the interview. The responses *no*, *rarely*, *sometimes* and *often* were coded as 0, 1, 2, and 3, respectively. The sum of the scores for each household was then used to establish the household's HFIAS score. The derived HFIAS scores determine the degree of food insecurity in the household in terms of accessibility (Coates et al, 2007) and are within the range

0 and 27. A HFIAS score of 0 is obtained when a household responds *no* (scored as 0) to all the nine questions while a score of 27 is obtained when a household responds *often* (scored as 3) to all the nine questions. This means that lower scores translate to food secure households and vice versa.

3.2.6.2 Household Food Insecurity Access Prevalence (HFIAP)

HFIAP reports on the food access prevalence that a target population exhibits. HFIAP was determined from HFIAS scores. HFIAP categorizes households into four levels of household food insecurity (food secure, mildly food insecure, moderately food insecure, and severely food insecure) in terms of accessibility. As explained by Coates et al. (2007), households that affirmatively respond to more severe conditions stated in the HFIAS questions are considered to be increasingly food insecure.

3.2.6.3 Household Dietary Diversity Score (HDDS)

This refers to the total food groups consumed in a household over a specific response period, usually the last 24 hours (Swindale & Bilinsky, 2005). While collecting data on HDDS, focus is given to the consumed food groups rather than individual food items consumed as this better represents the quality of diet in the household. In this study, HDDS was determined by classifying the foods into 12 food groups, namely: cereals; roots and tubers; vegetables; fruits; meat, poultry and offal; eggs; fish and seafood; pulse, legumes and nuts; milk and milk products; oil and fats; sugar/honey; and any other food such as condiments. A household with a high HDDS score signifies an improved household's diet with more diversity, while that with a low score is considered to have a poor diet with less diversity.

3.2.6.4 Months of Adequate Household Food Provisioning (MAHFP)

MAHFP was determined from the number of months in a year that households reported no food shortages. As described by Bilinsky & Swindale (2010), MAHFP is concerned with the regularity and reliability aspects of food security. It further focuses on variations in the household's ability to guarantee a regular supply of food in all months of the year. The respondents were asked whether they had access to food in the last twelve months of the interview. Those households that responded '*no*' were then asked to identify the months where they found it difficult to access foods – determining the MAHFP for each household. As such, households that registered a regular supply

of food throughout the year were considered to be food secure, while those that struggled during certain months were classified as food insecure.

3.2.7 Household Lived Poverty Index (LPI)

LPI is an experiential measure of the frequency of reports of people being incapable to access a basket of life's basic necessities, including food (Owuor, 2018) in the course of the year. The identified basic necessities, according to Mattes et al. (2016), include food, electricity, water, cooking fuel, income and medical care. The LPI scores were calculated from questions regarding how frequently households experienced unreliable access to electricity, food, cooking fuel medical care, clean water, and income in the previous year of the interview. For each household, the LPI score was computed from five-point Likert scale responses: *never* (=0), *just once or twice* (=1), *several times* (=2), *many times* (=3) and *always* (=4). Subjectively, high scores translate to increased experience of poverty.

3.2.8 Hypothesis Testing

Hypothesis testing was achieved through applying the Kruskal-Wallis test; a non-parametric test based on ranks seeking to compare two or more independent samples that may have equal or different sample sizes. It is suitable for variables that have been measured on the ordinal level/scale of measurement. Other assumptions of the Kruskal-Wallis test are that the study participants are selected randomly and that the variances are not equal. In the case of this study, the dependent variable was the households' food security status and the independent variables were the household size and the household Lived Poverty Index (LPI) that were measured at ordinal levels of measurement.

3.2.9 Ethical Considerations

Being a study that utilized an existing dataset of the parent study, the researcher first obtained consent to utilize the dataset. Secondly, the researcher acknowledged the use of the Nairobi HCP dataset. Finally, confidentiality of the respondents of the parent study was protected at all costs, and no alteration of the dataset was done after extracting the study sub-sample and variables.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings and discussion of the study. Guided by the study objectives and hypotheses, its aim is to present the study results and then interpret them in relation to the research problem while stating the significance of the study findings. The objectives of the study were:

1. To examine the demographic and economic characteristics of urban households with children under five years of age in Nairobi.
2. To determine the state of food security in urban households with children under five years of age in Nairobi.
3. To assess the demographic and economic dynamics that influence the state of food security in urban households with children under five years of age in Nairobi.

The study also hypothesized that:

1. H_0 : Household size does not significantly influence the food security status of households with children under five years of age in Nairobi.
 H_1 : Household size significantly influences the food security status of households with children under five years of age in Nairobi.
2. H_0 : A households' Lived Poverty Index does not significantly influence the food security status of households with children under five years of age in Nairobi.
 H_1 : A households' Lived Poverty Index significantly influences the food security status of households with children under five years of age in Nairobi.

4.2 Demographic Characteristics of Households with Children Under Five Years

4.2.1 Household Structure

Household structure refers to the generational nucleation of a household. 70.6% of the households under study were classified as nuclear households; consisting of a husband, wife and children. Only 12.3% of the households were classified as extended households consisting of a husband, wife, children and relatives. The rest of the households were either female-centered (10.9%) or male-centered (6.3%) households as illustrated in Table 4.1. Female-centered households were defined to consist of a female, children and relatives but lacks a husband while male-centered

households consisted of a male, children and relatives but lacks a wife (Owuor, 2018). These findings imply that most households under study had a nuclear family setup. The findings are also similar to that of Agbadi et al. (2017) who also reported that most households in Accra, Ghana comprised of nuclear families while assessing the levels of household food security.

Table 4.1: Household Structure

Structure	Frequency (n)	Percentage (%)
Female-Centered	52	10.9
Male-Centered	30	6.3
Nuclear family	338	70.6
Extended family	49	12.2
Source: HCP Nairobi Dataset Analysis (2020)		

4.2.2 Household Size and Composition

The sampled households had a mean household size of 4 members. Therefore, majority of the households under study comprised of four individuals. This corresponds to the findings by Mutisya et al. (2015) who documented an average household size of 3 when studying the household food security and health status nexus within Nairobi. As highlighted in Table 4.2, a total of 561 children under five years were registered in the 479 households. Out of this, 250 children were of the female gender while the remaining 311 were of the male gender. Therefore, the population of male children was higher compared to that of female children.

Table 4.2: Characteristics of Children under Five Years

	Frequency (n)	Percentage (%)
Gender		
Male	311	55.43
Female	250	44.57
Total	561	100
Age Distribution		
0-23 months	403	84.1
2-3 years	76	15.9
Source: HCP Nairobi Dataset Analysis (2020)		

Regarding the child population in the study households, 84.1% of the households had only one child under five years of age, 14.6% had two children, while 1.3% had 3 children below the age of five. Out of a sample size of 479 households, 403 study households had children who were

either one year or less. This can be attributed to the relatively young families that now exist in Nairobi County as reported by KNBS (2019b).

4.2.3 Employment Status of Household Head

For this study, employment of household heads was classified into three main categories; formal, informal, and casual employment. Formal employment was where the household head had entered into a contract agreement with a company/institution/organization and they get paid on a regular basis. Informal employment was where the household head was either self-employed or worked in a business setting that has minimal monitoring by the government. Casual employment was defined as when the head had combined both formal and informal employment. Out of the 479 study households, only 237 of them had heads with formal employment, 99 with informal employment, and 67 with causal employment. Thus, a large percentage of the households under study had heads who work in formal employment. These findings are similar to that of Acharya (2016) who reported that over 50% of household heads had either casual or formal employment while assessing the food security determinants in Tanzanian urban households.

4.3 Economic Characteristics of Households with Children Under Five Years

4.3.1 Household income

The study explored the different sources of income for the study households over the last month of the interview. As illustrated in Table 4.3, it was revealed that the major sources of income included formal wage work, informal wage work, casual wage work, and informal businesses in the form of selling goods and fresh produce. This is probably attributed to the existence of different types of work opportunities in Nairobi, both formal and informal, as reported by the KNBS (2019c). Notably, formal wage work was registered in 237 households. This signifies that the 237 households relied on formal employment for their income. These results are different from the findings of Hassan (2007) who documented that the major sources of urban household income within Garissa town are handouts from husbands and casual labor. The difference is attributed to the cultural characteristics and different gender roles of the population under Hassan's (2007) study.

Table 4.3: Household Income Source

Income Source	N	Percentage (%)
Formal Wage work	237	38.3
Informal Wage work	99	16.0
Casual Wage work (Formal and Informal)	67	10.8
Formal Business	85	13.7
Informal Business (Sale of fresh produce that is produced by this household)	10	1.6
Informal Business (Sale of fresh produce that is produced elsewhere)	16	2.6
Informal Business (Sale of goods)	63	10.2
Informal Business (Renting property)	4	0.6
Other Informal Business (Specify)	10	1.6
Interest Earned on Personal Investments	3	0.5
Gifts (one-time monetary gifts)	2	0.3
Cash Remittances	6	1.0
Government Social Grants (i.e. Old Age Pension, Unemployment Insurance, Child Benefit, Disability)	3	0.5
Formal loans (Banks)	6	1.0
Informal loans (Moneylenders)	3	0.5
TOTAL		100

Source: HCP Nairobi Dataset Analysis (2020)

The respondents were also requested to state the range within which their net income fall. Out of the 479 households, only 272 households were willing to reveal their net income range. As illustrated in Table 4.4, 36.8% of the households reported a net income within the 10,000 to 34,000 Kenya shillings range. Notably, 20.6% of the households earned a net income of less than 10,000 Kenya shillings. With income being integral to the food security status of households within urban areas, such households were highly likely to suffer from food insecurity.

Table 4.4: Household Net Income Range

Net Income (Ksh)	Frequency (n)	Percentage (%)
<= 10000.00	56	20.6
10001.00 - 19000.00	41	15.1
19001.00 - 34000.00	59	21.7
34001.00 - 75000.00	58	21.3
75001.00+	58	21.3
Total	272	100

Source: HCP Nairobi Dataset Analysis (2020)

4.3.2 Household Lived Poverty Index

The respondents were asked to state the number of times they went without various basic necessities and their responses were recorded on a Likert Scale. Figure 4.1 represents the findings from the responses. While over 80% of the households agreed that they have never gone without any of the mentioned basic needs, 28.8% of them went without electricity once or twice a year. This signifies that access to electricity was limiting to some of the households. From the Likert scale, the mean LPI was 1.09 since most of the households (91.4%) had an LPI score of less than 1 as illustrated in Figure 4.2. Therefore, most of the households under study have experienced relatively low levels of poverty. Similarly, the findings of the study by Nickanor et al. (2018) also registered a mean LPI of 1.78 while assessing the food security status of urban households in Namibia.

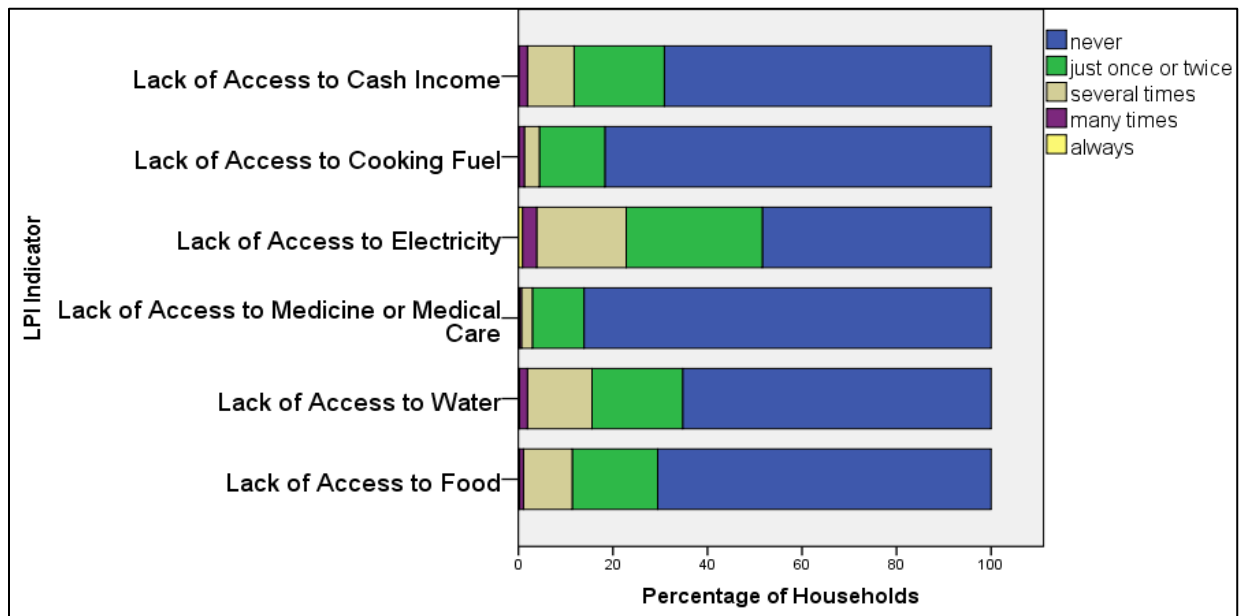


Figure 4.1: Lived Poverty Index Indicators
 Source: HCP Nairobi Dataset Analysis (2020)

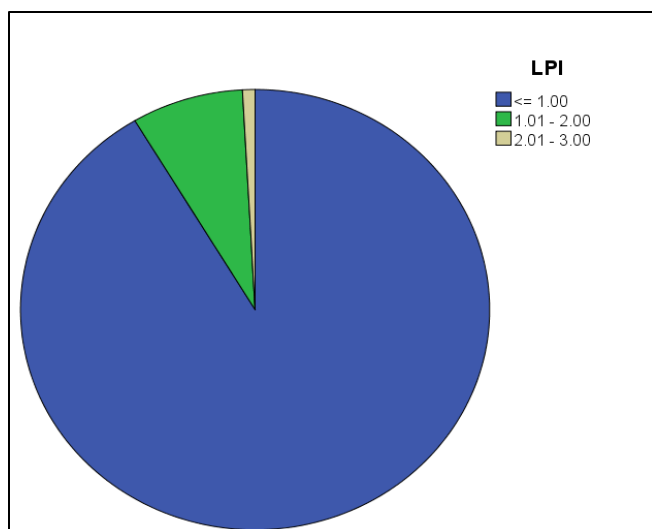


Figure 4.2: LPI Scores

Source: HCP Nairobi Dataset Analysis (2020)

4.3.3 Household Reliance on Non-Market Food Sources

The two non-market food sources considered in this study were urban farming and reliance on rural food transfers. From the analysis, it was reported that only 37 households (7.7%) with children under five years practiced any form of urban farming in Nairobi. The major reason cited for not participating in urban farming include lack of land to practice agriculture. Others also stated that buying food is a cheaper compared to growing it from scratch as illustrated in Table 4.5. The rest of the households (92.3%) did not engage in any form urban farming. Similarly, Chagomoka et al. (2017) who examined the importance of urban agriculture in households of Ougadougou. Burkina Faso also reported that many households did not engage in urban farming.

Table 4.5: Reasons for not Participating in Urban Farming

Reason	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
Farming is for rural people only	16.1	1.6	82.4
Lack of land	75.3	3.2	21.5
Lack of interest in growing food	30.3	4.3	65.4
Lack of skills to grow food	22.4	2.9	74.7
No access to farming inputs	30.6	3.9	65.5
Lack of time or labour	39.2	5.7	55.1
Buying food is easier than grow it	40.6	7.9	51.5
Theft of grown crops	36.8	9.9	53.3

Source: HCP Nairobi Dataset Analysis (2020)

On the other hand, the reliance on food transfers from rural home/areas was considered important to a significant number of households. As illustrated in Table 4.6, 50.7% and 41.9% of the households felt that food transfers from rural areas were very important and important to their survival, respectively. This signifies that most urban households with children rely on rural food transfers as a coping mechanism in addressing food security. Similarly, the study by Pottier (2015) in Kampala, Uganda also documented that many urban households relied on rural food transfers to meet their food security needs.

Table 4.6: Importance of Rural Food Transfers

Importance	Percentage (%)
Not important at all	0.4
Somewhat important	6.7
Important	41.9
Very important	50.7
Critical to our survival	0.4
Total	100.0
Source: HCP Nairobi Dataset Analysis (2020)	

4.3.4 Household Experience of Unaffordable Food Prices

It has been documented that some households forego some food items because of price increase or that the prices are too high compared to the household's food budget. Following analysis, Figure 4.3 presents the frequencies of households that forego various food items due to price increase or because the food items were unaffordable for the household. While 189 households reported never foregoing food items due to their prices, it was noted that 129 households did so once a month, while 77 households had to forego some food items once every week because of their prices. This signifies that most households under study heavily rely on their income/food budget to afford certain food items. The most foregone food items included beef, fish, and bread/rice/pasta/chapati food types. Similarly, Fotso et al. (2011) also conducted a study in Nairobi and noted that some families with children did not purchase certain food items due to budget constraints and/or high prices of these foods.

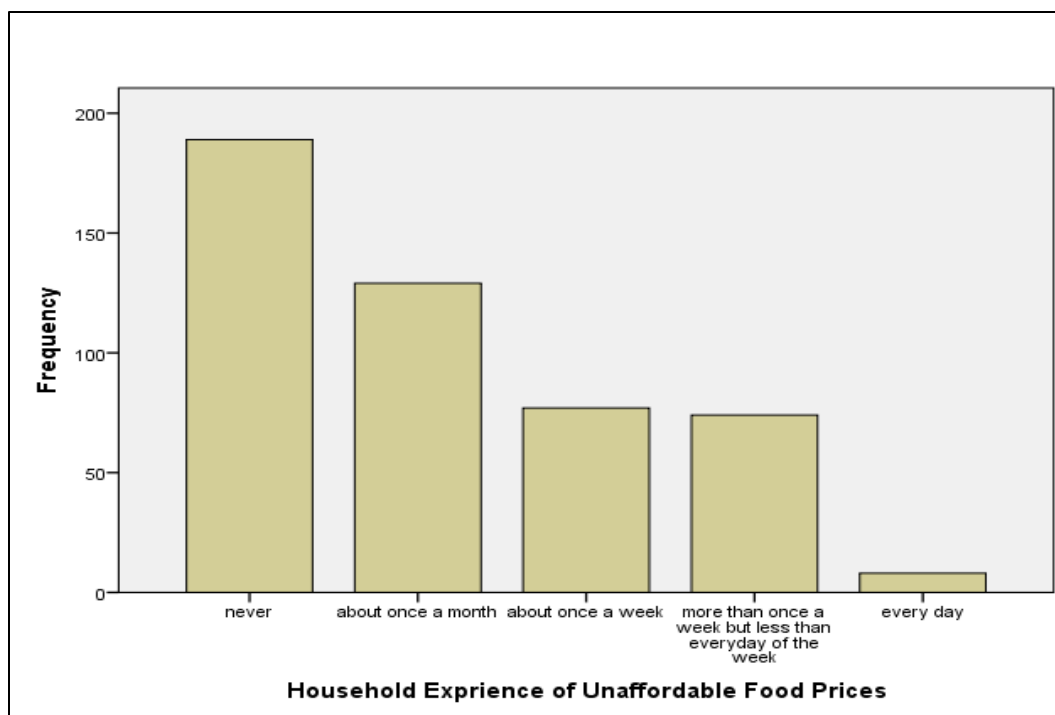


Figure 4.3: Household Experience of Unaffordable Food Prices

Source: HCP Nairobi Dataset Analysis (2020)

4.4 State of Household Food Security

4.4.1 Household Food Insecurity Access Scale (HFIAS) Scores

Out of the 479 study households, 127 of them had a HFIAS score of 0. Other households had scores ranging from 1 to 11. Less than 10% of the households registered a HFIAS score of between 20-27 as illustrated in Figure 4.4. The reported average HFIAS score was 5.84 and this is referred to as the HFIAS indicator. Therefore, these results indicate that most of the households were food secure to moderately food insecure. A study by Agbadi et al. (2017) in Accra, Ghana also reported a HFIAS indicator of 6.24 and concluded that most of their study households were food secure.

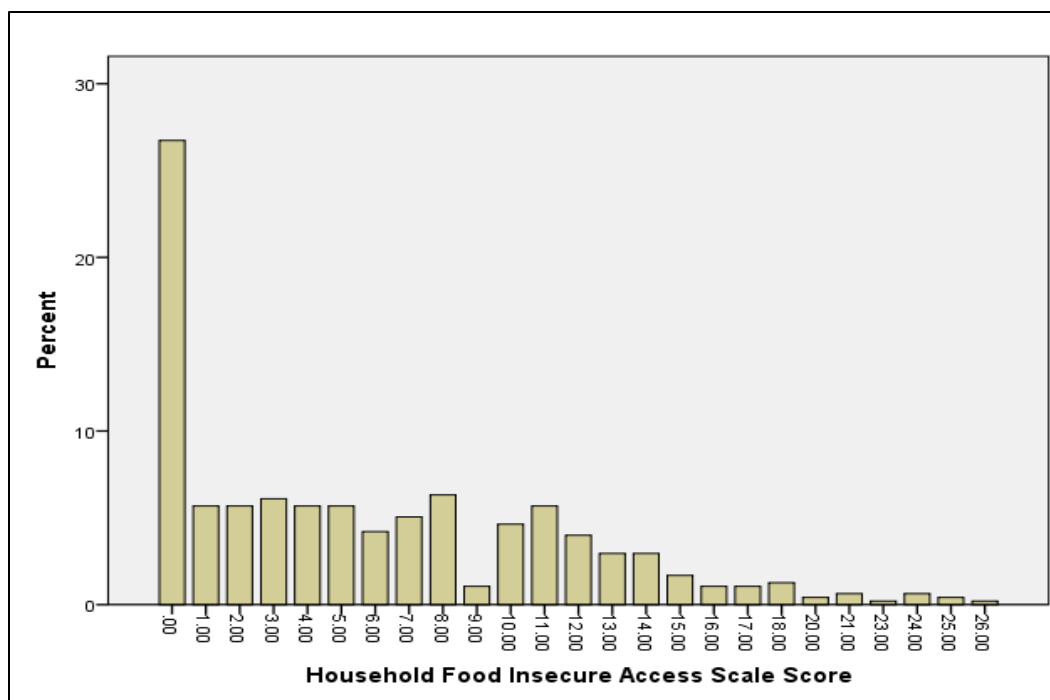


Figure 4.4: HFIAS Scores

Source: HCP Nairobi Dataset Analysis (2020)

4.4.2 Household Food Insecurity Access Prevalence (HFIAP)

Using the HFIAP measure, the study households were classified into four categories of food security (Figure 4.5). Out of the 479 households, only 28% of them were classified as food secure. 13.4% of the households were mildly food insecure, 36.2% were moderately food insecure and 22.4% were severely food insecure. Combining the food secure and mildly food insecure households means that 41.4% of the study households are generally food secure while combining the moderately food insecure and severely food insecure households means that 58.6% households are food insecure. This, in turn, signifies that the study households consisted of more food insecure households than food secure ones. This is close to the findings of Acharya (2016) who conducted a study seeking to understand the food security determinants of Tanzanian urban households and noted that food insecure households were significantly high (61%).

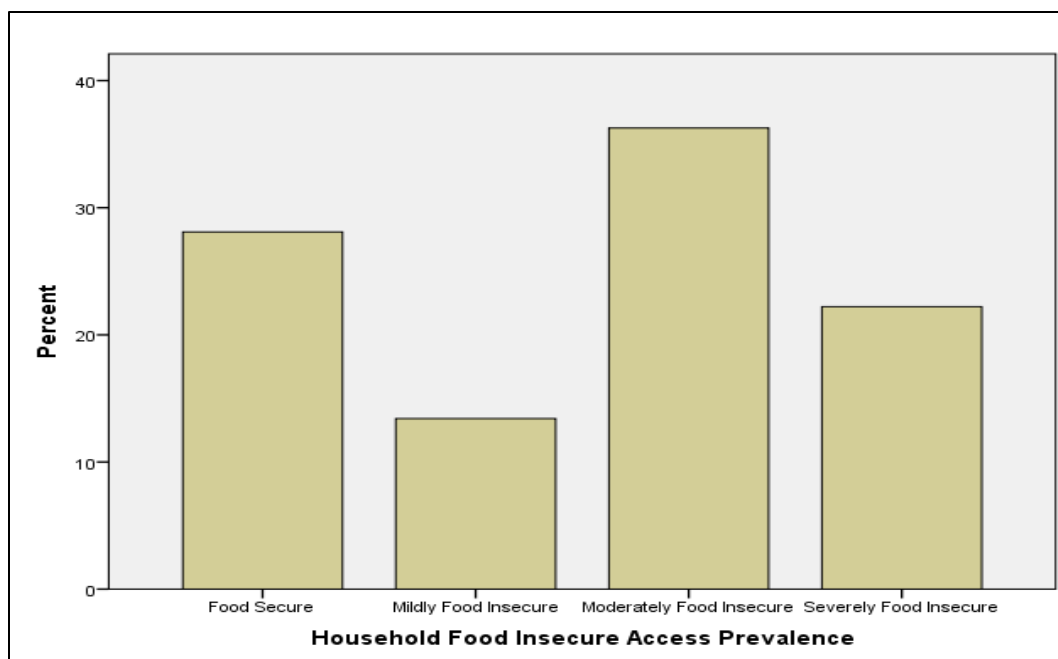


Figure 4.5: HFIAP

Source: HCP Nairobi Dataset Analysis (2020)

4.4.3 Household Dietary Diversity Score (HDDS)

Most households had a HDDS of 6 as illustrated in Figure 4.6. The average/HDDS indicator for the 479 households was 6.2. This indicates that over half of the households under study (302 households) have improved diets since they can access 6 or more food groups. This, in turn, signifies that these households are food secure to mildly food insecure. Those that accessed five or less food groups (177 households) were interpreted to be moderately food insecure to severely food insecure. Similarly, the study findings of Acharya (2016) in Tanzania also registered a HDDS indicator of 6.6 while assessing food security determinants in Tanzanian urban households.

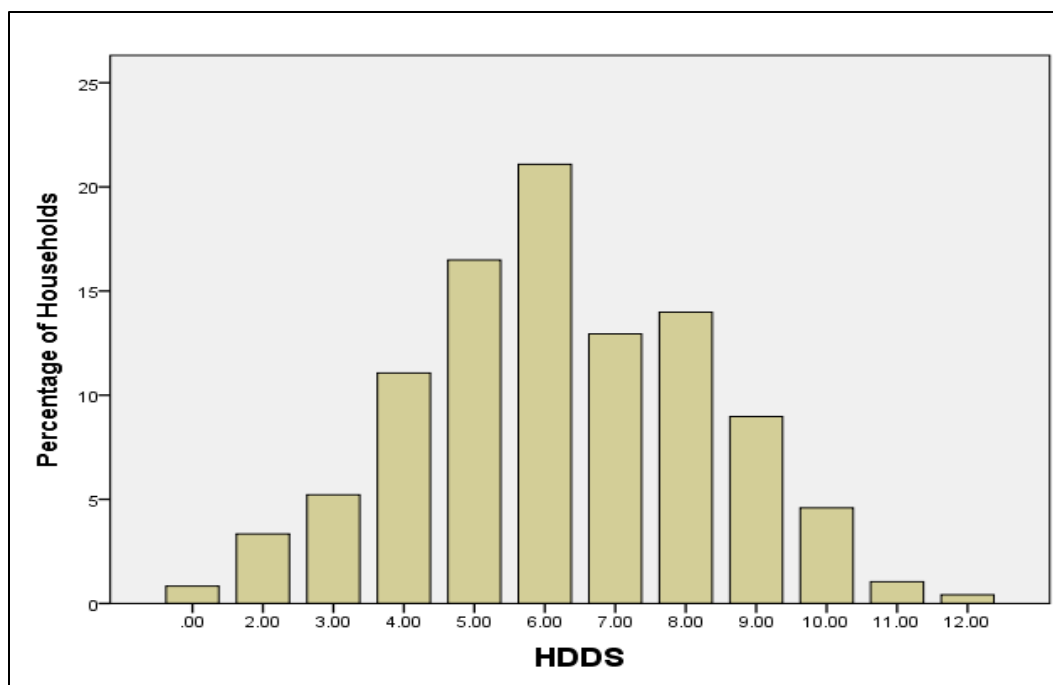


Figure 4.6: HDDS Scores

Source: HCP Nairobi Dataset Analysis (2020)

4.4.4 Months of Adequate Household Food Provisioning (MAHFP)

As illustrated in Figure 4.7, 8.8%, 12.9%, and 17.1% of the study households experienced 9, 10, and 11 MAHFP, respectively. Only 8.8% of the households had 8 or fewer MAHFP. The average or MAHFP indicator was 10.77. This indicates that over half of the sampled households (52%) had about 11 MAHFP and thus, had adequate access to food in most months of the year. This was in line with the findings of Agbadi et al. (2017) who also reported that most households had 10 MAHFP while studying the food security status of households in Accra, Ghana.

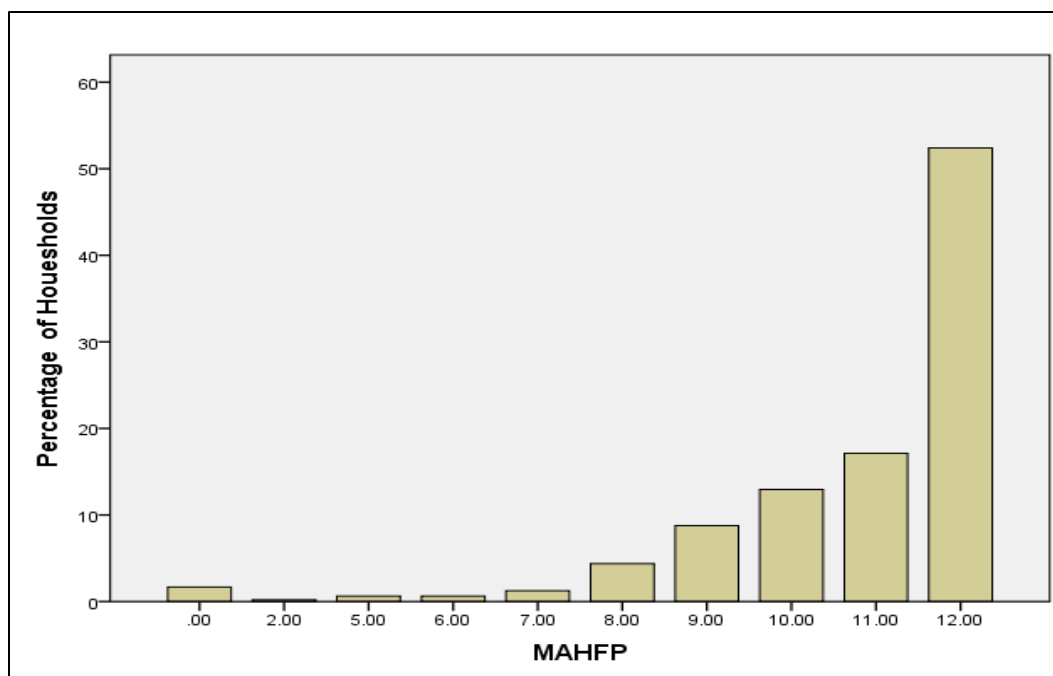


Figure 4.7: MAHFP

Source: HCP Nairobi Dataset Analysis (2020)

4.5 Demographic and Economic Dynamics Influencing the State of Food Security in Urban Households with Children under Five Years of Age

Data was analyzed using Kruskal Wallis test and the Chi-Square test of independence. A summary of the findings has been provided in Table 4.7. All the three demographic characteristics of the study households (household size, structure and employment status of a household head) were found to significantly influence the food security status of the study households. On the other hand, out of the four economic characteristics of households, three (households' income, LPI and experience on unaffordable food prices) of them significantly influenced the households' food security status. Household reliance on non-market food sources did not significantly influence the household's food security status. This implies that access to income, food prices and access to basic needs are important determining a household's food security status. Similarly, the study of Fotso et al. (2011) in Nairobi also reported that the economic and demographic characteristics of a household significantly influence their food security status.

Table 4.7: Economic and Demographic Dynamics Influencing Food Security

Food Security vs Demographic Characteristics		Statistical Test	Output
Household structure		Chi-square	Pearson Chi-square 4.970 ^a df 3 Asymp. Sig. .174
Household size		Kruskal-Wallis Test	Chi-square 14.471 df 11 Asymp. Sig. .208
Employment status of the household head	Formal employment	Chi-square test	Pearson Chi-square 11.181 ^a df 1 Asymp. Sig. .001
	Informal employment	Chi-square test	Pearson Chi-square 12.314 ^a df 1 Asymp. Sig. .000
	Casual employment	Chi-square test	Pearson Chi-square 10.232 ^a df 1 Asymp. Sig. .001
Food Security vs Economic Characteristics			
Household income		Kruskal-Wallis test	Chi-square 72.412 df 4 Asymp. Sig. .000
Household Lived Poverty Index		Kruskal-Wallis test	Chi-square 38.592 df 2 Asymp. Sig. .000
Household reliance on non-market food sources		Kruskal-Wallis test	Chi-square 2.534 df 4 Asymp. Sig. .639
Household experience on unaffordable food prices		Kruskal-Wallis test	Chi-square 163.479 df 4 Asymp. Sig. .000
Source: HCP Nairobi Dataset Analysis (2020)			

4.6 Hypothesis Testing

With the dependent variable being food security status of households and the independent variables being the household size and household Lived Poverty Index; the Kruskal-Wallis test was applied in testing the following null hypotheses and the results are discussed hereafter.

1. Household size does not significantly influence the food security status in households with children under five years of age in Nairobi

With the P value being less than 0.05 [$X^2(11) = 14.471, P = .338$], we rejected the null hypothesis and conclude that household size significantly influences the state of food security in households with children below five years in Nairobi.

2. Household Lived Poverty Index does not significantly influence the food security status in households with children under five years of age in Nairobi.

With the P value being less than 0.05 [$X^2(2) = 38.592, P = .000$], we reject the null hypothesis and conclude that the Lived Poverty Index of a household with children under five years of age has a significant influence on its food security status.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary of Findings

Household Demographic Characteristics

The study focused on three main demographic characteristics, that is, household structure, household size and composition, and the employment status of household heads. Similar to the findings of Agbadi et al. (2017) in Accra, Ghana, 70.6% of the study households had a nuclear structure consisting of a husband, wife, and children. Only 12.3% of the study households had an extended structure. Only 10.9% of the households were female-centered and 6.3% were male-centered. The mean household size was 4 and this was similar to the findings of Mutisya et al. (2015) in Nairobi. Regarding household composition, a total of 561 children under five years of age were recorded in the 479 households with 250 of them being of the female gender and 311 of them being of the male gender. From the study households, 84.1% of them had only one child below five years. Only 14.6% of the households had two children and only 1.3% of the households had 3 children below the age of five. These findings were attributed to the relatively young families in Nairobi as reported by the KNBS (2019b). It was also reported that out of the 479 households, 237 households had heads with formal employment, 99 with informal employment, and 67 with casual employment. These findings were similar to the study of Acharya (2016) in Tanzanian urban households.

Household Economic Characteristics

The economic characteristics of the study households focused on the household income, household LPI, household reliance on non-market food sources, and their experience of unaffordable food prices. The researcher reported that formal wage work, informal wage work, casual wage work, and informal businesses constituted the major sources of household income. This was attributed to the KNBS (2019c) findings that reported the existence of different working opportunities within Nairobi. Regarding the net income, it was reported that 36.8% of the households had a net income within the range 10,000-34,000 Kenya shillings. It was also noted that 20.6% of the households had a net income of less than 10,000 Kenya shillings and such households were highly likely to suffer from food insecurity. While analyzing the households LPI, a mean LPI of 1.09 was reported

with only 28.8% of the households going without electricity at least twice a year. This was in line with the findings of Nickanor et al. (2018) where a mean LPI of 1.78 in their study based in Namibia was reported. Regarding household's reliance on non-market food sources, it was reported that 92.3% of the study households did not engage in urban farming due to the lack of land to practice agriculture. The households also significantly relied on rural food transfers as a coping mechanism to meet their food security needs. These findings were similar to that of Pottier (2015) in Kampala, Uganda. With income being a significant factor in achieving household food security, it was reported that 129 households did forego food items once a month and 77 other households did so once every week because of the food prices.

State of Household Food Security

The average HFIAS score for the sampled households was 5.84 and this was in line with the findings of Agbadi et al. (2017) in a study that recorded an average HFIAS score of 6.24. Following the HFIAP classification, 41.4% of the study households were classified as food secure and the remaining 58.6% were food insecure. This finding was similar to that of Acharya (2016) who reported 61% food insecure households in Tanzanian urban households. The average HDDS was 6.2 and this is similar to the findings of Acharya (2016) who reported an average HDDS of 6.6 in their study. Also, 8.8%, 12.9%, and 17.1% of the households experienced only 9, 10, and 11 MAHFP, respectively. With the MAHFP indicator being 10.77, it was interpreted that 52% of the study households had adequate access to food in most months of the year. This was close to the findings of Agbadi et al. (2017) that also registered a MAHFP indicator of 10 while studying the food security status of households in Accra, Ghana.

Demographic and Economic Dynamics Influencing Household Food Security

After analyzing data using Kruskal Wallis test and the Chi-Square test of independence. It was reported that all three demographic characteristics (household size, structure, and employment status of a household head) had significant influence on the food security status of the study households. However, three of the four economic characteristics had a significant influence on the food security status of the study households. These were the households' income, LPI, and experience on unaffordable food prices. Household reliance on non-market food sources did not significantly influence the household's food security status. It was, therefore, concluded that access

to income, food prices, and access to basic needs are important determining factors of a household's food security status.

Hypothesis Testing

With the dependent variable being the food security status of households and the independent variables being the household size and household Lived Poverty Index; the Kruskal-Wallis test was applied in testing the two null hypotheses. The researcher rejected the first null hypothesis and concluded that household size significantly influences the state of food security in households with children below five years in Nairobi since the P value was less than 0.05 [$X^2(11) = 14.471$, $P = .338$]. The second null hypothesis was also tested and rejected since the P value was less than 0.05 [$X^2(2) = 38.592$, $P = .000$]. Therefore, it was concluded that the Lived Poverty Index of a household with children below five years has a significant influence on its food security status.

5.2 Conclusion

The overall objective of this study was to assess the food security status of urban households with children below five years in Nairobi County. Data analysis revealed household size, household structure, and the employment status of household heads as the demographic characteristics of the study households. Household's income, LPI, reliance on non-market food sources, and their experience on unaffordable food prices were the identified household demographic characteristics. The study households were also classified as food secure, mildly food insecure, moderately food insecure, and severely food insecure. Further analysis revealed that the demographic and economic characteristics of the study households have a significant impact on their food security. This implies that the food security status of households with children is influenced by the households' economic and demographic characteristics. Therefore, to adequately address their food security needs, intervention initiatives should focus on these economic and demographic characteristics. This would entail increasing a household's source of income, regulating food prices to enhance affordability, and creation of jobs to enable household heads earn an income that is decent enough to support their family's food security needs.

5.3 Recommendations

Following the study findings and discussion, the following recommendations were suggested:

- For future research, a similar research study should be conducted to further reveal more findings in the context of the current COVID 19 pandemic, social, and economic characteristics that Nairobi is experiencing.
- Similar research can also be carried out in other cities (such as Kisumu, Mombasa, and Nakuru) and big towns of Kenya for comparative purposes.
- The study has revealed that economic and demographic characteristics of households affect their food security status. Thus, to address food security, the Kenyan government and other relevant stakeholders should adopt a holistic approach while addressing food insecurity issues in urban households. This will improve the economic and social lives of people which, in turn, will improve their food security status.

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