HOUSEHOLD FOOD AND NUTRITION SECURITY AMONG WOMEN IN PERI-URBAN AREAS: A CASE OF MATHARE INFORMAL SETTLEMENT IN NAIROBI COUNTY, KENYA

BY

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DEPARTMENT OF FOOD SCIENCE, NUTRITION, AND TECHNOLOGY

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2020

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I hereby declare that this is my original work and has not been presented for a degree in any other University

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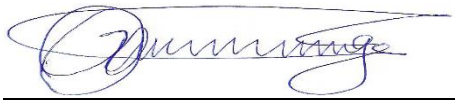

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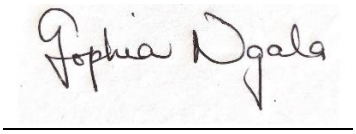

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DEDICATION

It is with deepest gratitude and warmest affection that I dedicate this dissertation to my parents Mr. & Mrs. Peter Chemweno who have been the greatest pillar of this work. To my siblings; Cyril, Godwin, Cletus, Amelia and Glenn, thanks for the encouragement you gave me. You have always been my source of inspiration!

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LIST OF ABBREVIATIONS AND ACRONYMS

CBD – Central Business District

FAO - Food Agriculture Organization

IFPRI- International Food Policy Research Institute

GAM- Global Acute Malnutrition

GHI- Global Hunger Index

GDP - Gross Domestic Product

FANTA – Food and Nutrition Technical Assistance

H/A- Height for Age

HAZ -Height for Age Z score

HDDS – Household Dietary Diversity Questionnaire

KAP – Knowledge, Attitude, and Practices

MUAC -Mid-Upper Arm Circumference

UNICEF- United Nations Children's Fund

USAID - United States Agency for International Development

W/A -Weight for Age

WFH- Weight for Height

W/H ---Weight for Height

WHZ -Weight for Height Z score

WFP- World Food Programme

WHO -World Health Organization

OPERATIONAL DEFINITIONS

Informal Settlement – Place where a group of people live on a piece of land that they have no legal claim to or households and land do not follow certain codes and rules. Also referred to as slum (UN HABITAT, 2015).

Household – Refers to those people who have lived in the same house for at least 30 days whether related or not, share meals together and consider the same person as their household head.

Nutritional knowledge – is defined as the understanding of the different types of food and how it nourishes the body and influences health.

Nutrition Status - states of the body influenced by the dietary intake; the level of nutrients in the body and the ability of those levels to sustain regular metabolic integrity (FAO et al., 2018)

Over nutrition – in the context of this study refers to an individual having a BMI of 25.0 kg/m^2 and above.

Primary education – in Kenya, this is the first phase of the 8-4-4 education system

Primary and secondary dropout - means not having completed the section of education.

Woman – in the context of this study it refers to a female person between 15-49 years (women of reproductive age).

ABSTRACT

Food and Nutrition insecurity remains a challenge in Kenya today. The situation in the urban slums is becoming serious and requires urgent action to cub its progress. Factors that can currently be associated with household food and nutrition security are, however, not clearly defined and hence limited knowledge to design home grown solutions especially among those living in urban informal settlements. The study aimed at assessing factors that contribute to household food and nutrition security among women of reproductive age in Mathare informal settlement in Nairobi County, Kenya. A cross-sectional study was carried out between July and August, 2019 in 243 households across five villages in Mathare Informal Settlement. Data was collected using a semi-structured pre-tested questionnaire.

The average household size of the study population was 4.4±2.0. The highest proportion of respondents were married (64.2%) and over half had attained primary education (59.5%). The average household dietary diversity score (HDDS) was 6.2±1.6. The mean dietary diversity score for women (MDD-W) was 4.55±1.62 with 51% of the women consuming less than five out of ten food groups. The most consumed food group was cereals (98.8%) while the least consumed was Vitamin A rich fruits and vegetables (12.3%).

There were positive associations between respondent's age (p=0.026), occupation (p=0.046), level of education (p=0.041), monthly income (p=0.003) and their dietary diversity scores. The mean score for nutritional knowledge obtained by the women was 57%. Majority (51.9%) of the respondents had moderate nutritional knowledge. There was a statistically significant difference between nutritional knowledge and level of education (p=0.000).

Food insecurity scores indicated that only 10.9% of the households were food secure, 37.1% were mild to moderately food insecure while 60.3% were severely food insecure. A significant difference ($p=0.000$) was obtained between food insecurity and the different 5 villages as well as a positive correlation with the age of the respondent ($r= 0.129$, $p= 0.045$). Other factors found to be associated with food insecurity were income, level of education, occupation, and household size. Use of negative coping strategies such as reducing meal portion size, reducing the quality of food, trading sex for food, and eating cheap and unhealthy street foods were found to be adopted by households. The prevalence of normal weight, obesity, and overweight was 48.6%, 29.6%, and 19.8% respectively. There was a positive ($r=0.263$, $p=0.000$) significant correlation between age and nutritional status of the respondents as the situation got worse as one ages. Households in Mathare informal settlement suffer food insecurity, the situation is exacerbated by lack of income indicated by use of sub-optimal coping mechanisms. Policies and programs tailored towards food security need to be put in place and efficient ways of ensuring that food items and subsidies are distributed among the most affected implemented by the government.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Food insecurity continues to be a great challenge facing the world today. According to Global Report on Food Crisis (2018), it is the absence of being able to access sufficient amounts of safe and healthy food for a healthy life (IFPRI, 2018). Food insecurity is a situation in which reliable access to acceptable food is restricted by a lack of financial resources and any other resources throughout the year (USDA, 2018). The level of hunger and under nutrition globally is at 20.9 from the alarming category of 29.2 in 2000 according to the 2018 Global Hunger Index, equating to a decline of 28% (Concern Worldwide and Welthungerhilfe, 2018).

GHI scores vary greatly across many countries and regions. The highest Hunger Index Scores are recorded in South of the Sahara in Africa and South Asia. Though the scores have gone down for these two regions, the current levels are still on the serious category towards the alarming category rather than towards the moderate category. The situation is deteriorating in most regions of Africa and South America. Africa, however, remains the continent with the greatest prevalence of undernourishment affecting greater than 256 million persons. The condition is also getting worse in South America where the prevalence of malnutrition rose from 4.7 percent in 2014 to 5.0 percent in 2017.The numbers of those affected by undernourishment is significantly decreasing in Asia (FAO, 2018).

One of the outcomes of food insecurity is malnutrition whose consequences include poor infant and child growth and an excess of diseases and deaths in adults and children with the most vulnerable being children and women (FAO, 2014). Undernourishment is a term that refers to three conditions namely wasting, underweight, stunting, and other conditions associated with low

micronutrient intake. Children between 6 to 59 months are usually the most affected. Globally in 2018, the number of children who had low height-for-age were 150.8 million (IFPRI, 2018).

When it comes to one being malnourished, women are more affected than their male counterparts. The trend of over nutrition continues to rise in Africa and North America with 38.9% being adults and also the adolescents (UNICEF, 2018). Millions of women are still experiencing low weight-for-age (underweight). Under nutrition increases the vulnerability to infections and risk of death from common infections (UNICEF, 2018). In Africa, the prevalence of wasting, stunting and overweight were as follows: 7.1%, 30.3%, and 5%, respectively (IFPRI, 2018). In Kenyan context, in May 2017, out of 37096 children under 5 years screened for acute malnutrition in 9 counties, 7% were severely malnourished, 24% were moderately malnourished, 26% were stunted and 11% were underweight (WFP, 2017).

Despite the overall decline in poverty rate, the poverty levels of those living in cities is continuing to rise in Sub-Saharan cities and is majorly as a result population growth, poor political structures, conflicts, the inability to channel growth into poverty reduction and poor planning. Most cities comprise of populations that are mostly involved in cash-based activities with even those that are so poor getting their most basic needs from the market (Kimani-Murage et al., 2014).

The state of food uncertainty is mostly a result of lack of income. It is extensively spread among those living in informal settlements of Nairobi. One household out of five is either affected by adult and/or child hunger (WFP, 2017).

According to APHRC (2014), children living in the urban slums are characterized by ill health and poor nutrition due to unhealthy living conditions and congestion that result in frequent diarrhea which can sometimes cause death. According to a study by UNICEF (2018), children and women are

disproportionately affected by under nutrition and non-communicable diseases and this has disastrous impact in the slums. It is difficult for parents and caregivers especially in slums to provide a balanced meal to their children hence a big problem of malnutrition among infants and children (WFP, 2017). According to the urban poor report (2015), women conditions in the slums areas are very poor, they have limited access to water, shelter, income, food, education, and healthcare than men. They generally experience three interrelated dimensions of urban poverty more severely than men –residential, social, and occupational vulnerabilities (Apata et al., 2015).

1.2 Problem statement

The right to food is recognized under the International law, but despite this recognition Nairobi county is still among the counties with the highest number of people experiencing food security issues with 100,000 households facing marginal food intake seeking out an existence on typically less than a dollar a day, and with limited means of earning any better livelihood (WFP, 2016). In Kenya, urban slum dwellers comprise 2.5 million people with 60% of the population being those living in informal settlements in Nairobi County (Oxfam, 2017).

Food insecurity in the urban slums is becoming serious and requires urgent intervention before it becomes disastrous (Oxfam, 2017). People in Mathare informal settlement struggle everyday with food insecurity and /or malnutrition due to poverty and diseases. Most of these people rely on low-wage casual labor to survive and as such they rely on food brought from markets to feed their families (Oxfam, 2017).

For the longest time attention had mostly been given to the rural poor concerning their food security issues in light of impacts of failed rain, but stakeholders have now appreciated that it is not only the rural poor who are affected but also the urban poor especially due to the rising global

food prices. The urban poor are an important group of vulnerable population who need to be addressed (UNICEF, 2009). Low food intake in households and poor health care were the major causes of malnutrition according to a study conducted in Mathare, Mukuru, and Viwandani slums in 2017. People in Mathare valley struggle everyday with malnutrition due to poverty and diseases. The crisis in the urban slums is one of access rather than availability (Concern Worldwide, 2017). There are thousands of Non-Governmental Organizations operating in Nairobi and almost half of them implementing nutrition and other programmes with the aim of reducing and alleviating poverty and food insecurity (WHO, 2014).

Despite efforts made, women in Nairobi's urban informal settlements present various levels of under and over nutrition presenting as maternal and child morbidity and mortality in Mathare Informal Settlement. Factors that can currently be associated to maternal malnutrition and especially household food insecurity have not been clearly defined or studied. The current study will establish the different factors contributing to household food insecurity among women in Mathare Informal Settlement in Nairobi County.

1.3 Justification

This study contributes to the body of knowledge available on the factors associated with household food and nutrition insecurity among households with women of reproductive age. The results will be used to contribute towards the nutritional knowledge of mothers through enhancing nutritional education through sensitization and mobilization especially at the Hospital Clinics thus contributing to the achievement of SDG'S number three, (ensure healthy lives and promote well-being at all ages and contributing to Kenya's Big Four) .The education in the local Hospitals will also dwell on consumption of a varied diet contributing to, Agenda number two, to achieve food security and nutrition. The study will also reinforce local authorities and other stakeholders

supporting Food and Nutrition interventions to tackle household food security and nutrition issues and provide coping strategies hence lowering vulnerability and enhance sustainability in Mathare Informal settlement and other areas. The findings will also form a reference point for researchers on the same or similar fields of study.

1.4 Aim of the study

To contribute towards affordable, accessible, and nutritious food to people living in the informal settlements of Kenya.

1.5 Purpose of the study

To highlight the degree of and factors contributing to household food insecurity among women of reproductive of age and households living in Mathare informal settlement so as to inform the Government and other stakeholders supporting food and nutrition interventions in the country.

1.6 Objectives

1.6.1 Overall Objective

The overall objective is to establish the factors contributing to household food and nutrition security among women in living in Mathare Informal Settlement.

1.6.2 Specific Objectives

1. To determine socio-demographic characteristics of study households living in Mathare Informal Settlement.
2. To determine the maternal nutritional knowledge of women living in Mathare Informal Settlement

3. To determine household food and nutrition security of women living in Mathare Informal Settlement.
4. To establish the dietary diversity of women living in Mathare Informal Settlement.
5. To determine the nutritional status of women (of reproductive age) living in Mathare Informal Settlement.

1.7 Hypothesis

1. **$H_0$1** There is no significant association between Socio-demographic characteristics of households in Mathare Informal Settlement and the household food security
2. **$H_0$2** There is no association between nutritional knowledge of women and their nutritional status.
3. **$H_0$3** There is no significant association between Minimum Women Dietary Diversity and their nutritional status
4. **$H_0$4** There is no significant association between household food insecurity access scores and household dietary diversity.
5. **$H_0$5** There is no significant association between nutritional status of women and their food security status

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of Food and Nutrition Security

The idea of food security has grown since the early 1940's to a broader term including four main areas; accessibility, availability of food, utilization, and stability (FAO, 2016). On the other hand, nutrition security is an extensive term that has since developed and it involves 'multisector nutrition planning' and the conceptual framework from UNICEF which encompasses three major dimensions; availability of sufficient food, care and feeding practices, hygiene and well-being (FAO, 2016).

In the World Food Conference held in November 1996 from the process of International Consultation, a current redefinition of food security was discussed and this definition is "Food security occurs at all times, when all people, have access to safe, nutritious, and sufficient food either physically, socially and/or economically, that is able to meet their food choices and dietary needs for a healthy and active life". On the hand the situation of food insecurity exists when there is inadequate food in terms of physical, social, or economic access (FAO, 2009).

According to USDA (2016), "Food insecurity is a situation in which frequent access to food is affected by scarcity of financial resources at times during the year" (USDA, 2016). Food security has three pillars namely, availability, accessibility, and affordability to safe and nutritious food. To derive a framework for sustainable food security in the world, each of these components which also rely on other sub-factors must be taken into consideration (FAO, 2013). With the complex

nature of the food security concept, different frameworks have been made to help in comprehending linkages among the various food security dimensions while explaining linkages with underlying causes and outcomes as well as related concepts and terms (FAO, 2016).

Figure 2.1 shows linkages among the various food security dimensions by the FAO-Food Insecurity & Vulnerability Information and Mapping Systems (FIVIMS) framework.

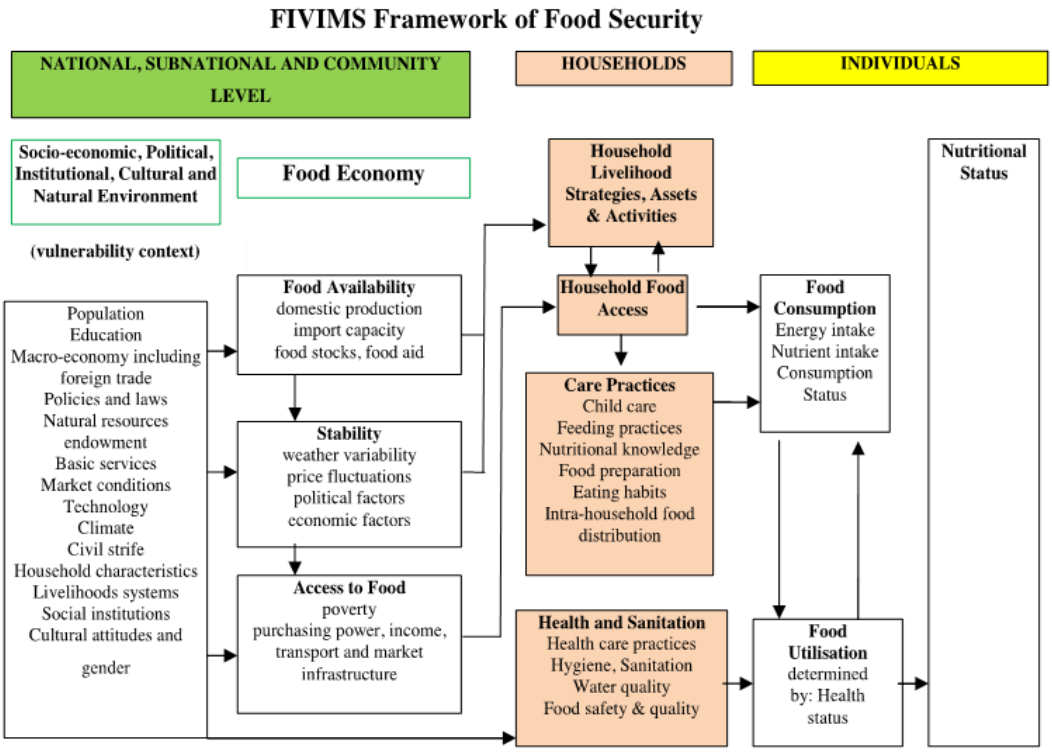

Figure 2.1: **FIVIMS Conceptual Framework - Adapted from FAO (2016)**

2.1.1 Trends in Food and Nutrition security

Over the last three years, the total number of people who face hunger problems globally has been increasing. People faced by chronic food shortages globally is approximated to have increased from around 804 million in 2016 to almost 821 million in 2017 (Concern Worldwide and Welthungerhilfe, 2018).

Hunger varies greatly by region. Serious levels of hunger are found in the South Asia and South of the Sahara in Africa at 29.4 and 30.5 respectively (FAO, 2018). These scores vary widely from those of Commonwealth Independent countries, Eastern Europe East, Latin America and the Caribbean and South Asia which have GHI scores that running from as low as 7.3 to 13.2 representing low and moderate hunger level (IFPRI, 2017). Even though the scores have gone down for these two regions, the current levels are still on the serious category towards the alarming category rather than to the moderate (FAO, 2018). Africa has been experiencing a strange rise in their food security situation since the end of 2016. By the end of 2017, the number of food insecure people in Kenya was 314 million people (IFRC, 2018).

At the core of the big four agenda in Kenya (Food Security, Universal Health Coverage, Affordable Housing, and increase to 15% the impact of Manufacturing to GDP) is a decrease in the number of people facing poverty issues. The Big Four Agenda identifies food security as a key pathway for improving the conditions of majority of Kenyans (IPS, 2017).

2.1.2 Indicators to assess Food Security

There are different classification of indicators used to measure the levels of food security at national level which include food supply in the nation and indicators that measure the availability of total food energy against the energy requirements of the general population. These indicators provide an approximation of the situation of food security at national level but does not show vulnerable subpopulations or rather the estimation of changes in food security that are short term (Jones et al., 2013).

In the State of Food Security and Nutrition, the following eight indicators are used: the total number of undernourished people in regions and at country level, severely undernourished people, children affected by wasting, stunted children, children who are overweight, obese adults, women

affected by anemia and the number of children aged 0-5 months exclusively breastfed (FAO et al., 2017).

Analyzing food insecurity at the individual level is important in order to highlight possible differences within households. Cultural and social factors are some of the problems that affect the distribution of food and resources within households. Women and young children are at times discriminated when it comes to food distribution mostly in circumstances of food shortage. Mothers are likely to forego their food consumption to avoid the consequence of food insecurity among their children (IFPRI, 2018). Gender imbalance in the community and the role of women play a role in the power of decision making and how food can be accessed in a particular household with great effect on women's own food and nutrition security status together with that of their children ((Pereira et al., 2017).

The appearance of undernourishment is commonly considered to be female. In most households those faced by food insecurity problems are mostly women and children making them more vulnerable to malnutrition than men. Undernourishment in mothers can bring about a cycle of deficiency that mostly results in giving birth to low birth weight babies, delay in growth, increased child mortalities and morbidities, poor brain function and low productivity in children (World Bank, 2013).

2.1.3 Drivers of Food and Nutrition Insecurity

Conflicts and insecurity are among the key causes of food insecurity in 18 countries where about 74 million persons are food insecure and require high priority help (IFPRI, 2018). Nigeria and Yemen are countries threatened by famine, the GHI scores of this two nations fall in alarming and serious categories. In Nigeria inequality is the cause influencing the GHI scores, 4.5 million people from the total population (180 million people) located in the northeastern part of the country are

at risk of experiencing famine or are being affected by famine because of the ongoing insecurity/violence caused by Boko Haram (VOA, 2017; UNDP, 2017a), the rest of the state have low food insecurity issues (FEWS NET, 2017c), these parts also have uneven child under nutrition (NBS, 2015). Just like Nigeria, Yemen faces a similar crisis caused by violence though it is evenly spread across the country, a population of 17 million people (around 65%) face food insecurity concerns (UNDP, 2017a; EWSNET, 2017a).

In 2017 Central African Republic had the highest GHI score, this is because the country has suffered due to instability and violence since 2012. Civil war experienced in this country has led to market disruption, loss of Livelihoods and weakened food security (USAID, 2017a). In May 2017, 500,000 were displaced internally even though the total population was 5 million. In Somalia, severe drought, internal displacement due to violence caused by the Al Shabab, and problems faced in providing assistance to the citizens almost led to famine in the country in 2017. More than 25% of the population are believed to be facing food insecurity and on an emergency (FEWS NET 2017b).

The frequent violence resulting into internal displacement of individuals, poor agricultural inputs/methods, prevalent diseases affecting crops and livestock, lack of suitable infrastructure, gender inequity, and a rising population are the key elements challenging food security DRC" (USAID 2016).

The major causes of food insecurity in Kenya include climate change, poor nutrition, poor policies, gender inequality, economy, and waste of food (Concern Worldwide, 2018). However, the GHI score has dropped in Kenya by 44% since 2000 and this has moved the country from an alarming to category to a serious category near to moderate. Fundamentals behind this progress are the improvements made on each of the GHI indicators. The nation has witnessed a progressive economy in the past years (WFP, 2017a); it has also implemented strategies that are improving food security and nutrition. In 2012, the country developed a National Nutrition Action Plan

(NNAP), the plan was supplemented by investments and projects in agriculture, disaster management, food preservation and storage, and other initiatives (Dayton Eberwein et al., 2016). Kenya is yet to achieve its targets on food security and nutrition, also some parts of the country face more food insecurity concerns and have hunger related concerns. The impacts of the drought that hit East Africa in 2017 created food insecurity challenges for most parts of the country with food prices, livestock and harvest being affected negatively (FAO GIEWS, 2017b).

In a study conducted in two slums in Nairobi, the results indicated high cases of food insecurity. The occurrence of food insecurity for the joint investigation was 50 %, for the mild-moderate group was 35 % and that 15 % of households did not have concerns of as per the Food Insecurity Access Scale. The major drivers of food shortage in such settings include income levels, livelihood sources, size of the household, ratio of dependence; illness, slum of residence and insecurity (Gabreyesus et al., 2015; Chatterjee et al., 2012). Those households faced by food insecurity are in most cases of low socio-economic class and headed with someone with minimum or barely no education. Statistics show that women headed households are poorer than households headed by their male counterparts and that most of these women are very less educated (WFP, 2016).

2.1.4 Link between food security and nutrition status

Limited access to nutritious good food leads to under nutrition as well as being overweight and obese. The possibility of one being with a child who is of low birth weight and being stunted is also increased by poor access to food, it is also associated to overweight and obesity issues among women and girls of school age in upper middle and high income nations (IFPRI, 2018). Low birth weight in infants has been proved to be an outcome of household food insecurity both in high and low income settings (Maitra, 2018). Figure 2.2 shows the pathways from inadequate food access to multiple forms of malnutrition.

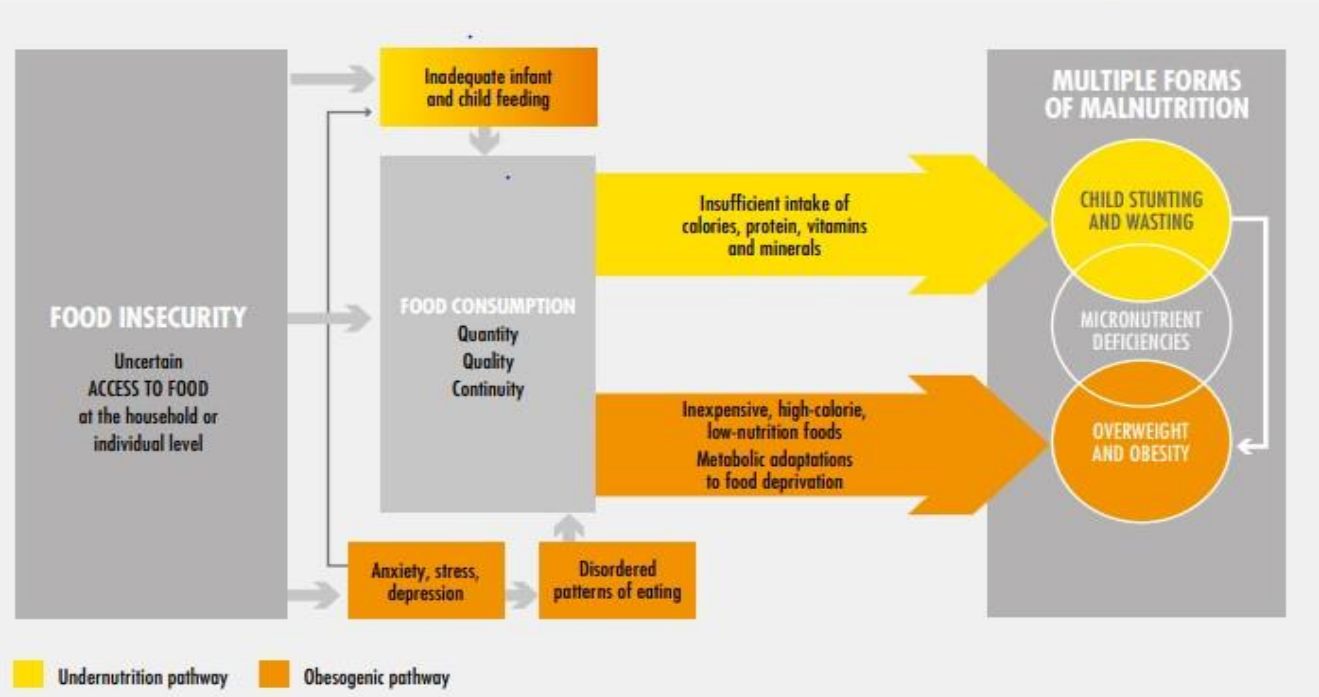

Figure 2.2: Pathways from inadequate food access to multiple forms of malnutrition

Source; WHO (2018)

Factors that prevent fetal, infant, child growth, and development include inadequate access of proteins, vitamins, minerals, and calories. Maternal under nutrition and high risk of getting a child that is of low birth weight are caused by such factors which in the long run contribute to child stunting. Breastfeeding is also affected to a larger degree by the stress of having to live without food in the household which results to production of less quantity of breastmilk (FAO, 2018).

The location of most malnutrition cases are urban slums, which are complex settings characterized by divided and less consistent communities than those living in the rural settings. Within such settings the inter-relationship between poverty, health, and migration are not fully comprehended (Zulu et al., 2011). With rising unemployment cases those living in these informal settlements are highly susceptible to shocks in the rise of prices of certain commodities, political violence and

outbreak of diseases whose consequences directly translate to food insecurity, high cases of diseases and in the end rising levels of malnutrition and deaths (Concern Worldwide,2017).

In the WHO African section, the possibility of a child not attaining 5 years is the greatest at 74 for each 1000 live births which is 8 times above the one from WHO European section at 9 for every 1000 live births (WHO, 2015). In 2017, globally, 150.8 million children below 5 years were stunted, 50.5 million had low weight –for -height and 38.3 million (5.6%) overweight. Approximately half of all morbidities in children under 5 years are caused by under nutrition, resulting in deaths of 3 million children annually. Under nutrition increases the vulnerability to infections and risk of death from common infections (UNICEF, 2018).

In Africa, the prevalence of wasting, stunting and overweight are as follows: 7.1%, 30.3%, and 5% respectively (IFPRI, 2018). In Kenya, in the month of May 2017, out of 37,096 children Under-5 screened for acute malnutrition in 9 counties, 7% were severely malnourished and 24% were moderately malnourished and 26% of them were stunted and 11% were underweight (WFP, 2017). In 2018, Out of 7 million children Under-5, 1.8 million children (26%) suffered from chronic malnutrition (USAID, 2018).

As far as it may seem to be contradicting, overweight and obesity are conditions that are in one way or another a result of one being food insecure and this may lead decision makers in those regions where there are many people whom are poor and food insecure to doubt and ask themselves questions specifically on the distribution of resources especially food among the population (Ghattas, 2014). Nutrition studies have examine the existence of double and triple burden of malnutrition among the poor in the urban areas. In a study done by Kimani-Murage et al. (2015), in Viwandani and Korogocho slums in Nairobi, the co-existence of maternal over nutrition and child under nutrition was observed, where 43% of overweight and 37% of obese mothers had

stunted children. Dominguez-Salas et al. (2016) argue that there is clear evidence of the triple burden of malnutrition with high levels of chronic malnutrition among children coexisting with high levels of maternal overweight/obesity (one-third of mothers) and low intake of essential micronutrients and high prevalence of anemia among both (Dominguez-Salas et al., 2016).

The relationship between overweight, obesity and one being food insecure goes through one's diet which is mostly influenced by the price of food. Health-giving and natural food are often costly, therefore when resources to purchase food stuffs in a home become limited, people opt for foods that are less costly and in most cases such foods are high in calories and very low in terms of nutrients. This is mostly the case in urban informal settlements and developing and high-income nations (FAO, 2014).

In a situation of globalized food centers where the proportionate cost of food high in fats and sugars is low in comparison to natural produce such as vegetables and fruits, the formulation of prices to fit those individuals that are food insecure may often lead to diets whose energy levels are a bit greater and lower in diversity, fiber, and micronutrients (Ghattas, 2014).

2.2 Urban Poverty

Lack of sufficient food is not at all a complication of those living in rural areas but also a problem facing the urban poor. Migration from rural areas to urban centers in Kenya is among the greatest in the world. One in three children living in slums are living in poverty (Concern Worldwide, 2017). Over the last decade the annual urban population growth has been estimated to be 5% compared to the annual population growth in Sub Saharan Africa that is at 2.3% (UN HABITAT, 2017).

Nearly half of the people in the world will be living in the cities by 2033 as projected by the World Bank. Those residing in urban areas especially in informal settlements mostly struggle with the

high cost of living or are not in a position to purchase sufficient food that meets their minimum dietary requirements (WFP, 2017).

Unhealthy, populous places of living with minimum access to communal amenities heightens the degree of food insecurity situation among those dwelling in the urban informal settlements. Many at times those living in these informal settlements have scant range of coping strategies to utilize especially when they are faced with situations of food insecurity than those living in the rural areas. They do not have means of entry towards acquiring some land and they sort of have poor or weaker intergenerational support systems (WFP, 2016).

Those living in informal settlements are mostly involved in non-formal forms of work with poor economic situations. Most of these people are involved in activities such as industry workers, Tonga pullers, and Rickshaw pullers and in the construction sector. Hawking, petty shop keeping, selling handicrafts and street vending are the most likely types of businesses run by these people. Their socio-economic status greatly lowers the cost of living of the urban informal dwellers' (Sajjad, 2014)

Poverty levels especially in urban areas of Kenya is mostly related to the gender of the household head. In a recent study, in households headed by women there was a 48% poverty incidence in comparison to 31 % in households with men as household head in the cities (NCCS, 2012). When the households are headed by a female there are more undernourishment issues, though this condition is highly influenced by culture and socio-economic status of the people (Shifa and Leibbrandt, 2017)

2.3 Dietary diversity

According to FAO, dietary diversity is the estimated amount of food intake that replicates access to different types of food by a certain household or individual and is a presentation for the adequacy of the nutrients in an individual's diet (FAO, 2010b). It can be evaluated with tools such as dietary diversity scores whereby the total amount of food clusters is taken over a given time frame and they are the best indicators of one's general quality of the diet as well as important proxies of the state of food security in a household (FAO, 2011).

Dietary diversity involves the ability to have access to safe and quality diets by everyone that provides both macro and micro nutrients in sufficient amounts. At individual level, dietary diversity reflects an individual's micronutrient intake whereas at household level it reflects food accessibility (Badake, 2014; FAO, 2010b; Ngala, 2015).

In a study of the central region of Ghana, the assessment of an individual's diet helps examine the danger of a deficiency because of inadequate or excess consumption of vital nutrients required for a better well-being. Promoting dietary diversity has been suggested to be among the approaches to reduce nutritional issues that happen owing to insufficient intake of micronutrients and food and nutrition security (Bandoh and Kenu, 2017). Intake of a diverse variety of foods among and inside the food clusters guarantees sufficient intake of micronutrients which are critical to nutrition adequacy (Kennedy, 2009).

Inadequate dietary diversity is a great issue in the world and is mostly faced by those households with low socio-economic status. In a study done in rural areas in Bangladesh, dietary diversity proved to be a good measure of women's diet (FAO, USAID, and FANTA, 2016). The same results were also found in a study done in Burkina Faso that indicated diversity in diet as a measure of the

quality of food taken by women and it correlated positively with their nutrition status (Ochieng et al., 2017).

The most affected group is the women, yet the data on food patterns and micronutrient intake conclude insufficiency. Due to the biological needs of prenatal period and lactation, women are mostly affected. This is because women require iron even when they are not lactating or pregnant. The issues on diet quality and gaps for WRA are common in low and middle income countries (FAO and FHI, 2016). There is usually unequal distribution of resources among the households making food security biased based on gender (Chakona et al., 2017).

Despite the fact that a paradigm shift from food security to nutrition security has been assumed in India by dietary diversification, micronutrient adequacy has still not been achieved in India, the most affected individuals being women who live in the slums. The major obstacles towards achieving a minimum dietary diversity among women (MDD-W) in this location include; illiteracy, gender prejudice and poverty (Pal et al., 2017). Studies have found that most people in resource poor settings depend mostly on starchy staples in their diets with minimal animal protein and few fruits and traditional vegetables (Kiboi et al., 2017).

2.3.1 Tools for Assessing Dietary diversity

Dietary diversity can be measured at either the household or at an Individual level and higher scores are denoted to represent a more diverse diet (FAO, 2011). Two dietary diversity indicators have been suggested by the FAO, that is Household Dietary Diversity Score (HDDS) and the Minimum Women's Dietary Diversity Score (MDD-W) which both denote to a recall duration of 24 hours but other timeframes such as previous 3 or 7 days can still be used. The choice of any depends on the study place or population (FAO & FHI, 2016).

2.3.1.1 Household Dietary Diversity Score (HDDS)

This is a tool for assessing dietary diversity suggested by FAO. It assesses the quality of food at household level (FAO, 2018). It uses an accepted list of 16 food clusters for all nations and circumstances. Information from each food group is of two types (either Yes/No). All the 16 food groups have equal importance (relative weights equal 1) in which food from any group consumed gives 1 point. This indicator is the basic addition of the total amount of the food collections consumed which goes from 0 to 12 (Sassi, 2018).

2.3.1.2 Minimum Dietary Diversity for Women of Reproductive Age (MDD-W)

To be certain about the women's dietary diversity we can utilize MDD-W which aims to give information on levels of nutrients intake and food consumption of women (FANTA, 2014). The indicator shows food groups taken by women within a given time, it also acts as a measure on the ability of the household to achieve the micronutrients in their food. When calculating the MDD-W, 16 different clusters are put together to give 10 essential clusters (Castro, 2014). The resulting 10 clusters were: (1) Starchy staple: these include Cereals (rice, wheat), tubers, plantains, and roots, (2) Legumes and pulses (lentils, beans, peas), (3) Nuts and oil seeds, (4). Milk products, (5) Fish, meat, poultry, (6) Eggs (7) Fruits and vegetables rich in vitamin A (βcarotene), (8) Green leafy vegetables, (9) other fruits, (10) other vegetables (FAO et al., 2016).

The MDD-W indicator is useful in characterizing and making comparisons on dietary diversity among different groups of people, because of this factor it is vital to identify and target populations who are at risk. The indicator is also useful when tracking progress and measuring the influences of new programs and policies. Its strength includes being utilized in large surveys –this includes national surveys representing the whole population this is possible because it is simple and adds a few questions to long surveys (Arimond et al., 2013). However, the indicator has its own limitation

in that it has the ability to collect qualitative dietary data only, therefore unable to represent individual-habitual intake and that it depends on the respondent's ability to remember when collection of data is based on 24-hour memory (FAO & FANTA, 2014).

Mortalities in developing countries represented by the number of children that are less than 5 years is 6% and this can be avoided by giving children providing proper complementary feeding (Aemro et al., 2013). Even though diversity in diets is essential in tracking micronutrient availability of diets, it is not a conclusive predictor of proper diet for health. There is a little indication to use dietary diversity scores in individuals other than children and women of Reproductive age (Roba et al., 2016; Victor et al., 2014).

2.4 Nutritional Status of women living in Nairobi Informal Settlements

According to a study by Concern Worldwide, the overall GAM Rate in the Nairobi slums was 4.6% (3.4 – 6.3, 95% CI) which is indicative of an acceptable nutrition status in the area based on the WHO classification of GAM. The prevalence of SAM among the children below 5 years in Slums was found to be 0.1% based on the WFH and/or edema. The GAM Rate in the slums of Nairobi was 4.6% which is approximately 23,791 cases, with the estimated cases of SAM being 517 and this indicates that stakeholders and other organizations need to put more effort in addressing the major drivers of malnutrition (Concern Worldwide, 2017). A major predisposing factor for maternal diseases and deaths has been shown to be maternal undernutrition. Available scientific evidence demonstrates that intake of nutrients while pregnant is important for the growth of fetus and enhances better nutritional status in mothers. Maternal malnutrition is usually linked with high risk of low birth weights and it is recommended that before, during and after birth, the maternal nutrition status should be adequate. Pregnant women have been considered vulnerable to malnutrition due to their increased nutrient requirement and therefore different types of foods in

their diets is considered imperative towards their achievement of adequate nutrient intake (Kiboi et al., 2017).

According to Nutrition Causal Analysis conducted in Viwandani and Mukuru Slums in January 2017, poor health care, inadequate care practices and household low food intake were the major drivers of malnutrition in Nairobi Slums.

2.4.1 Methods of assessing nutritional status

The importance of assessing an individual's nutritional position is that it gives necessary information that helps in studying the effect of nutrition on disease, identify vital nutrients in a particular population, and also come up with efficient and effective health programs and policies to curb nutrition related conditions (WHO, 2018). An individual's nutritional status is determined using the ABCD method; A-Anthropometric measurements, B-Biochemical assessment, C-Clinical assessment, D-Dietary Assessments (Upadhyay and Tripathi, 2017). The indicators that measure anthropometry are; height, weight, circumference, etc., this is because they can detect the changes that occur in body composition to give information on the nutritional status of a particular group of people ,this includes; newborn babies,, children between the age of 6 to 59 months and also adults. anthropometric measurements have an advantage since it can suggest and identify trends of growth and development of a person (WHO , 2014), despite this advantage its limitation is that it cannot be used to get information on nutritional deficiencies affecting an individual (FANTA, 2016).

2.5 Maternal Nutritional Knowledge

Women's responsibility in food security matters is so certain such that FAO stated that they perform a great task towards food security in most developing countries especially on matters of production, accessibility of food, sustainability and in terms of nutrition security (Norozi et al., 2013). The period

and the way of commencing complementary feeding, the amount of food, and how to sustain it requires specific knowledge (Yeganah et al., 2018).

Nutritional knowledge and attitude play a key role in food security, as failure to provide adequate food indicates food insecurity (Norozi et al., 2013). A significant requirement for an individual's change in behavior and attitude towards nutrition is the actual knowledge of nutrition.Good nutritional knowledge knowledge encourages women to have a good feeding pattern for their family (Ogden et al., 2007). Uneven distribution of food, lack of food production and knowledge have been shown to be among the leading causes of malnutrition (Jatau, 2014).

In a study by Yeganah et al. (2018), mother's level of education was among the major factors that influenced the knowledge of food security. Nutritional knowledge was high among those who had acquired academic education, this could be due to the fact that knowledge regarding food security, complementary feeding practices, and appropriate foods for both children and adults could have been acquired from the academic institutions (Yeganah et al., 2018).

Increasing maternal nutritional knowledge, embracing a proper nutrition attitude can actually promote food security among households (Farivar et al., 2009).

2.5.1 Methods of assessing maternal nutritional knowledge

Maternal nutritional knowledge can be assessed using the Knowledge, Attitudes, and Practices from FAO, which provides direction and applicable phases for planning and conducting a KAP assessment for examining and reporting the investigation findings (FAO, 2014). The module gives already set questions that contain information on very detailed knowledge, approaches, and practices that are associated with the 13 utmost nutrition matters. It is a useful method for obtaining an insight in people's personal determinants and dietary habits since it assesses and analyzes one's

nutrition-related knowledge, attitude, and practices (FAO, 2014). Another method of assessing nutritional knowledge is by using Bloom's taxonomy of the educational procedure where acquiring knowledge follows a progressive procedure from concept to the actual exercise. When an individual is able to replicate a specific piece of information that is when it is considered that one has acquired knowledge (Gichana, 2013).

2.6 Gaps in Knowledge

As much as there is routine data collection on food and nutrition security among urban informal dwellers, the underlying associated factors related to it are quite unclear hence limited knowledge to design home grown solutions. There is a global need of sufficient and evidence based information which is crucial in maximizing investments targeted at improving the situation of one being food secure and in turn achieving good nutritional status of a population (IFPRI, 2016).

The problem of food insecurity needs better personalized interventions that are well tailored on accurate information to address it. The Government of Kenya contributes to food and nutrition security in urban slums of social especially through income related policies by contributing to the cost of social amenities through reduced offering free education programmes and reducing the cost of health services at public health facilities. This in turn gives a chance to the urban poor to have a little more disposable income that will be spent on buying food. The other contribution is through the school- feeding programs (KARI, 2016).

The current study therefore seeks to establish the different factors contributing to household food and nutrition insecurity among women in Mathare.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study setting and methodology

3.1.1 Geographical Location

The study was conducted in Mathare, Nairobi County, Kenya. Nairobi County is split into 17 sub-counties and borders a few counties, to the North and West is Kiambu County, to the East is the County Government of Machakos, and to the South is the County Government of Kajiado. It is lies between latitudes 1˚18' South and longitudes 36˚45' East with an area of 696.1 Km² (KNBS, 2009).It is located at a height of 1,798 metres above the sea level. The Eastern part of Nairobi County is separated by steep valleys as you approach the city boundaries. Nairobi River, Ngong River, and Kabuthi River are the main rivers in the county. Mathare Informal Settlement is the oldest slum in the Valley. It has a population of about 500,000 (KNBS, 2009). It is composed of three housing units; the lowest class comprises of mud, waste-tin, or timber and lacks basic services and infrastructure whereas the upgraded housing units are single rooms with partly good infrastructure. The top class units comprise of high-rise buildings that are privately owned. Most residents are involved in small-scale businesses in their houses. Most households consists of about 5 members (Mutakaa, 2014).

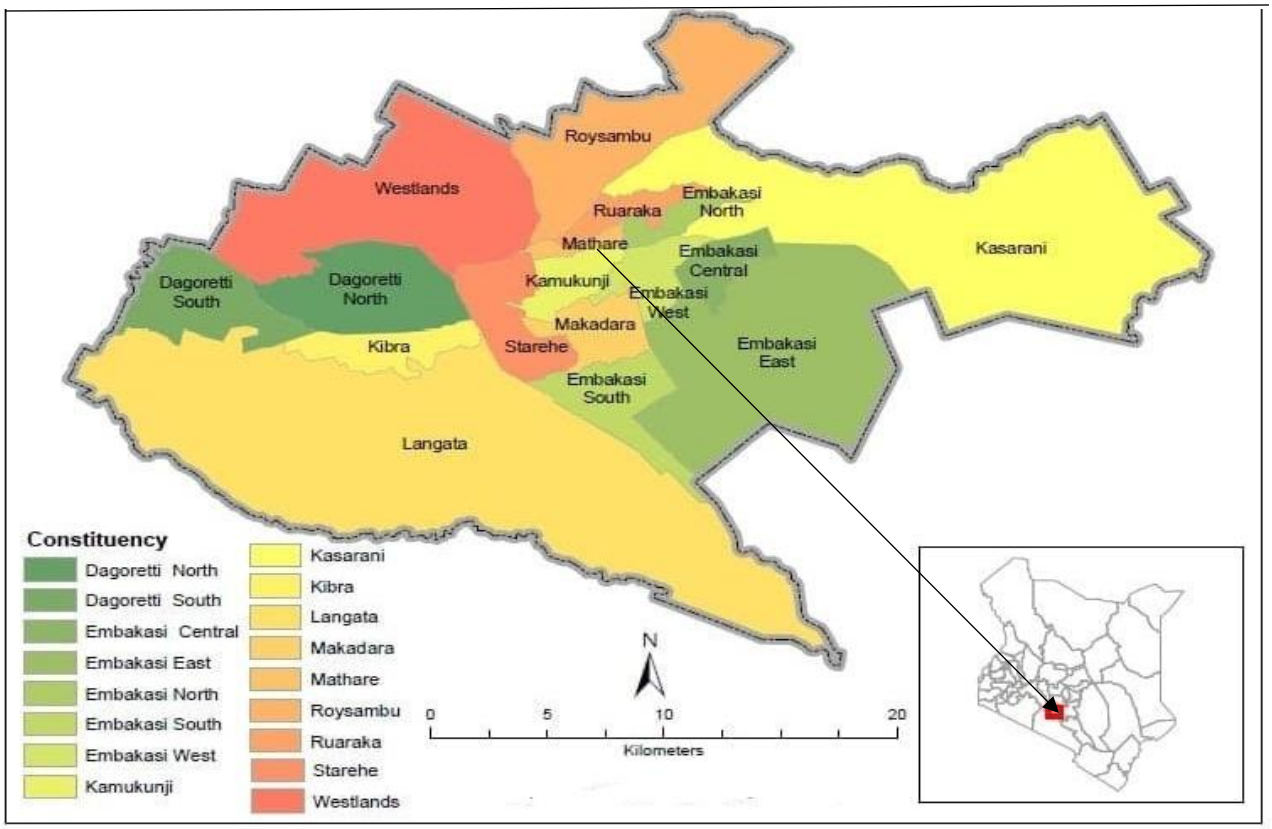

Figure 3.1: Map showing the study area; Source: IEBC 2012

3.1.2 Socioeconomic context of the area

Mathare Sub County is composed of six wards namely Kiamaiko, Mlango Kubwa, Ngei, Huruma, Mabatini, and Hospital. Mathare Informal Settlement is the oldest slum in the Valley. It has a population of about 500,000 (KNBS, 2009).

Mathare Informal settlement is composed of three housing units (based on economic units); the lowest class comprises of mud, waste-tin, or timber and lacks basic services (water and electricity) and infrastructure whereas the upgraded housing units are single rooms with moderate infrastructure. The top class units comprise of high-rise buildings privately owned. Most residents are involved in small-scale businesses such as vending foodstuffs and selling second hand items in their houses. Most households consists of about 5 members (Mutakaa, 2014).

3.1.3 Climatic Conditions

Nairobi County has a moderate cool climate that is from the high altitude. Temperatures ranges are from 10˚C to a high of 29˚C with a rainfall pattern that is bi-modal. The annual mean rainfall pattern is 786.5 mm. There are two rainfall patterns in the county, short rains between October and December with an average rain of 638 mm and long rains between March and May with 899 millimeters as the mean rainfall pattern (Nairobi County, 2017).

3.2 Research Methodology

3.2.1 Study design

A cross-sectional survey was undertaken in households across Mathare Informal Settlement. The study used both qualitative and quantitative methods in the collection of data.

3.2.2 Study Population

The study population consisted of households with Women (of reproductive age) living in Mathare Informal Settlement.

3.3 Sampling

3.3.1 Sample size determination

Fischer's et al. (1991) formula was used in calculating sample size as shown below;

$$n = \frac{z^2pq}{d_2}$$

Where n=minimum desired sample size z= value for the chosen confidence interval 1.96=95% confidence interval p= prevalence estimates of Stunting (one of the indicators of food insecurity) in Nairobi County (17.2 %) as per KDHS (2014).

q= 1-p the estimated proportion d= degree of desired accuracy/precision for the estimate (5% or 0.05)

Therefore;

$$\frac{1.96^2 \times 0.172 \times 0.828}{0.05^2} = 218.9 = 219$$

Added attrition of 10%; $\frac{219}{0.90}$ = 243 Households

3.3.2. Sampling Procedure

Mathare was purposively selected, being the second largest slum in Nairobi County.

The villages that participated in the study were randomly selected. Women were also selected randomly (being vulnerable groups to food insecurity). The number of households per village to be sampled were selected using proportionate to size sampling which involved calculating the sample size for each village. Households that participated in the study were selected using systematic random sampling. Figure 3.2 shows the sampling frame used in the study.

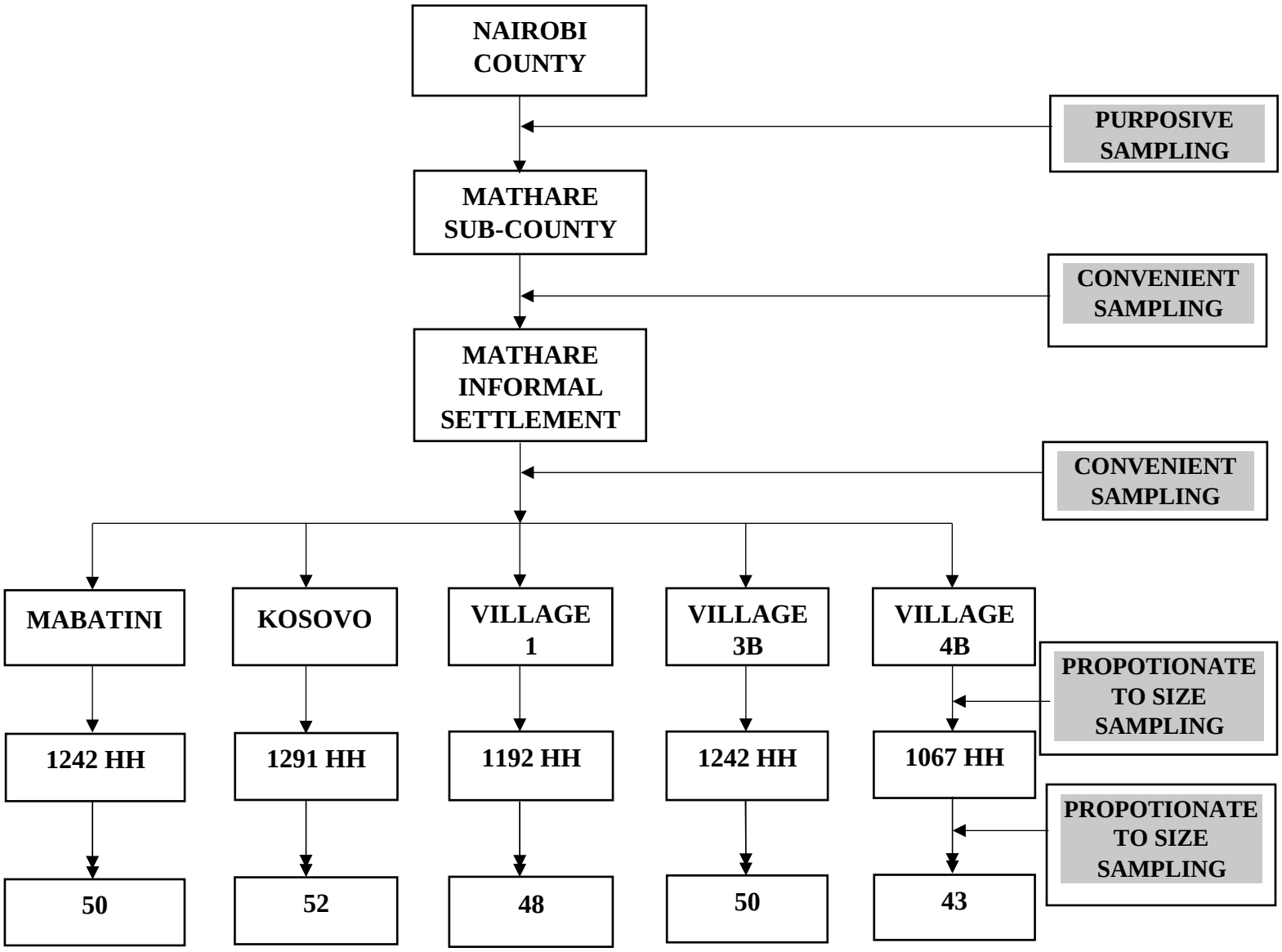

Figure 3.2: Sampling frame and households sampled per Village in Mathare Informal Settlement in Nairobi County, Kenya

3.3.3 Inclusion Criteria

The sampling unit was the household. All households with women between the age of 15 and 45 living in Mathare Informal Settlement during the time of the study were eligible for the study.

3.3.4 Exclusion Criteria

Women who were unwell, pregnant, or physically challenged were excluded in the study.

3.4 Research Instruments

3.4.1 Data collection methods

3.4.1.1 Determination of socio- demographic characteristics of households living in Mathare Informal Settlement

Socio- demographic data was collected from the study households using a semi structured questionnaire. The questionnaire had questions on marital status, level of education, relationship to household head, occupation and contribution to household, the household's main source of income, how much they earn, whether the house they lived in was their own or rented, the type of assets owned by the family and the type of cooking fuel (Appendix 4).

3.4.1.2 Determination of food group and maternal nutritional knowledge of women living in Mathare Informal Settlement

Data on nutritional knowledge among women living in Mathare was obtained using a structured questionnaire. The questions were adopted from FAO (2014) indicators on Knowledge, Attitude, and Practices which mothers were asked to assess their level of knowledge. Knowledge score was computed from a total ten responses (Appendix 4). A right response was scored "1"while a wrong response got a score of "0". Three categories for the knowledge score were then formed; low knowledge score for scores between 0-8, average knowledge 9-16 score while 17-24 score indicated high knowledge (Pillai et al., 2016).

3.4.1.3 Establishment of dietary diversity of women and food insecurity in Mathare Informal Settlement

3.4.1.3.1 Assessment of Dietary Diversity

The foods eaten by entire household and those eaten by the woman were collected using a questionnaire (Appendix 4), which intended to get information from the respondent on drinks and foods they consumed or drank the day before (past 24 hours) at home or elsewhere. The respondent was supposed to remember all foods and drinks they took from the previous day morning (yesterday morning) when they got up. For the respondent Individual dietary diversity questionnaire, the respondents were informed that that the questions referred to them and not any other member of the household.

Both HDDS and MDD-W used an accepted list of 12 food clusters and 10 food groups respectively, for all nations and circumstances (FAO and FHI 360, 2016). Information from each food group is of two types (either Yes/No). The responses were ticked according to corresponding food group category. Every food group with a drink or food was scored 1 while the food group with no food or drink was given a score of 0 (Appendix 4).

3.4.1.3.2 Assessment of Household Food Insecurity

HFIAS for this particular study was established by FANTA project (Coates et al., 2007). The component had a series of 9 questions that represented an increasing severity of food insecurity among the respondents. All the questions consisted of a Yes or No question and asked if the respondent or any other member in the household had either felt or experienced a certain behavior over the prior month. An occurrence question followed the severity question whereby the respondent was asked how frequently the severity condition occurred and the scores ranged from once or twice to denote the condition “Rarely” occurred, 3 to 10 times to indicate the condition

occurred “Sometimes” or more than 10 times to denote “Often”. The HFIAS score was then categorized further into 4 groups of severely food insecure, moderately food insecure, mildly food insecure and food secure (Coates et al., 2007).

3.4.1.4 Determination of nutritional status of women of reproductive age in Mathare Informal Settlement

Information on the nutritional status was collected using anthropometric measurements. It involved use of a bathroom scale to measure weight and modified tape measures to measure height (Appendix 4).

Height: Adults were measured while standing. Modified tape measures which measured up to 2m were used. Height was taken to the nearest 0.1 mm. This measurement was done in accordance to standardized ways (WHO, 2004).

Weight of adults: Bathroom scales were used and the weight taken to the nearest 0.5 gms, the weight measurement was also done according to standardized methods (WHO, 2004).

Body Mass Index: was used to calculate the nutritional status of the respondents. For this study, the World Health Organization’s definition was used. Participants were grouped into four classes; Underweight (<18.5kg/$m^{2)}$, Normal weight (18.5kg/m^2 to 24.9kg/m^2), Overweight (25.0 kg/m^2 - 30.0kg/m^2) and Obesity (>30.0 kg/m^2) (WHO, 2004).

Key Informant Interviews (KIIs) (Appendix 5) were conducted among various notable groups in the area to gather information on their general view of food and nutrition security. The groups included village elders, women groups, administrative leaders, traders, and health professionals. The interviewers took notes during the interview as well as recording them.

3.4.2 Recruitment and training of field assistants

Three research assistants were selected to assist in data collection. They were recruited on the basis of holding at least a Bachelor's Degree, fluent in both Swahili and English and residents of Nairobi County. The enumerators were trained on the purpose, objectives and requirements for the study with the main emphasis on how to fill in the questionnaires in the CAPI tool, how to input the data and the ethical requirements in the field.

3.4.3 Ethical Considerations

Permission was sought from the Office of the County Commissioner in Mathare Sub-County (Appendix 3) and a research permit obtained from the National Commission for Science, Technology, and Innovation (NACOSTI) (Appendix 2). An informed consent form was used to seek permission from the respondents (Appendix 1).

3.5 Data Management and Analysis

3.5.1 Quality Control

Data quality was ensured through pretesting of the questionnaire to check for reliability of the data collected and for modifications or reframing, exclusion or addition of questions to achieve the desired results. Field assistants were supervised daily. Anthropometric equipment were calibrated every morning. Every questionnaire was cross checked daily to ensure that there were no abnormalities.

3.5.2 Data Analysis

Data entry and cleaning was done using SPSS version 20. Descriptive statistics was used to analyze Socio-demographic data. Anthropometric indices were calculated as Body Mass Index (BMI) as an indicator of nutrition status.

Chi-square was performed to determine the association between the women's nutritional status and their socio-demographic characteristics. Chi-square tests were used to define the associations between variables and to predict the probability of certain variables affecting the food security status of households. ANOVA was used to test for differences in the means of the dependent variable broken down by the levels of independent variable. Logistic regression analysis was used to show the factors associated with household food insecurity access. Statistical significance was set at $p < 0.05$.

CHAPTER FOUR

RESULTS

4.1 Household Socio-demographic characteristics

Male headed households were made up of 75.5% of the total population whilst 24.5% were female headed households. The mean age of the sampled women was 34.3 ± 8.7 years. The range in years was 18 to 49 years. About 58.4% of the household heads had attained primary education, 3.1% reported never having gone to school whereas the rest had secondary and tertiary education (38.5%).

The average household size in the study area was 4.0 ± 2.0. There was a significant association between household size and specific villages (χ^2=70.5, df = 48, p=0.01). The mean age of the sampled women was 28.62 ± 7.33 years. Majority of the women were married (64.2%), single being 25.7% and the rest were either widowed, divorced, or separated (**Table 4.1)**.

There was a significant association between marital status and the level of formal education (χ^2=38.0, df=20, p<0.05) whereby among those who did not have any form of schooling, 75% were married while the rest was either separated or a widow (12.5%). The proportion of those who had college or university education was high among those who were single (57.1%).

Table 4.1: Socio-demographic characteristics of the study Households with women of reproductive age in Mathare Informal Settlement, Nairobi County

Household demographic characteristics	Frequency	Percent (n=243)
Age range		
15-19	15	6.2
19-24	66	27.2
25-29	63	25.9
30-34	45	18.5
35-39	26	10.7
40-44	18	7.4
45-49	10	4.1
Marital status		
Married	152	62.6
Divorced	7	2.9
Separated	8	3.3
Widow	11	4.5
Single	65	26.7
Relationship to HH head		
Household Head	62	25.5
Wife	156	64.2
Daughter	20	8.2
Others	5	2.1
Education Level		
None	8	3.3
Completed primary	90	37
Primary drop out	54	22.2
Completed secondary	40	16.5
Secondary drop out	37	15.2
College / University	14	5.8

4.2 Study Households Socio-economic characteristics

Majority of respondents were unemployed (35.4%), while 34.6% depended on casual labor for their source of income 23.3% were involved in business while the rest were students**.** The main source of income for most of the households was casual labor (65.4%) and business either big such

as shop keeper or small such as vegetable vendor (20.6%). About 10.5% of the households had salaried jobs while (65.4%) of the households majority engaging in casual waged labor.

There was an association between occupation of the women and their education level (χ^2=58.1, df= 25 p<0.05).

Most households earned a monthly income below USD $ 100 which is equivalent of 10,000 Kenyan shillings. Those who earned USD $50 per month were 37.4%, between $50 and $10 were 40.1% and the rest earned above $100. There was a significant association between the main source of income and the different villages (χ^2=29.9, df=16, p<0.05) as indicated in Table 4.2.

Table 4.2: Occupation by village of women (of reproductive age) living in Mathare Informal Settlement

Types of occupation	**Mabatini (%)**	**Village 1 (%)**	**Village 3 B (%)**	**Village 4 B (%)**	**Kosovo (%)**
Business	24.0	22.9	26.0	32.6	19.2
Casual Labor	38.0	29.2	40.0	30.2	32.7
Unemployed	36.0	33.3	34.0	23.3	44.2
Student	2.0	6.2	0.0	7.0	0.0
Others	0.0	8.3	0.0	7.0	3.8

Note: %=percentage, Village numbers 1, 3B and 4B are the actual names of the villages

Among the cooking fuel categories, paraffin was used by the majority at 68.9%, followed by charcoal 15.6%, gas (12.5%) while the others either used firewood or electricity (coil) (3%). There was a positive significant association between the type of cooking fuel and the villages ($\chi 2$ = 31.9, df=16, p= 0.01).

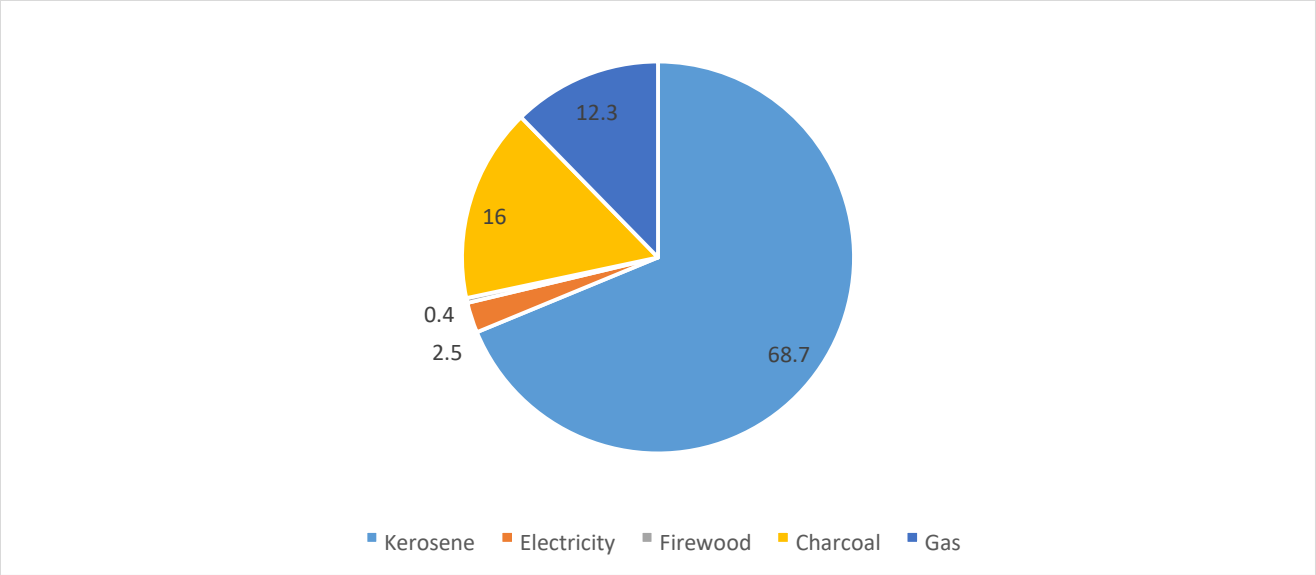

Figure 4.1: Percent distribution of the main type of fuel used by the respondents

4.3 Maternal and diverse diets knowledge of women living in Mathare Informal Settlement

The study sought to know the nutritional knowledge of women on maternal and diverse diets. The mean score for nutritional knowledge was 13.0 ± 5.5 standard deviation. The highest score was 23 while the lowest was 3 out of a maximum of 27. Majority of the respondents (72.8%) knew what a varied diet was. Those that mentioned 3 food groups that make up a varied diet were 43.2 %. About 37.9% were not aware of the food groups while the rest either mentioned 2 or 1 food groups. About 60.1% of the study population indicated that they knew what Vitamin A was. Knowledge of the benefits of Vitamin A was stated as prevention of illnesses (17.7%), protects the eyes or any other correct fact (11.9%) while majority of them (70.4%) did not know the importance of Vitamin A. Majority of the respondents (49.4%) did not know or gave a wrong answer on any source of proteins while 31.3% mentioned 3 sources, 10.3% mentioned just 1 source while the rest (9%) mentioned 2 sources.

On average, 95.5% of the respondents mentioned that they clean their vegetables before cutting or cooking them. From the entire study population, 74.1% answered that they cook their vegetables

by shallow frying them while the rest mentioned that they boil them before shallow frying them. Generally, majority of the women had moderate nutritional knowledge (51.9%), 28.4% had high nutritional knowledge while 19.8% had low nutritional knowledge.

4.3.1 Association between maternal nutritional knowledge and level of education

Nutritional knowledge of the respondents were compared with the level of education. The women who had high nutritional knowledge scores (62.3%) had attained secondary education and tertiary education (college or university). Those with low nutritional knowledge scores had completed primary education and below (85.4%). There was a significant association between the level of education and the nutritional knowledge score in that the women with a higher level of education had scored more (χ^2=159.7, df=100, p=0.000).

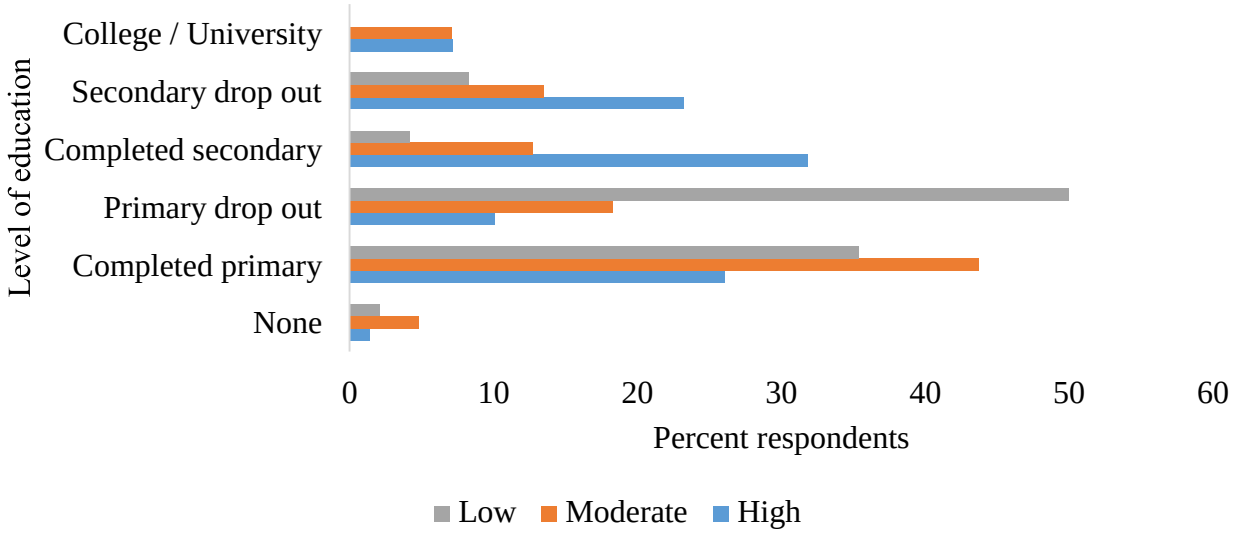

Figure 4.2: Distribution of respondent's level of education by nutrition knowledge

4.4. Dietary diversity and household food insecurity access scale (HFIAS)

4.4.1. Household dietary diversity score of the study population

Based on the 12 food groups, which were: 1. Cereals 2. White tubers and roots 3. Vegetables 4. Fruits 5. Meat 6. Eggs 7. Fish and other sea food 8. Seeds, nuts, and legumes 9. Milk and milk products 10. Fats and Oils 11. Sweets 12. Beverages, condiments, and spices. The mean number of food group taken by the household was 6.2 ±1.55. The minimum household having consumed nothing in the past 24 hours while the highest had consumed 11 food groups (Figure 4.4).

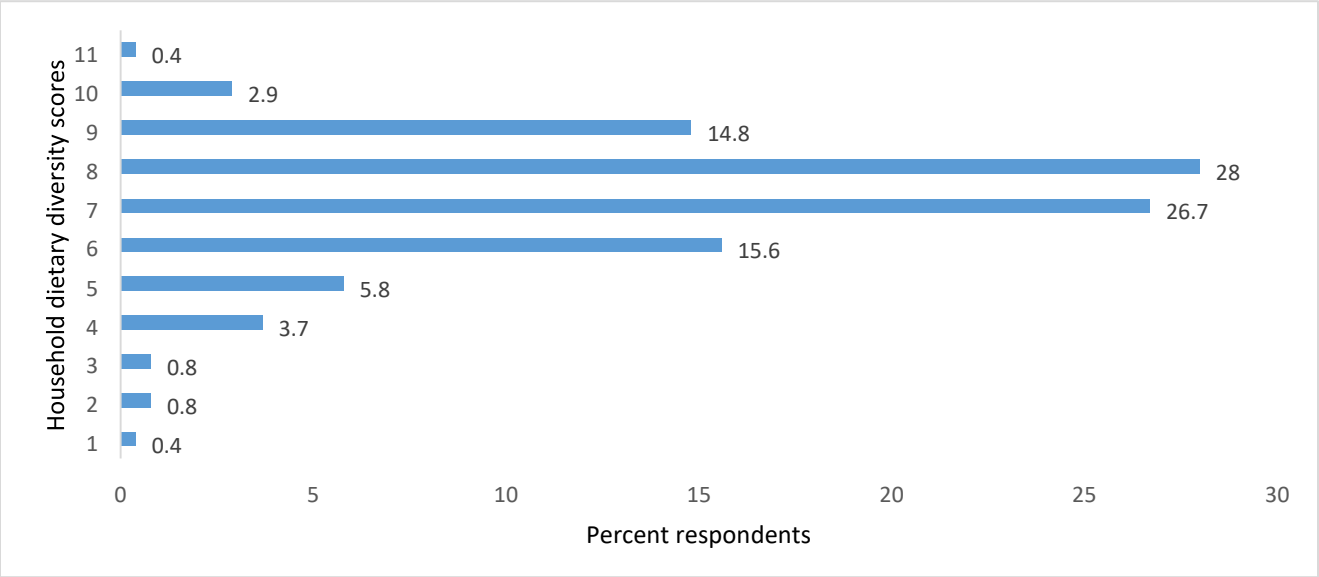

Figure 4.3: Distribution of Household by dietary diversity scores

Cereals and vegetables were consumed by over 90% of the households. However, Roots and Tubers were consumed by 19.8% of the total population. Meat was consumed by only 17.7% of the households while Fish (21.4%) and sea products (19.8%) were consumed the entire study population. Legumes (25.1%), Fruits (33.3%), and Milk (27.6%) was consumed by just slightly over a quarter of the entire study population. Oils, sweets, and condiments were consumed by over 80% of the total population. Most households (85.2%) had medium dietary diversity (5 -8 food

groups), those in the Low dietary diversity category (<5 food group) were 11.5%. About 3.3% had high dietary diversity (>8 food groups) (Figure 4.5).

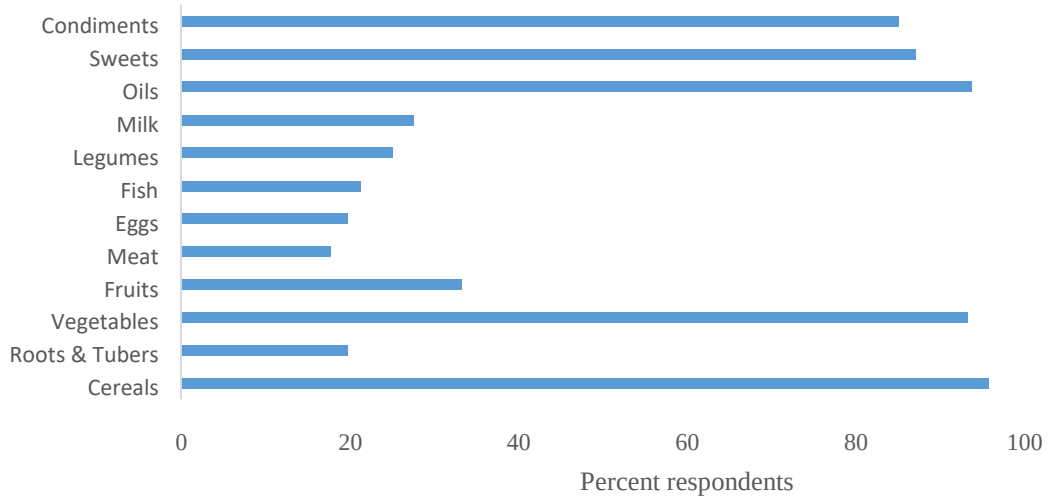

Figure 4.4: Distribution of food groups consumed by the study household in Mathare Informal Settlement

4.4.1.1 Association between food groups consumed and households in the villages in Mathare Informal Settlement in Nairobi County

Food groups consumed by the entire household in the study were compared according to the villages of residence (Table 4.4) and statistically significant association were observed between consumption of fruits, eggs, legumes, oils and sweets and the households' villages of residence ($p<0.05$). Majority of those who consumed legumes (29.5%) were from village 4B while the least (13.1%) were from Kosovo. Among those who reported to have taken fruits, majority were also from Village 4B while the least from Kosovo. Majority of those who consumed eggs were from Village 1 (31.2%) while the least were from Mabatini (12.5%). One way ANOVA showed a significant difference in the means of both villages and food groups consumed ($p=0.010$).

Table 4.3: Distribution of villages of residence in Mathare Informal Settlement and the food groups consumed

Food group	Mabatini n=50	Village 1 n=48	Village 3 B n=50	Village 4 B n = 43	Kosovo n= 52	p-value
Cereals	20.2	19.7	21.5	17.6	21.0	.560
Vegetables	20.3	19.8	19.8	18.1	22.0	.733
Fruits	21.0	24.7	16.0	29.6	8.6	.000*
Meat	25.6	11.6	20.9	25.6	16.3	.362
Legumes	19.7	16.4	21.3	29.5	13.1	.049*
Fish	19.2	19.2	28.8	15.4	17.3	.561
Eggs	12.5	31.2	29.2	12.5	14.6	.036*
Milk	16.4	16.4	20.9	14.9	31.3	.201
Oils	18.4	21.1	19.7	18.4	22.4	.004*
Roots and tubers	22.9	12.5	16.7	25.0	22.9	.397
Sweets	17.5	21.7	21.7	19.3	19.8	.002*
Others	18.8	21.7	21.3	17.9	20.3	.201

***Statistically significant at p< 0.05. Other food group is represented by spices, condiments, and beverages**

4.4.2 Minimum Dietary Diversity for Women (MDD-W) in the study area

The minimum dietary diversity scores were calculated according to the following 10 food groups which were: (1) Starchy staple: these include Cereals (rice, wheat), tubers, plantains, and roots, (2) Legumes and pulses (lentils, beans, peas), (3) Nuts and oil seeds, (4) Milk products, (5) Fish, meat, poultry, (6) Eggs (7) Fruits and vegetables rich in vitamin A (β-carotene), (8) Green leafy vegetables, (9) Other fruits, (10) other vegetables (FAO et al., 2016).

The mean MDD-W was 4.55 ±1.62. About half of the study women (51.0%) had a low DDS (< 5 food groups) while the other half (49.0%) had High DDS (5 -10 food groups) **(Figure 4.6).**

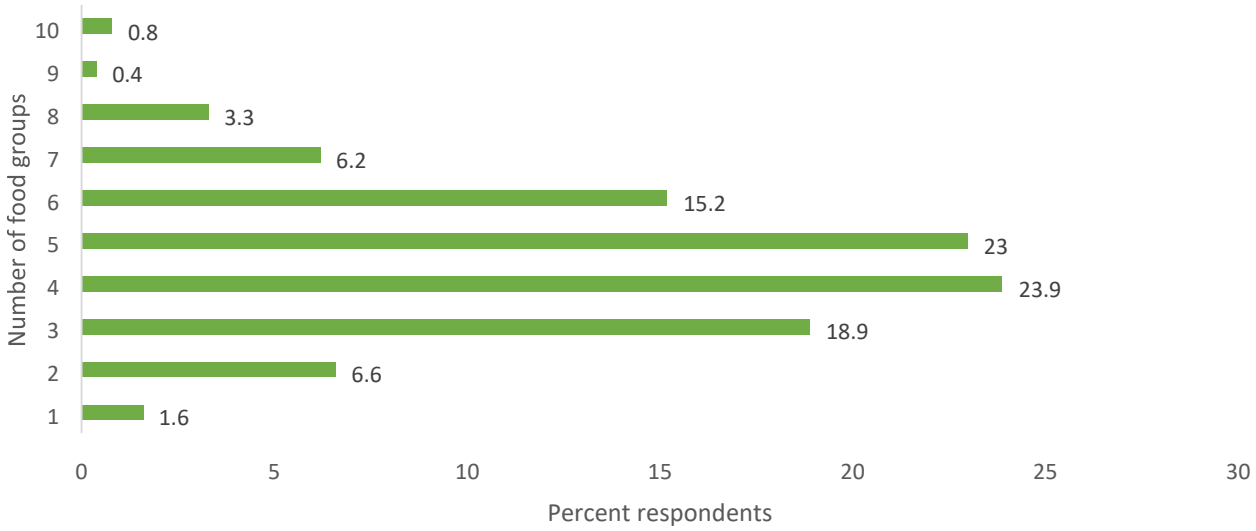

Figure 4.5: Distribution of women's' minimum dietary diversity scores by food group

Grains, white roots, & tubers were the most consumed food group by the entire population (98.8%). Of the total study women, 69.1% of the population consumed dark green leafy vegetables, 12.3% consumed fruits, and vegetables rich in Vitamin A, 90.9% consumed other vegetables and while 25.1% consumed other fruits. Poultry, meat, and fish was taken by 38.5% of the women while eggs was taken by 21.8%. Pulses, nuts, and seeds were consumed by 24.3% whereas milk and milk products was consumed by 31.7 % of the women in the study population (Figure 4.7).

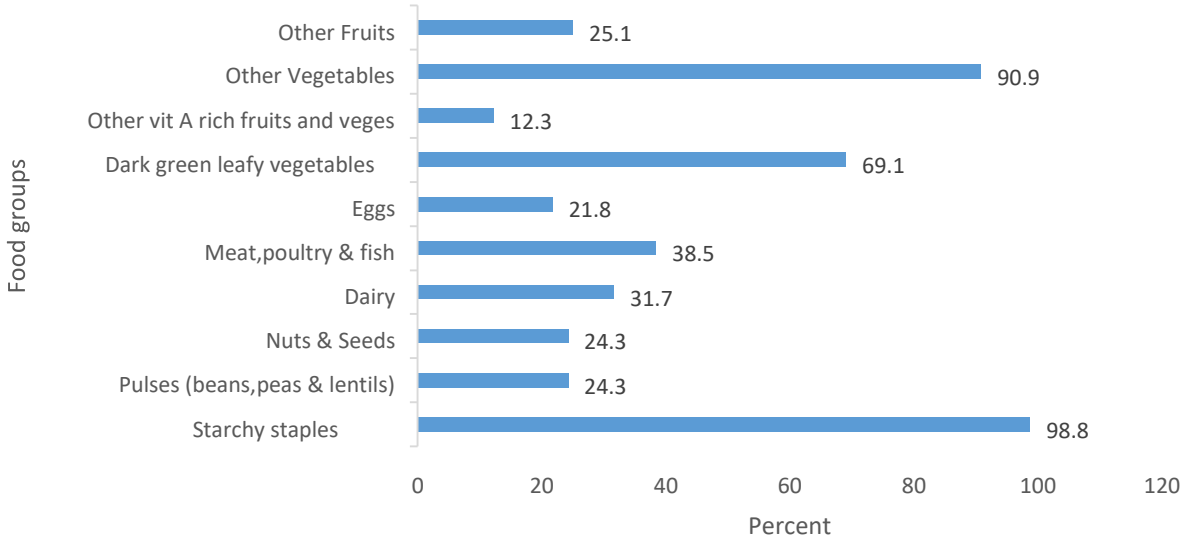

Figure 4.6: Distribution of Women's dietary diversity score by food group

There was a significant association between Women's dietary diversity and their occupation (χ^2 =11.3, df = 5, p=0.046). Majority of the casual labourers had a low MDD-W (57.8%). Those involved in different business activities such as vegetable vendors and selling of second hand clothes) (51.7%) had low MDD-W while 48.3% had a High DDS. Majority of those who were unemployed had a Low MDD-W (51.2%), with these category women having lower MDD-W than the business women. There was a significant association between the dietary diversity of women and the level of education (χ^2 =11.6, df = 5, p= 0.041). Majority of those with low MDD-W had attained primary education (68.7%) while the rest had either secondary or tertiary education (21.3%). Among those with High MDD-W, 34.5% had completed primary education followed by those with secondary education (38.6%). There was a positive significant association between an individual's monthly earning and their dietary diversity (χ^2 = 11.6, df = 2, p =0.003).

Majority of those earning below USD $50 (55.7%) and those earning between USD $50 – USD$100 (58.0%) had a low MDD-W. Majority of those earning above USD $100 had a high MDD-W (69.1%). There was a significant association between MDD-W and maternal nutritional knowledge (χ^2 = 9.3, df=2, p=0.010) whereby women with low dietary diversity scores had moderate (55.6%) and low nutritional knowledge at and 24.2%, respectively. Among those with a High MDD-W, majority had high (37.0%) and moderate (47.9%) nutritional knowledge (Table 4.5). There was positive significant association between MDD-W and HDDS (χ^2 =90.8, df=10, p= 0.000). Among those women with low MDD-W, majority of their entire household (62.9%) had consumed between 5-6 food groups while the least household (0.8%) had consumed only one food group. Majority of the study households with women who had high MDD-W had consumed between 7-8 food groups (68.1%). There was no significant association between MDD-W and the food security indicator (p>0.05).

Table 4.4: Minimum dietary diversity scores by sociodemographic characteristics of women living in Mathare Informal settlement

Socio-demographic characteristics	LOW MDD-W	HIGH MDD-W
	N (%)	N (%)
Level of formal education		
None	5(4.00)	3(2.50)
Completed primary	49(39.50)	41(34.50)
Primary drop out	35(28.20)	19(16.00)
Completed secondary	15(12.10)	25(21.00)
Secondary drop out	16(12.90)	21(17.60)
College / University	4(3.20)	10(8.40)
Occupation		
Business	31(51.70)	29(48.30)
Casual Labor	48(57.80)	35(42.20)
Unemployed	43(51.20)	41(48.80)
Student	1(14.30)	6(85.70)
Others	1(16.70)	8(88.8)
Monthly Earnings KES		
Below 5,000	49(55.7)	39(44.3)
5,000 - 10,000	58(58.0)	42(42.0)
Above 10,000	17(30.9)	38(69.1)
Nutritional Knowledge		
Low nutritional knowledge	30(24.2)	18(15.1)
Moderate nutritional knowledge	69(55.6)	57(47.9)
High nutritional knowledge	25(20.2)	44(37.0)

Note: N=sample size, %=percentage, MDD-W=Minimum dietary diversity score for women, Others-denotes to respondents depending on any other family member for money, 1USD= 100 KES

4.4.3 Household Food Insecurity Access Scale (HFIAS)

The scores for this food security indicator ranged from 0 to 27 with a mean of 11.761 ± 7.23 SD and median score of 12. Of the total population 10.9% were food secure, 7.4% mildly food insecure, 29.65 % moderately food insecure whereas the rest 60.3% were severely food insecure **(Figure 4.8)**.

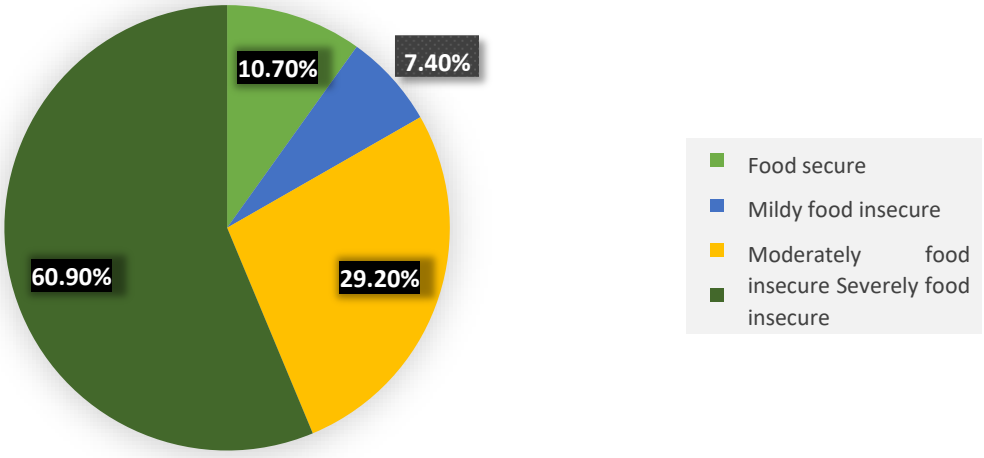

Figure 4.7: Distribution of study households by Household Food insecurity categories

Worry or Uncertainty about food

Households that reported to worry about not having food were 77%, out of these 25.5% reported that they worried "Often "while 30.5% worried "Sometimes" on the frequency question (**Table 4.6)**

Inadequate Quality of Food

Households that responded to the Yes/No question when asked if any member in the household had eaten undesirable foods due to insufficient money to buy others were 81.4%.When the results

from the two items in the domain were combined, 83% agreed to consuming insufficient food **(Table 4.6).**

Insufficient Quantity of Food

Households that reported to have slept hungry due to lack of enough food were 29.7%, 74.1% reported that they had cut back on meal size while 73.2% reported to have skipped meals because there was no money to purchase more foodstuff. Results from the answers for the six items in domain 3 were combined and the findings indicated that 142 households (58.5%) faced at least one of the severity condition associated to food insufficiency in the past one month **(Table 4.6)**

Table 4.5: Frequency of occurrence of nine items on Household Food Insecurity Access Scale and the extent of Food Insecurity Domains

I. HFIAS Questions	**Frequency of occurrence: n=243**			
	Never	**Rarely**	**Sometimes**	**Often**
1.Worrying that the household would not have enough food	23.5	20.6	30.5	5.5
Insufficient Quality of food				
2.Not eating the kinds of preferred food due to lack of resources	18.5	16	36.2	29.2
3.Eating limited variety of foods	15.6	18.5	36.2	29.6
Insufficient food intake or quantity of food:				
4. Eating smaller meals because of lack of resources	18.5	18.1	32.1	31.3
5.Cutting the size of meal due to lack of resources	25.9	19.3	31.3	23.5
6.Skipping meals	26.7	18.9	29.6	24.7
7. Lack of food of any kind	47.7	18.1	19.3	14.8
8. Sleeping hungry because there was no enough food	70.4	14.4	9.5	5.8
9.Staying an entire day and night without eating	83.1	7.8	5.3	3.7
II. HFIAS - Domains	**No to all items [n (%)]**		**Yes to at least one item [n (%)]**	
Anxiety or Uncertainty about food	56 (23.0)		187(77.0)	
Inadequate quality	42(17.0)		201(83.0)	
Insufficient quantity or food intake	101(41.5)		142(58.5)	

4.4.3.1 Association between socio demographic characteristics, nutritional knowledge, nutritional status and Household Food Insecurity categories

There was a significant association between household food insecurity access scores and the households in various villages (χ^2 = 145.4, df=108, p=0.010). Majority of those who were food secure were from Kosovo (57.70%) whilst majority of those faced by moderate and mild food insecurity were from Village 4B (50.8%). Majority of households experiencing severe food insecurity were from Village 3B **(Table 4.7).** There was a positive significant correlation between age of the respondents and household food insecurity access scores (r= 0.129, p= 0.045). There was a positive significant association between marital status and household food insecurity scores (χ2=135.4, df =108, p= 0.038).

Table 4.6: Distribution of villages and household food insecurity access scale (N=243)

Villages in the Study area	Food secure	Mildly food insecure	Moderately food insecure	Severely food insecure	Mean HFIAS	Standard deviation
	%	%	%	%		
Mabatini	15.40	18.30	18.30	20.90	12.50	7.52
Village 1	7.70	18.30	18.30	20.90	12.583	6.80
Village 3 B	11.50	15.50	15.50	25.00	14.74	7.00
Village 4 B	7.70	25.40	25.40	16.90	9.837	5.63
Kosovo	57.70	22.50	22.50	16.20	9.019	7.60

***HFIAS-Household Food Insecurity Access Scale**

Other factors that were significantly related with food insecurity after adjusting for other factors were income, education level, occupation, and household size. Households with an income of more

than USD $100 per month were five times more likely experience food security in comparison to those with a monthly earning of less than USD $50 (OR =5.9,(-3.8-0.2) 95% C.I).

Compared to those households whose occupation was business, the odds of food security in households who were not employed but just a student was 6 times higher (OR =6.5,(-12.1—0.9) 95% C.I). Larger households were two times likely to be food insecure compared to a smaller size household (less than 5 members) (OR = 2.4 (1.1 -4.7), 95% C.I). Compared to individuals who had no formal schooling at all, the odds of being food secure among the secondary dropout and those with tertiary education was 6 times and 7 times higher respectively ($p<0.05$) as shown in **Table 4.8** .

Almost all households (99.2%) purchased food with 0.8% having their major source of food as a gift from a friend or relative or as Food Aid. Use of sub-optimal coping strategies such as reducing the size of meals, purchasing food on credit from local venders, trading sex for money, purchasing street foods and borrowing money, and selling household items was predominant in the slum as evidenced from the Key Informant Interviχχews.

Table 4.7: Logistic Regression Analyses showing factors associated with Household Food Insecurity Access among women in Mathare Informal Settlement in Nairobi, Kenya

Socio-demo characteristic	*Proportion N=243*	*Bivariate logistic regression*		*Multi-variate logistic regression*	
	n (%)	*Coefficient (95%C.I)*	*p-value*	*Coefficient (95%C.I)*	*p-value*
Level of Income (USD)					
< 50 (***Ref)***	88(36.2)				
50 – 100	100(41.2)	-1.8[-3.8-0.2]	<0.001*	-1.4[-3.5-0.5]	0.0003*
>100	55(22.6)	-5.9[-8.3--3.6]		-5.1[-7.6--2.6]	
HH size					
Small HH(<5 members) (***Ref)***	140(57.6)		0.002*		0.008*
Large HH (>5 members)	103(42.4)	2.9 [1.1 - 4.7]		2.4 [13.4-24.3]	
Level of education					
None(***Ref)***	8(3.3)				
Completed primary	90(37.0)	-4.2[-9.3-1.0]		-5.9[-11.1--0.9]	
Primary dropout	54(22.2)	-2.3[-7.6-3.0]	0.024*	-5.0[-10.2-0.2]	0.061
Completed Secondary	40(16.5)	-4.7[-10.1-0.8]		-4.8[-10.1-0.4]	
Secondary dropout	37(15.2)	-6.4[-11.9--0.9]		-7.9[-13.2--2.5]	
College / University	14(5.8)	-7.4[-13.6--1.2]		-7.0[-13.2--0.9]	
Occupation					
Business(***Ref)***	60(24.7)				
Casual labor	83(34.2)	0.5[-1.9-2.9]		-0.4[-2.8-1.9]	
Unemployed	84(34.6)	-0.7[-3.1-1.7]	0.038*	-0.5[-2.8-1.7]	0.388
Student	7(2.9)	-6.5[-12.1--0.9]		-4.5[-10.1-1.1]	
Others	9(3.7)	-5.4[-11.4-0.6]		-3.2[-9.0-2.6]	

***Statistically significant at p<0.05, C.I –Confidence Interval, HH-Household, Ref - the reference group for a particular variable**

4.5 Nutritional status of women in the study population

Over nutrition was evident in Mathare Informal Settlement, 29.6% of the respondents were overweight, 13.2% had moderate risk obesity, and 6.6% of the total study population had high risk obesity based on their BMI's. About half of the women 48.6% were of normal weight while the rest were underweight (51.4%) **(Figure 4.9).** There was a positive significant association between age of the respondent and nutritional status ($\chi 2=42.8$, df=24, p=0.010). Overweight was high among the 18-23-year old and those between 30-35 years old. Obesity was more predominant among those between 24 to 29 years and less among those between 18 and 23 years (Figure 4.1).

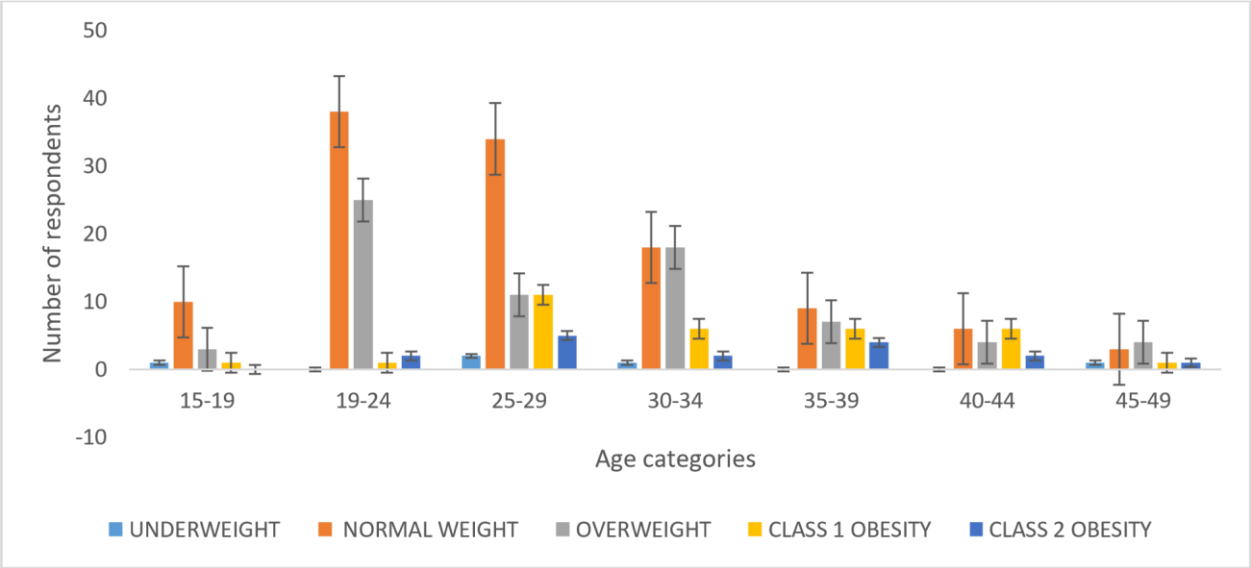

Figure 4.8: BMI Classification of the index women in Mathare informal settlement. The bars indicate the standard error of means

4.5.1 Predictors of Nutritional Status of the respondents

Multiple linear regression analysis was used to find out the predictors of nutritional status among the women. This was performed using "Enter" method where a significant model emerged ($F_{8,234}$=3.461,P<0.01,Adjusted R square = 0.075). Statistically significant predictors of nutritional status for the women were age and dietary diversity scores (Table 4.9).

Table 4.8: Predictors of Nutritional status of the respondents

Regression model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Age of respondents	0.15	0.055	0.194	2.723	0.007*
Marital status	-0.05	0.034	-0.093	-1.457	0.146
Level of formal education	0.021	0.046	0.031	0.464	0.643
Occupation	-0.043	0.045	-0.063	-0.946	0.345
Household size	0.042	0.032	0.089	1.332	0.184
Monthly Earnings	0.024	0.083	0.02	0.294	0.769
MDD-W	-0.078	0.038	-0.134	-2.056	0.041*
Nutritional knowledge	0.004	0.012	0.021	0.303	0.762

Dependent Variable: BMI CLASSES
MDD-W =Minimum Dietary Diversity Score for Women
***Prediction is significant**

CHAPTER FIVE

DISCUSSION

5.1 Socio-demographic characteristics of the study Households living in Mathare Informal Settlement

Majority of the households were headed by males, a finding similar to the country's findings (KDHS, 2014) which is a typical finding in developing countries. The mean age of the sampled women was 28years, these findings compare to those of Abuya et al. (2012) where the women's age ranged between 25-29 years old. Majority of the women were married followed by those who were single and the rest was either a widow, divorced or separated. The average household size in the study area was 4.4 which is slightly higher than the Kenyan National average of 3.9 members per household in Nairobi as per the Kenya Health Demographic Health Survey (KDHS, 2014). This has a negative effect on the food security and dietary diversity of a household due to the economic difficulties in meeting needs of large households (Kahanya, 2016).

Education is a key characteristic in determining the level of engagement in socio-economic activities at both individual and household level (Cherop, 2017). Majority of the women interviewed had attended up to primary education while few had attained secondary and tertiary education and even fewer had no formal education This corresponds well with a study done in Kakamega in Kenya where women's education level was primary school and below (Cherop, 2017). However, the findings differ Kenya's National data that showed that women between the ages of 15-49 with no formal schooling were 7% (KNBS, 2014). The low education level attainment results from economic and socio-cultural factors which may include lack of tuition fees, ignorance about schooling and inability to achieve passing grades in primary school.

Pregnancies and early marriages also contribute to the high primary drop outs particularly among women (Birchall, 2018).

In the current study, most members of these households lived below $100 dollars per month indicating high vulnerability to poverty and food insecurity in the study area. Food security is directly linked to access and hence to one's earned income (Owour et al., 2017). These findings corresponded with those of World Bank (2013) where nearly half of Kenya households earned less than $ 100 dollars per month while 2% had completely no income (World Bank, 2013).

Acute Respiratory Infections (ARIs) are as a result of one's type of cooking fuel which have an effect on the levels of indoor air contamination. One of the targets of the Sustainable Development Goals (SDG 7) on energy is to ensure access to clean fuel. The major source of cooking fuel for the respondents in this study was paraffin .Over reliance on carbon fuels exposes one to poor respiratory health and also has negative consequences for the quality of air generally (Owour et al., 2017). The use of paraffin was way above the Kenya Population and Housing Census (2016) which indicated that majority of the households used paraffin as the major source of cooking fuel (KIHBS, 2016). The results compared to a study in Nairobi that showed that 65% of urban population used kerosene for cooking. This depicts high levels of poverty among the slum dwellers with majority being unable to afford the cost of electricity (Owour et al., 2017).

5.2 Food Availability in the Household

5.2.1 Dietary Diversity of the study household and Women living in Mathare Informal Settlement

The findings of HDDS in our study are similar to a study done by Action against Hunger (2009) in Mathare where the mean dietary diversity was 6.3 which indicates moderate dietary diversity. The study found a Minimum dietary diversity scores for women which was below the recommended value of five food groups. The findings of this study also compares to a study done in low socioeconomic areas in Nairobi where a Minimum dietary diversity score for women of 4.3 was recorded (Ongosi, 2014). Several studies in developing countries have acknowledged that diet in these countries is majorly cereal based (Kiboi et al., 2017; Herrador et al., 2015; Ochieng et al., 2017). Majority of the study participants reported to having eaten food items from cereal and cereal products. In the developing world, a lack of a diet that is diversified is a great problem considering the diets majorly consist of starchy staples with minimal seasonal fruits, vegetables, and animal products (Arimond and Ruel, 2004).

The minimal intake of animal proteins in this study exposes the respondents to Iron Deficiency anaemia. Intake of protein rich foods which are highly priced and hence less affordable to the slum dwellers was very low in this study and Indicator of high risk Protein Energy Malnutrition. Micronutrient deficiencies and chronic energy deficiencies are among the leading nutritional problems affecting WRA (Kemunto, 2013). A study conducted in Burkina Faso showed that increased intake of flesh foods and organ meat, is considerably linked with reduced possibility of micronutrient deficiencies (Becquey and Martin-Prevel, 2010).

The study found convincing evidence that MDD-W is related with the socioeconomic status of an individual or the household. The higher the income the higher the chances of having diversified

diets. The probable reason for this is that higher earning is associated with increased power of buying food which can help in improving dietary diversity.

Individuals with higher education levels had better chances of having a higher dietary diversity score. This may due to the fact women with higher education levels might have gotten information on the appropriate eating practices. The results of this study therefore agree with those several other studies which showed that diversity in diet is indeed associated with socioeconomic status (Taruvinga, 2013; Kiboi et al., 2017). A study in Ahvaz- Iran presented a significant association between and individual's socio-economic condition and dietary diversity scores (Vakili et al., 2013).

Most women who had just attained primary education or had no education at all had lower minimum dietary diversity scores for women. Education level influences a woman's level of knowledge and food choices (Kemunto, 2013). In respect to the association between other demographic factors (age, marital status, relationship to household head) and dietary diversity, the current study found no statistically significant association. Comparable findings were also observed by Kiboi et al. (2017) in Laikipia County where factors such as marital status and age were not associated with the women's dietary diversity.

There was a positive statistical significance association between nutritional knowledge and Minimum dietary diversity scores for women. Nutritional knowledge is likely to have an influence on household's skills to understand and use nutritional messages which ultimately contribute to better dietary diversity (Rajendran et al., 2017). A previous research in Tanzania, showed that households who were provided with nutritional education improved the quality of their household diets (Pillai et al., 2016). Similar findings in Tanzania and rural Cambodia also showed a positive correlation between nutritional knowledge and dietary intake whereby the Infant and Young Child Feeding behaviours of caregivers of children between 0-23 months was improved through

nutritional education. In rural Cambodia, the dietary diversity of women was improved after being educated on the importance of vegetables, how to prepare them, consumption, and how they are utilized in the body (Ochieng et al., 2017; Reinbott et al., 2016).

5.2.2 Household Food Insecurity Access Scores of study households living in Mathare Informal Settlement

HFIAS scores showed that households were faced by three of the most severe conditions (mildly food insecure, moderately food insecure, severely food insecure). This finding relates to a study done in Mumbai, India among those with low socioeconomic status (Chatterjee et al., 2012). This finding compare to a study done in Korogocho slums in Nairobi County where 64% of households were severely food insecure and only 8% being food secure (Kimani-Murage et al., 2014). This also corroborates to a study done in Mumbai Slums in where severely food insecure households were 59.7% and 16.6% were mildly to moderately food insecure (Chatterjee et al ., 2012).

The study did not find considerable difference in the number of households with affirmative answers between the domain of insufficient quality and the domain of anxiety. This therefore explains how those living in these urban informal settlements are vulnerable to food insecurity in their daily lives. Similar studies in Tanzania and India also showed that more households responded agreeably to questions on intake of undesirable foods than worrying about their food condition (Knueppell et al., 2009; Chatterjee et al., 2012). Items that received highest affirmative responses were questions asking whether an individual had consumed same foods daily due to lack of money, that asked if any individual in the entire house ate any type of food that they did not want due to lack of money had a response. Majority of the study households reported to consume a smaller amount than they wanted because they did not have sufficient resources to purchase food. This findings are similar to those of a study done in Butajera District, Ethiopia that also found

highest affirmative responses from Item 2 and 3 (Gabreyesus et al., 2015). This study showed a positive significant association between the income and the food security score, with lower income households being more food insecure. Other studies in the same setting, (Kimani-Murage et al., 2014; Agarwal et al., 2009), the findings in this study illustrated issues related with household food security in Mathare to include income, occupation and size of the household. These results correspond to those from a study in Nairobi which reported that food security is directly linked to one's income (Owour et al., 2017). Most households purchase their food on a daily basis which means there exists a direct connection between food security and income (Kamau et al., 2011). Majority of the study population earned a monthly income that was below $100 USD. A probable reason for this could be that majority of the population were casual labourers and therefore earned an income that was not well paying. A report by World Bank showed that among those who reside in Nairobi's slums, 63 percent live below the poverty line (World Bank, 2008). According to the 2005/2006 KIHBS survey, it was estimated that the food poverty line in a month for an adult was found to be equivalent to $147 USD in urban areas (Masese, 2014). This shows that the poverty levels in Mathare Informal settlement are so high and could ultimately translate to food insecurity since food has to be bought with the little disposable income. Considering that the economy in the informal settlements is cash-based, and the fact that food is bought daily, food spending is very flexible and can simply be reduced to cover shortages compared to other expenses such as rent, business, and school fees as agreed by Key Informants (KII).

"People *here are so poor, one must earn some money in order to eat. The issue of food insecurity mostly comes up when the breadwinner gets sick and therefore not able to work. We only eat what is available and mostly that is ugali (maize meal) and sukumawiki (kales).Foods especially animal proteins are a luxury here and hence less eaten" (KII, Mabatini 4C and Kosovo Villages).*

In this study, the findings showed a positive statistical association between household size and household food insecurity, with the larger household being more food insecure. Similar findings of a study conducted in rural Bangladesh also stated that the bigger the household, the greater the risk of food insecurity (Harris-Fry et al., 2015), as more money is devoted to food in such households compared to those that are smaller in size (Babalola and Isitor, 2014; Emmanuel and Ayoola ,2013). It would generally be expected that an individual's level of education would guarantee a secure livelihood and therefore a food secure life. Findings from this study show that one's education level may not be able enough to guarantee food security ($p>0.05$). This corresponds to a study done in Mathare slums that also showed a weak correlation between education and food security (Masese, 2014).

The existence of coping strategies in the setting is an important sign of food insecurity and usually points towards how severe the situation is. As evidenced from the findings and the Key Informant Interviews, coping mechanisms such as trading sex for money, purchasing street foods, adults sacrificing food for children and minimizing the food taken (either in terms of amount or quality) are mostly used to manage the problem of food insecurity in the setting.

"*Hunger here is a big problem and sometimes one does not have any cash at all hence indulging in activities such as theft and prostitution. Prostitution here is so common especially among young girls and women, as young as girls even in class four. They go to Eastleigh,Riverroad or a place called 'Kwa Budhi ' here in Mathare where women even trade sex for as low as 20 shillings "(KII, Mabatini and Mlango Kubwa Villages).*

A study by Amuyunzu (2009), showed that there are few support systems in the slums for people experiencing food insecurity. Participation in programs promoted by any Non-Governmental Organizations was not common as majority of the population (91.8%) mentioned that they were not involved in any program.

5.3 Nutritional status of study women living in Mathare Informal Settlement

Over nutrition was evident in Mathare Informal Settlement as majority of the respondents were overweight or either had moderate risk obesity or high-risk obesity. This is similar to findings from KDHS (2014) indicating that overweight and obesity were more common in urban areas (KDHS, 2014; Mkuu and Epnere, 2018). High proportions of adult over nutrition were also found in previous studies conducted in Kenya's urban slums (Oti et al., 2013) . Diseases such as cardiovascular diseases, cancers and diabetes are associated with an individual being overweight or obese (Chowdhury et al., 2016). The high risk of obesity among Kenyan women in urban areas is associated with increased consumption of high calories and high fat diet (Mbochi et al., 2011). Overweight and obesity also exposes these women to higher risks of maternal outcomes such as pre-eclampsia, gestational diabetes and postpartum hemorrhage (Chowdhury et al., 2016).

Overweight was high among the young adults and those who were in the early thirties to midthirties while obesity was more pronounced among those between mid-twenties while lowest among young adults. These findings were similar to those of Kimani-Murage et al. (2015) where the combined proportions of overweight and obesity increased with increasing age from younger women between 18 to 29 years at 17.1% to the oldest adults at 30.5%.

There was a high incidence of underweight, normal weight and overweight among those households earning less than $100 dollars while moderate and high risk obesity was more evident among those earning more than $100 dollars. A study in Japan indicated that individuals from low socioeconomic groups had little concern about the type of food they consumed and considered food price vital compared to those from high SES groups (Murayama, 2014). A study done in Central African Republic and in the Republic of Congo showed that Undernutrition and Obesity are associated with food consumption and with different socioeconomic factors (Jesus et al., 2017). Individuals from low SES majorly consume high energy dense foods which have lower energy

costs because of their low food expenditure budgets. The relationship between these low SES and over nutrition may be due to the low prices of the high energy foods and may be reinforced by the sweetness of sugar and fat which are highly palatable (Darmon and Drewnowski, 2015).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Nutritional knowledge level affects the Minimum dietary diversity for women. Socioeconomic factors such as level of education affects the nutritional knowledge of women.

Over nutrition is present among women of reproductive age in Mathare Informal settlement. Dietary diversity is low among the study households and among women in the study area and there is high consumption of cereals but low consumption of animal and plant proteins as well as Vitamin A rich foods.

Food insecurity is high in the study area with most households being moderately and severely food insecure. Households in the study area employ several coping strategies when faced with food insecurity.

6.2 Recommendations

There is need to educate the community on how to work with available food stuffs within their budget to meet their nutritional requirements.

Food security policies and programs need to set up better ways of ensuring that food items and subsidies are distributed among the most affected in the informal settlements. A Program envisioned as appropriate in addressing food insecurity in the slums is one that the Government can fund microentrepreneuship activities and skills development to individuals in the urban slums through Community Based Organizations or self-help groups. In doing so, the individuals can have income to purchase food without necessarily having to depend on donations.

Further research is needed to identify better ways of dealing with food insecurity among residents in urban informal settlements.

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APPENDICES

APPENDIX 1: INFORMED CONSENT FORM

Introduction and consent form for a study on **HOUSEHOLD FOOD AND NUTRITION SECURITY AMONG WOMEN IN PERI-URBAN AREAS.A CASE OF MATHARE INFORMAL SETTLEMENT IN NAIROBI, KENYA.**

Introduction

Hello, my name is ……..and I am working in collaboration with Anastasia Jepkoech from the University of Nairobi, Department of Food Science, Nutrition, and Technology, Applied Human Nutrition Programme.I am conducting a research that seeks to identify the **Factors contributing to Household Food and Nutrition security among women living in Mathare Informal Settlement, Nairobi County, Kenya.**

Confidentiality

Information given will be kept confidential and used to prepare a dissertation which will not include any specific name. Reference numbers in the questionnaires will be used to link your name and your answers without identifying you.

Your participation in this study is highly voluntary.

By signing or approving this consent form indicates that you understand what will be expected of you and that you are willing to participate in the survey.

May I begin now?

Signature of the respondent ……

Signature of the interviewer ……

Date …….

Appendix 2: Ethical Approval A

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **814011**

Date of Issue: **10/October/2019**

RESEARCH LICENSE

This is to Certify that Miss.. Anastasia Jepkoech of University of Nairobi, has been licensed to conduct research in Nairobi on the topic: HOUSEHOLD FOOD AND NUTRITION INSECURITY AMONG WOMEN IN PERI-URBAN AREAS: A CASE OF MATHARE INFORMAL SETTLEMENT IN NAIROBI COUNTY, KENYA for the period ending : 10/October/2020.

License No: **NACOSTI/P/19/1882**

814011

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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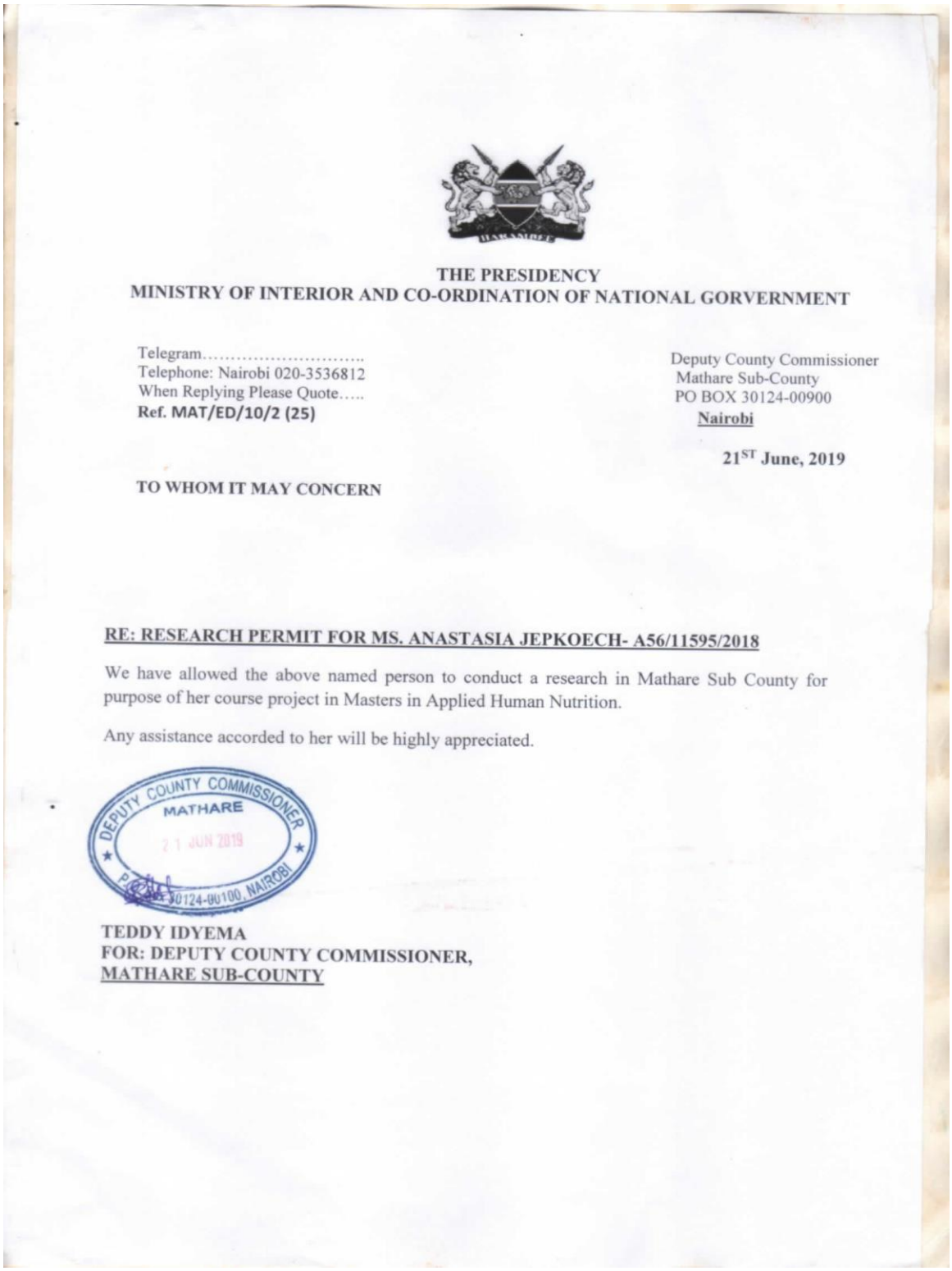
Appendix 3: Ethical approval B



THE PRESIDENCY
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GORVERNMENT

Telegram.....
Telephone: Nairobi 020-3536812
When Replying Please Quote.....
Ref. MAT/ED/10/2 (25)

Deputy County Commissioner
Mathare Sub-County
PO BOX 30124-00900
Nairobi

21ST June, 2019

TO WHOM IT MAY CONCERN

RE: RESEARCH PERMIT FOR MS. ANASTASIA JEPKOECH- A56/11595/2018

We have allowed the above named person to conduct a research in Mathare Sub County for purpose of her course project in Masters in Applied Human Nutrition.

Any assistance accorded to her will be highly appreciated.

DEPUTY COUNTY COMMISSIONER
MATHARE
21 JUN 2019
P.O. BOX 30124-00100, NAIROBI

TEDDY IDYEMA
FOR: DEPUTY COUNTY COMMISSIONER,
MATHARE SUB-COUNTY

Appendix 4 : Questionnaire

SECTION A: DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

A1: HOUSEHOLD IDENTIFICATION AND DEMOGRAPHICS

A1_01 AD 1: COUNTRY KENYA

A1_02 AD 2: COUNTY NAIROBI

A1_03 AD 3: SUB COUNTY MATHARE SUB-COUNTY

AD3: PLEASE SELECT THE WARD

- Mabatini
- Mlango Kubwa
- Hospital

A1_05 AD 5: VILLAGE

- Mabatini
- Village 1
- Village 3 B
- Village 4 B
- Kosovo

A1_06 HH UNIQUE NUMBER …….

A1_08 ENUMERATOR'S NAME

A1_08 A Anastasia Jepkoech

A1_08 B Lynne Njeri

A1_08 C Immaculate Chepkirui

A1_08 D Yegon Duncan

A1_09 DATE OF INTERVIEW **…… STATEMENT OF AGREEMENT**

PLEASE READ THE FOLLOWING TO THE INTERVIWEE

Confidentiality

Information given will be kept confidential and used to prepare a dissertation which will not include any specific name. Reference numbers in the questionnaires will be used to link your name and your answers without identifying you.

Your participation in this study is highly voluntary.

May we proceed

A1_10 AGREED TO PARTICIPATE **0=NO ( ) 1=YES ( )**

A1_11 A FIRST NAME OF HH HEAD……

A1_11 B LAST NAME ……..

HEAD OF HH : A1_12 A AGE IN YEARS …….

A1_12 B YEAR BORN …….

A1_12 C LEVEL OF EDUCATION ……

CODES 0=None 1=completed primary 2=primary drop out 3=completed secondary4=secondary drop out 5=college/university

A1_13 A FIRST NAME OF INDEX WOMAN ……

A1_13B LAST NAME ……

INDEX WOMAN: A1_14 A AGE IN YEARS ……

A1_14 B YEAR BORN | | | | |

A1_14 C MARITAL STATUS

CODES: 1=Married 2=Divorced3=Separated4=Widow5=Single6=N/A

A1_14 D LEVEL OF EDUCATION

CODES: 0=None 1=completed primary 2=primary drop out 3=completed secondary4=secondary drop out 5=college/university

A1_14 E RELATIONSHIP TO HH HEAD

CODES: 1=Household head2= Wife3=Daughter4=Parent5=Others (specify)

A1_14F OCCUPATION

1=Formal employment2=Business3=Farming4=Casual labor5=Unemployed6=Student7=N/A

8=Others (Specify)

A1_14 G CONTRIBUTION TO HOUSEHOLD

1=Nothing 2=Money 3=Labor 4=Childcare 5=Savings 6=Pension 7=Others(specify)

A1_15 A CELL PHONE NO: ……

A1_15 B BELONGS TO: 1 = HH head ( ) 2 = Index Woman ( ) 3 = Other in HH ( ) 4 = Neighbor( )

HOUSEHOLD SIZE: RESIDENT AT LEAST DURING THE PAST 3 MONTHS

	M	F	TOTAL
A1_17: LESS THAN 5 YEARS OF AGE (0-59 months)			
A1_18:5-14 YEARS			
A1_19:15-24 YEARS			
A1_20:25-64YEARS			
A1_21: 65 YEARS AND ABOVE			
A1_22: TOTAL SIZE (verify with the interviewee)			

A2: SOCIO ECONOMIC STATUS

A2_1. What is the household's main source of income?

1 = Salaried job ( ) **2** = Shop Owner ( ) **3** = Help from children ( )

4 = Casual waged labor ( ) **5** = Small own business/petty trade ( ) **6** = others (specify)

A2_2. Approximately how much do you earn per month from all sources

- Below 5,000 KES
- 5,000 – 10,000 KES
- Above 10,0000

A2_3. Do you live in a rented house or own house?

1. Rented ( )

2. Own ( )

IF RENTED, HOW MUCH DO YOU PAY FOR RENT?

- Below 2000 KES
- 2000 -3000 KES
- Above 3000 KES

A2_4. What is the main type of cooking fuel?

1= Kerosene ( ) **2**= Electricity ( ) **3** = Firewood ( ) **4** = Charcoal ( ) **5** =Gas ( )

6 = Others Specify …….

A2_5. Which of the following are owned by your family? 1= YES 0=NO

1. Television ( ) **2.** Radio ( ) **3**. Cellphone ( ) **4**. DVD Player ( ) **5**. Bicycle ( )

6. Land ( ) 7. Plot ( ) **8.** Car ( ) **9**. Motorcycle ( ) **10**. None ( )

A2_6. What is the major source of foods in your Household? 1=YES 0=NO

1. Nearby market ( )
2. Rural homes ( )
3. Farming nearby ( )
4. Donation/Relief ( )
5. Other (specify)

SECTION B: EVALUATION OF MATERNAL NUTRITIONAL KNOWLEDGE

The interviewer will probe mothers on the following questions:

B1_a.Do you know what a balanced diet is? YES=1 N0=0

YES ( ) **NO** ( )

B1_b. If Yes, what are the 3 food groups? (Carbohydrates, Proteins, Fats)

A. Mentioned 3 Groups - 3
B. Mentioned 2 Groups – 2
C. Mentioned Any 1 Group – 1
D. Mentioned a Wrong Answer or Did not Know – 0

B2 _a. **Have you ever heard of vitamin A? YES =1 NO=0**

Yes ( ) .No ( )

B2_b. Why is vitamin A important? _____Does the answer mention that it:

- Prevents disease? 1. Yes 0. No ( )
- Protects the eyes? 1. Yes 0.No ( )
- Any other correct fact? 1. Yes 0. No ( )
- Wrong Answer or Didn't Know

B2_c.What do you think are the sources main sources of Vitamin A? (Beef, Liver, Sweet potato, spinach, carrots, Dark green vegetables, Yellow and orange vegetables, Milk, Oranges, Pawpaw, Tomatoes).

A. Mentioned Any 3 or more sources – 3

B. Mentioned Any 2 sources – 2

C. Mentioned Any 1 Source – 1

D. Mentioned a Wrong Answer or Did not Know - 0

B3.What are the main sources of protein? (Eggs, Mutton, Beef, Beans, Milk, Fish, Others (Specify))

A. Mentioned Any 3 or more sources – 3

B. Mentioned Any 2 sources – 2

C. Mentioned Any 1 Source – 1

D. Mentioned a Wrong Answer or Did not Know - 0

B4. How do you think vegetables should be prepared?

A. By Cleaning them before cutting

B. By Cutting them then cleaning

C. By Cleaning with hot water then rinsing with cold water

B5. How do you cook your vegetables?

A. By Shallow frying

B. By Boiling

C. By Boiling then shallow frying

B6_a Do you deworm your children? YES =1 NO=0

Yes ( ) **No** ( )

B6_b If Yes, How Often ?

A. Monthly

B. Yearly

C. After 3 Months

D. Twice Yearly

E. I don't know / I don't remember

SECTION C: TRAINING AND ACCESS TO INFORMATION

C1. Does your household participate in programs promoted by any Non-Governmental Organization?

[1] Yes [0] NO

C2. Which program is the household participating in?

[1] Agriculture [2] Nutrition [3] Health and HIV 4] Risk mitigation [5] other_____

C3. Which NGO is providing these programs?

[1] AMREF [2] CONCERN WORLDWIDE [3] INTERNATIONAL POTATO CENTRE (CIP) [4] WORLD FOOD PROGRAMME (WFP) [5] WORLD HEALTH ORGANIZATION (WHO) [6] FARM CONCEN INTERNATIONAL (FCI)

[7] Other_ _____

C4. Has any member of the household received any information/ training from any extension agent about food production, nutrition, and/or storage in the last 6 months?

[1] Yes [0] NO

SECTION D: DIETARY DIVERSITY SCORE

N/B: THE FIRST TABLE IS PRIMARILY TO PROMPT MEMORIES (RECALL) OF FOOD CONSUMED IN THE LAST 24 HOURS BEFORE THE SURVEY AND TO CONFIRM THE MAJOR INGREDIENTS IN COMPOSITE DISHES.

Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home. Start with the first food or drink of the morning, write down all foods and drinks mentioned. When the respondent has finished, probe for meals and snacks not mentioned. For composite dishes (e.g. githeri – maize / beans, chapatti – cereal / oil) note down the major ingredients.

N/B: The interviewer should establish whether the previous day and night was usual or normal for the respondent. If unusual- feasts, funerals and most members absent, them another day is selected. Was it a 'special' day yesterday (e.g. wedding, funeral, etc.)? [ ] (0 = No, 1 = Yes). If yes specify: _____

ID	**FOOD GROUP**	**Examples; customize for local context always, also consider other locally available food items**	**Household consumed in the last 24 hours? (No = 0, Yes = 1)**	**WRA consumed in the last 24 hours? (No = 0, Yes = 1)**
D01	CEREAL STAPLES OR FOOD FROM CEREALS	Millet, sorghum, maize, rice, wheat, bread, noodles, biscuits		
D02	WHITE TUBERS & ROOTS	Potatoes, yams & sweet potato, cassava, false banana or foods made from these		
D03	VIT A RICH VEGETABLES& TUBERS	orange veg: pumpkin, carrot, orange fleshed sweet potato		
D04	DARK GREEN LEAFY VEGETABLES	okra, spinach, sukuma wiki, managu, terere, kunde, saga, pumpkin leaves		
D05	OTHER VEGETABLES	Tomato, onion, eggplant, cabbage, capsicum, mushroom		

D06	VIT A RICH FRUITS	orange fruits: ripe mango, apricot, peach, papaya		
D07	OTHER FRUITS	Apple, banana, plantain, pineapple, avocado		
D08	ORGAN MEAT (IRON RICH)	Liver, kidney, heart, other organ meat (incl. intestine)		
D09	FLESH MEAT	Beef, pork, lamb, goat, rabbit, wild game, chicken, other poultry		
D10	EGGS	Eggs		
D11	FISH & SEAFOOD	Fresh or dried fish or shellfish		
D12	LEGUMES, NUTS & SEEDS	Beans, peas, pigeon peas, green grams (chickpeas), lentils, nuts		
D13	MILK & MILK PROD.	Milk, cheese, yoghurt, other products. Include milk in tea if >= 1/3rd of cup		
D14	OILS AND FATS	ANY oil, ANY butter		
D15	SWEETS	Sweets, sugar, honey		
D16	SPICES, BEVERAGES, CONDIMENTS	Any other foods, coffee, tea		
D17. Household level only **D18**.Individual level	Did you or anyone in your household eat anything (meal or Snack) OUTSIDE the home yesterday? Did you eat anything (meal or snack) OUTSIDE the home yesterday?			

D19. Primary Source of Food

1 = Own Production ( )

2= Purchased ( )

3= Borrowed, Cash for work, gift from friends or relatives ( )

4= Food Aid ( ) 5=

Other ( )

SECTION E: HOUSEHOLD FOOD INSECURITY SCALE

Each of the questions in the following table is asked with a recall period of four weeks (30 days). (Introduce the section explaining to the respondent that we just want to understand the food situation and not to provide any form of help)

Example:

E01_a In the past four weeks, did you worry that your household would not have enough food? 0 = No (skip to Q2) 1 = Yes

E01_b. HOW OFTEN DID THIS HAPPEN?

1 = **Rarely** (1-2 time in past four weeks) 2 = **Sometimes** (3 to 10 times in the past four weeks)
3= **Often** (>10 times in past four weeks)

PART A

NO	OCCURRENCE QUESTIONS	ANSWER (YES /NO)	If Yes, how Often?
E02	In the past four weeks, did you worry that your household would not have enough food?		
E03	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?		
E04	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?		
E05	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?		
E06	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?		
E07	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?		
E08	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?		
E09	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?		
E10	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?		

SECTION F: ANTHROPOMETRIC ASSESSMENT FOR THE INDEX WOMAN

		F1_A	F1_B	F1_C
	Measurement	**First reading**	**Second reading**	**Average**
F1	**Weight**			
F2	**Height**			

Appendix 5: Key informant interviews guide

Name of the Key Informant:

Designation:

Place:

Thank you for your willingness to participate in this interview. Any information you give will be highly appreciated. The information will guide on assessing **Household Food and Nutrition security among women living in Mathare Informal Settlement, Nairobi County, Kenya.**
QUESTIONS

1. What is your role or position in this community?
2. For how long have you lived or worked in this community?
3. a. What is your general view of Food and Nutrition security in Mathare Informal Settlement?
   b. Do you think that many households in this community have a problem with food security?
   c. What do you think are the contributing factors?
   d. How do people cope with this the problem of food security?
   e.What does the community and the key players do to address this problem?
4. Is there farming done around here ? How is it important as a source of food?
5. What is the most readily available type of food likely to be consumed here ?
6. What do you think the GOK and Nairobi County Government is doing to improve the Food security of affected individuals in this place ?
7. What is the most purchased food by the locals?
8. What is the price per unit of the most purchased food?
9. Do you feel that the services available in terms of Food and nutrition are adequate? What else could be done to improve to improve on welfare of the most vulnerable groups in this community? **PLEASE PROBE ON THE ROLE OF THE GOVERNMENT**

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August 21, 2020

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By Anastasia Jepkoech

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