

**HOUSEHOLD FOOD SECURITY AND NUTRITIONAL STATUS OF HIV  
SERO-POSITIVE CLIENTS ATTENDING LONGISA COUNTY HOSPITAL  
COMPREHENSIVE CARE CLINIC, BOMET COUNTY, KENYA**

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## DECLARATION

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

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## **DEDICATION**

To my dear wife Jane Chebet, lovely daughter and son; Gillian Ayanna and Dylan Kipchumba who have been the source of great inspiration and to my Dad Mr. Jeremiah Biomndo and Mum Mrs. Alice Chebusit for their moral support. Thanks to the Almighty God for the strength and zeal He gave me during this work.

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**ABBREVIATIONS AND ACRONYMS**

<b>AIDS</b>	:	Acquired Immune Deficiency Virus
<b>ART</b>	:	Anti-Retroviral Therapy
<b>BMI</b>	:	Body Mass Index
<b>CCC</b>	:	Comprehensive Care Clinic
<b>CoGB</b>	:	County Government of Bomet
<b>GoK</b>	:	Government of Kenya
<b>HDDS</b>	:	Household Dietary Diversity Score
<b>HHS</b>	:	Household Hunger Scale
<b>HIV</b>	:	Human Immunodeficiency Virus
<b>KES</b>	:	Kenyan Shillings
<b>MAM</b>	:	Moderate Acute Malnutrition
<b>MUAC</b>	:	Mid Upper Arm Circumference
<b>NASCOP</b>	:	National AIDS and STI's Control Programme
<b>NACOSTI</b>	:	National Council of Science, Technology and Innovation
<b>PLWHA</b>	:	Persons Living with HIV and AIDS
<b>RDI</b>	:	Recommended Dietary Intake
<b>SAM</b>	:	Severe Acute Malnutrition
<b>SD</b>	:	Standard Deviation
<b>SPSS</b>	:	Statistical Package for Social Sciences
<b>TB</b>	:	Tuberculosis
<b>WHO</b>	:	World Health Organization

## OPERATIONAL DEFINITION OF TERMS

**Clients:** Adult HIV sero-positive persons receiving anti-retroviral therapy at Longisa County Hospital Comprehensive Care Clinic.

**Dietary Intake:** Intake of calories, protein, fats, vitamins (A, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, C,) Iron, and Zinc of clients measured by 24-Hour Dietary Recall.

**Household Food Security Status:** was measured as follows:

- Food Availability: measured using respondent's occupation as a proxy measure, and ability of respondent's households to access income capable of ensuring intake of sufficient quantities of diverse and nutritious diets.
- Food Accessibility: assessed by Household Hunger Scale (HHS) adopted from Ballard et al., 2011 and Household Dietary Diversity Score (HDDS) adopted from FANTA (Swindale & Paula, 2006), showing the capability of households to obtain food sufficient in quality and quantity.
- Food Utilization: measured by the respondent's nutritional status as indicated by Mid Upper Arm Circumference (MUAC) and Body Mass Index (BMI) using the WHO 2006 Cut off Points.
- Food Stability: measured by the manner in which respondent's households respond to food crises as indicated by the HHS adopted from Ballard et al., 2011.

**Nutritional Status:** assessed by the BMI and MUAC of respondents using the WHO 2006 Cut off Points.

**Food Consumption Patterns:** frequency of consumption of foods from selected food groups based on a 7-day recall.

**Sero-positive:** In the study, refer to blood showing traces of HIV antibodies.

**ABSTRACT**

Food insecurity remains a major problem in poor households, and its implications worsen in disease states including Human Immunodeficiency Virus (HIV) and AIDS. More than 10 million Kenyans are chronically food insecure and 1.6 million have HIV. A synergistic relationship exists between food insecurity, HIV, and AIDS. Human Immunodeficiency Virus and AIDS cause an imbalance of the four fundamental elements of food security: food access, availability, utilization, and stability. There is limited literature on household food (in) security and nutritional status of HIV sero-positive clients drawn from areas that have in recent times reported poor food production. Bomet County recently experienced poor production of county's staple: maize, due to the emergence of Maize Necrosis disease, which resulted in increased harvest losses. The main purpose of the study was to assess the household food security and nutritional status of HIV sero-positive clients attending Comprehensive Care Clinic at Longisa County Hospital, Bomet County. The study used a cross-sectional analytical design on a comprehensive sample of 210 adult HIV sero-positive clients. A structured questionnaire was used to collect data on socio-demographic and socio-economic factors, anthropometric measurements, dietary intake, and food security status. Analysis was done using descriptive statistics, which included means, percentages, standard error of the mean, and frequencies. Pearson-moment correlation was used to establish strength of associations between continuous variables and Chi-square for relationship between categorical variables. Independent-Samples t-test was used to ascertain the existence of significant differences in the study variables across the male and female gender categories. One-Way ANOVA was used to determine the existence of significant difference in the means of categorical variables and non-categorical variables. A p-value of  $< 0.05$  was used as the criterion for statistical significance. Data drawn from 24-hour dietary recall was analysed using Nutri-survey. SECA calculator model 491 was used for accurate determination of the Body Mass Index (BMI). Majority of the respondents: (61.6%) were females. Adequacy in meeting energy requirements was 47.4% for males and 50% for females. Males and females met the dietary needs for selected nutrients: vitamin A, B<sub>1</sub>, B<sub>2</sub>, C. Iron intake was significantly low among female respondents whereby 89.3% did not meet the RDI and zinc intake among male respondents was low as only 28.9% met the RDI. Consumption frequency of meats, eggs, and fish was irregular. Household food insecurity prevalence was 17.7% as evidenced by a Household Dietary Diversity Score (HDDS) of  $\leq 4$ . About 23.7% of the respondent's households had severe household hunger. Mean Household Hunger Scale score was  $1.56 \pm 0.061$  indicating that most of the respondent's households experienced moderate household hunger. The prevalence of underweight was 22.8%. There was a significant relationship between nutritional status measured by BMI and household food security status measured by HDDS at  $p=0.001$ . Household food security status measured by HHS and nutritional status as assessed by MUAC had a positive association at  $p=0.001$ . Dietary intake and nutrition status did not exhibit any relationship. The study recommends the need to scale up care and treatment modalities at Comprehensive Care Clinics (CCC's) by considering and including household food security and nutritional status aspects as part of nutritional care and support modalities for HIV sero-positive clients. This provides an ample means of optimizing ART, enhancing rehabilitation, and adherence to care and treatment.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background of the Study

Human Immunodeficiency Virus and AIDS pandemic has and continues to have devastating effects on the infected and the affected populations all around the globe. By the close of the year 2012, an estimated 35.3 million people globally were living with HIV (UNAIDS, 2013). In the same year, close to 25.0 million people in Africa were living with HIV and AIDS disease. Kenya is one of the countries that have been hardly hit by the HIV pandemic, whereby in the year 2012, close to 1.6 million Kenyan's were living with the disease. An estimated population of 28,000 in Bomet were living with HIV in 2014 (Ministry of Health & National AIDS and STI Control Programme, 2014). Amongst the 47 counties, Bomet is ranked 32<sup>nd</sup> with regards to the total number of HIV sero-positive persons and 35<sup>th</sup> in terms of adult HIV and AIDS prevalence (Ministry of Health & NASCOP, 2014).

Food security exists in cases where households have the ability to ensure that all the household members at all times have economic, social, and physical access to safe, enough, acceptable, and nutritious foods, which caters for their food and dietary preferences that enables them to lead a healthy and active life. In the period between the year 2011 and 2013, 842 million people in the world were food insecure (FAO, 2013). The prevalence of food insecurity in Africa is high whereby close to 25% of Africa's population is food insecure. In Kenya, more than 10 million people are chronically food insecure (Kenya Agricultural Research Institute, 2012). Even with the availability of lifesaving anti-retroviral therapy for people living with HIV and AIDS, the mere presence

of food insecurity in their household's results in poor treatment outcomes. This is because of the primary fact that access to sufficient, safe, acceptable, and nutritious food is crucial for the improvement of the health and nutritional status of HIV-infected clients. Across various parts of the world, HIV, AIDS, and food insecurity are some of the main causes of mortality and morbidity (Anema et al., 2009). Human Immunodeficiency Virus, AIDS and food insecurity increases the vulnerability and worsens the severity of each other. HIV and AIDS reduces the economic productivity of infected individuals; hence, predisposing the individuals and their families to food insecurity. The case of Longisa County Hospital, Bomet County was worth studying because limited literature existed on household food security of HIV sero-positive persons in this County. Bomet County recently reported poor food production, especially maize, which is its staple food and cash crop because of Maize Necrosis disease, which affected various parts of the county resulting in increased harvest losses (Wangai et al., 2012).

## **1.2 Statement of the Research Problem Statement**

There is a synergistic relationship between HIV and AIDS and nutritional and food security. HIV and AIDS results in poor health status, which elicit an imbalance between equal access to food, food availability, quality of food, and stability of food supplies. Efforts geared towards fighting HIV and AIDS pandemic have often been hampered by food insecurity, which compromises the effectiveness of anti-retroviral medications utilized in the management of HIV and AIDS disease. Good nutrition achieved by consumption of adequate and nutritious diets is important for preservation and achievement of health and helps the body protect itself from infections (NAS COP, 2007). The World Health Organization (WHO) recommends that HIV sero-positive patients



should consume adequate nutrients derived from a variety of food sources (WHO, 2003). During instances of food insecurity, persons living with HIV and AIDS lack access to a variety of food sources needed to provide adequate nutrients that are crucial in enhancing their nutritional status and response to anti-retroviral medications. Progression of HIV to AIDS increases the occurrence of opportunistic infections. These infections increase an individual's nutrient requirements and failure to sufficiently meet them leads to wasting, which is a significant predictor of HIV progression. Therefore, inadequate nutrient intake due to food insecurity hastens HIV progression to advanced and severe stages (Hailemariam, Bune & Ayele, 2013).

Despite several nutrition interventions offered at various HIV Comprehensive Care Clinics (CCC), the nutritional status of HIV sero-positive patients continues to deteriorate because such interventions are specific to certain situations that affect the patient's nutritional status. As an example, these interventions do not focus on the need to realize the determinants of household food insecurity as a core factor that influences the patient's nutritional status. The situation is worsened during periods of reduced food production emanating from harvest losses caused by emerging crop diseases such as Maize Necrosis disease, which recently affected various parts of Bomet County resulting in reduced production of maize, which is the county's staple food crop. The study sought to address the gaps by assessing household food security status and nutritional status of HIV sero-positive clients attending CCC at Longisa County Hospital, Bomet County. Insights from the study supplement existing knowledge, which is crucial for programme implementers seeking to improve food security and nutritional status of HIV sero-positive persons.

### **1.3 Purpose of the Study**

To assess the household food security and nutritional status of HIV sero-positive patients attending CCC at Longisa County Hospital, Bomet County, Kenya.

### **1.4 Objectives of the Study**

1. To determine the socio-demographic and socio-economic characteristics of HIV sero-positive patients attending Longisa County Hospital.
2. To assess household food security status of HIV sero-positive patients attending Longisa County Hospital.
3. To determine dietary intake of HIV sero-positive clients attending Longisa County Hospital.
4. To assess the nutritional status of HIV sero-positive clients attending Longisa County Hospital.
5. To determine the relationship between food security and nutritional status of HIV sero-positive clients attending Longisa County Hospital.

### **1.5 Research Hypothesis**

H<sub>01</sub> – There is no significant relationship between food security and nutritional status of HIV sero-positive patients.

H<sub>02</sub> - There is no significant relationship between dietary intake and nutritional status of HIV sero-positive patients.

### **1.6 Significance of the Study**

The study has generated crucial insights on the issue of household food security in the context of HIV and AIDS that adds to existing knowledge, which is valuable for action aimed at improving the food security of HIV sero-positive persons by different HIV and AIDS program implementers.

### **1.7 Delimitation of the Study**

Results obtained from the study may not be generalized to all the HIV sero-positive clients attending Longisa County Hospital CCC because the respondents only comprised of male and female adult clients aged 18 to 55 years.

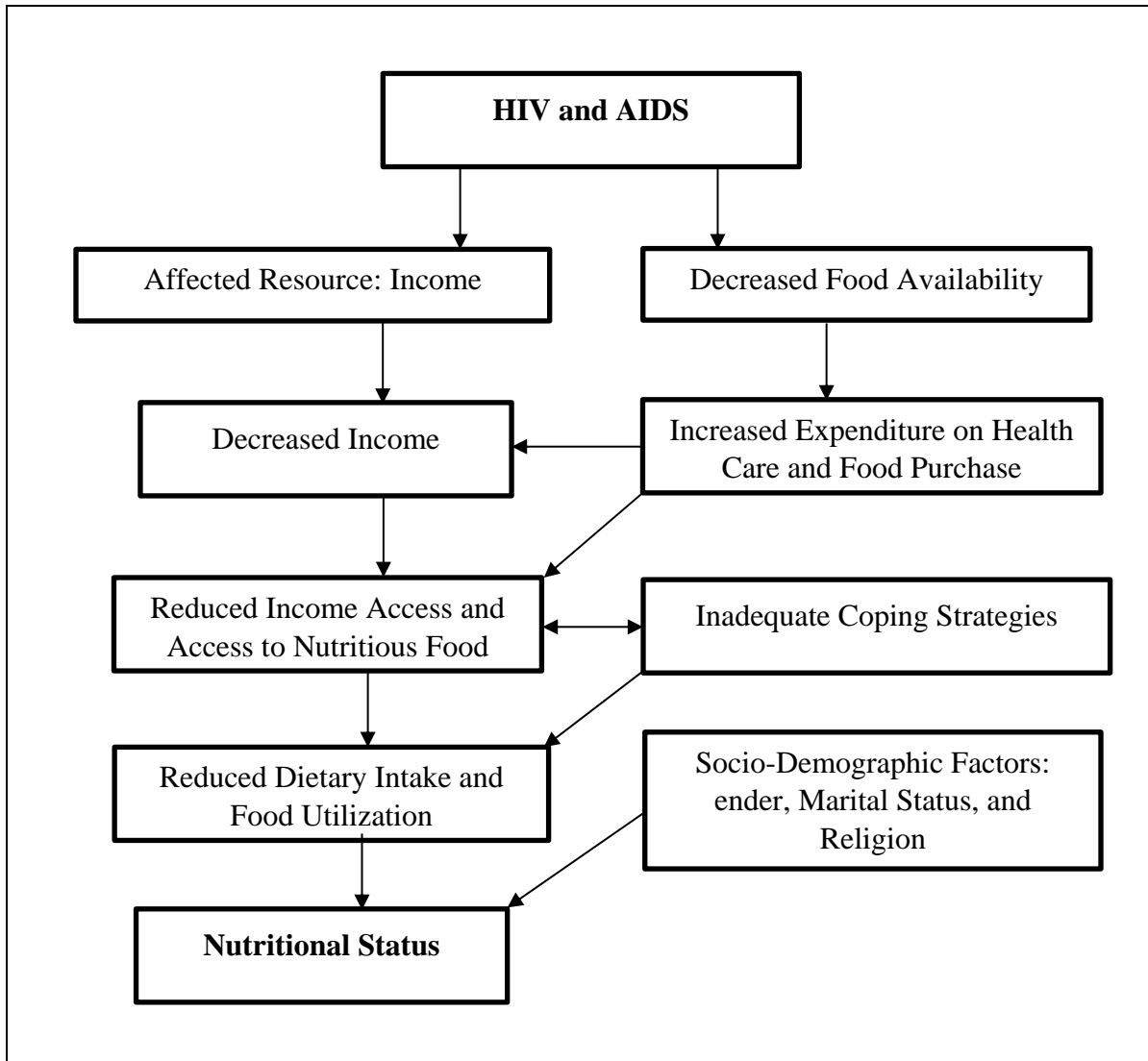
### **1.8 Limitation**

The 24-hour dietary recall used only assessed food security status at one point in time; hence, did not offer trends of the household food security status of the study population. In addition, food availability as a core dimension of food security was assessed using a proxy measure; occupation, which did not guarantee comprehensive assessment of food security. Furthermore, morbidity patterns as a core influence of nutritional status in the study population were not investigated.

## **1.9 Conceptual Framework**

This study was based on a conceptual framework depicting the relationship between food insecurity, HIV and AIDS, and nutrition, which was adopted and modified from the UNAIDS Food Security Conceptual Framework (UNAIDS, 1998). HIV, AIDS, and food insecurity exhibit a causal relationship that intertwines them in a vicious cycle. Morbidities and mortalities caused by HIV and AIDS result in adverse socio-economic consequences for households leading to increased food insecurity. HIV and AIDS disease renders active and working household members ill, which results in the loss of household income, labour, skills and assets. The situation is worsened by consequent treatment costs and funeral costs for HIV and AIDS related deaths. A reduction in the net value of household food production is often evident after the death of working household members. Affected households are often prompted to adopt temporary survival strategies, which impede on the long-term financial stability of such households.

The impaired financial capability of HIV affected households hinders access to income and nutritious foods, which result in poor health care, poor health status, reduced dietary intake, and food utilization. Reduced financial capability also results in adoption of inadequate coping strategies to mitigate food crises. Such strategies often entail an overall reduction in dietary intakes, as well as intake of nutritious foods. Eventually, this compromises the nutritional status of HIV sero-positive persons.



**Figure 1.1** *Conceptual framework on the relationship between food insecurity and HIV and AIDS.* **Source:** Adopted and modified from the UNAIDS Food Security Conceptual Framework (UNAIDS, 1998).

Socio-demographic factors have an influence on nutritional status of HIV sero-positive persons. This is evident by the fact that these factors dictate an individual's dietary practices. Similarly, appropriate health seeking behaviours amongst HIV sero-positive persons ensures adherence to treatment regimens; hence, influencing nutritional status.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Overview of HIV and AIDS Situation

According to an epidemiological report by UNAIDS, 2013, 35.3 million people all around the globe were living with HIV, whereby 70.82% (25.0 million) of these were in Africa. According to Alemu & Bezabih (2008), a huge proportion of African populations reside in rural areas, where the backbone of the economy is labour intensive agriculture. Worth noting is the fact that the implications of HIV and AIDS on rural livelihoods are context specific. Existing literature on HIV and AIDS do not offer much information on the implications that HIV and AIDS has on rural livelihoods. Therefore, existing literature are specific to the areas that have been studied.

Evidence from a wider array of literature shows that household food insecurity and HIV and AIDS often overlap and intensify the occurrence of each other. Garcia et al. (2013) notes that HIV and AIDS and food insecurity in different parts of the globe including Sub Saharan Africa, occur simultaneously. Garcia et al. (2013) further assert that food insecurity that is often experienced by HIV sero-positive people may be accredited to the primary fact that HIV and AIDS has a colossal effect on the functioning and structure of households. HIV and AIDS lowers the immunity; hence, reducing the capability of an infected individual to adopt sustainable livelihood strategies and work productively. In addition, HIV and AIDS worsen the economic situation of a household in that more resources are spent on treatment, which hinders food access.

## **2.2 Factors influencing Household Food Security Status of HIV Sero-Positive People**

Household food security is affected by several factors broadly categorised as availability, accessibility, utilization, and stability. The measures used were Household Dietary Diversity Score (HDDS), occupation (proxy measure), nutrient intake, food consumption patterns, Household Hunger Scale (HHS) and nutritional status of the HIV sero-positive persons. Other factors that affect household food security status of HIV sero-positive persons are socio-demographic factors and socio-economic factors.

### **2.2.1 Socio-demographic Factors**

According to Deshmukh-Taskar, Nicklas & Berenson (2007), marital status as a socio-demographic factor influences household food security status in that married individuals/households have a higher likelihood of consuming diverse diets comprising of snacks and main meals. On the contrary, unmarried individuals/households are less likely to consume diverse diets and are more likely to consume more servings of alcoholic beverages. Religion also has an influence on dietary diversity, whereby various researches have pointed to the fact that Christians consume more diverse diets than other religions such as Muslims (Deshmukh-Taskar, Nicklas & Berenson, 2007). An empirical study carried out in Louisiana showed that education has a positive implication of household food security status. The study found out that people with more than twelve years of education had a high intake of dairy products, fruits juices, cereals/bread, and vegetables (Deshmukh-Taskar, Nicklas & Berenson, 2007). This concurs with a study by Thornton, Pearce, & Ball (2014), which showed that household food security is strongly related to higher education. Furthermore, Thornton, Pearce, & Ball (2014) notes that

male-headed households have a greater food security status than female-headed households. The sentiments expressed by Deshmukh-Taskar, Nicklas & Berenson (2007) and Thornton, Pearce, & Ball (2014) on the effect of marital status, educational levels, and household head on food security is true. However, the studies did not consider how the socio-demographic factors affect food security during specific seasons such as during periods of reduced food production. The current research bridged this gap by focusing on the manner in which socio-demographic factors affect food security status during seasons when populations experience food shortage occasioned by crop diseases (maize necrosis disease).

### **2.2.2 Socio-economic Factors**

Savy et al. (2005) assert that dietary diversity is closely aligned with socio-economic status. Individuals drawn from disadvantaged socio-economic backgrounds rarely purchase grocery foods, which are often more nutritious in that they are low in salt, fat, and sugar, and are high in fibre. Findings from a study done by Mokono (2015) indicate that there were cases where food secure households had poor dietary practices occasioned by lack of nutritional knowledge and poor attitudes. Individuals doing manual jobs (blue-collar) purchase vegetables and fruits less regularly than those employed in office jobs (white collar). Sanusi et al. (2006) notes that household income capability, as a proxy indicator of socio-economic status is highly associated with adequate food access and food security. Individuals with a low household income are more predisposed to food insecurity than households with high household income who have a higher purchasing power. However, Sanusi et al. (2006) does not consider the fact that lack of nutritional knowledge amongst members drawn from high-income households may jeopardize food



utilization component of food security occasioned by purchase of less nutritious foods. Savy et al. (2005), Mokono (2015), and Sanusi et al. (2006) provide crucial insights on the manner in which socio-economic factors are related to dietary diversity. Nonetheless, these studies did not consider how occupations aligned with food production such as farming affect dietary diversity. The study filled in this gap as it focused on how both food-production based occupations, especially farming, and non-food production based occupations such as business, salaried employment, and casual labour affect dietary diversity.

### **2.3 Dietary Intake of HIV Sero-Positive Persons**

Dietary intake requirements for HIV sero-positive persons vary depending on the disease stage. As HIV progresses, the nutritional requirements increase; hence, the need to increase dietary intakes. According to Koethe and Heimburger (2010), failure by HIV sero-positive persons to sufficiently meet the nutrient requirements at various HIV and AIDS stages results in HIV-associated wasting. Such wasting has been identified as a contributing factor to the occurrence of malnutrition and is a recognized predictor of HIV progression to full-blown AIDS. Progression of HIV provides a viable platform that elicits the occurrence of opportunistic infections. According to Ivers et al. (2009), inadequate dietary intakes results in an increase in opportunistic infections. Ivers et al. (2009) notions are supported by Weiser et al. (2011) who articulate that opportunistic infections that are apparent amongst HIV sero-positive persons impair nutrient intake and utilization, therefore, compromising nutritional status. The research explored dietary intake as a major variable that determines the nutritional status of HIV sero-positive persons.

## **2.4 Nutritional Status of People Living with HIV and AIDS**

When the first case of HIV infection was reported in the early 1980's, it was noted that infected persons presented with pertinent weight loss or mass wasting. This is perhaps the primary reason as to why HIV infection during this period was referred to as “wasting disease.” However, the advent of anti-retroviral medications utilized in treatment and care of HIV-infected patients has resulted in an immense improvement of the nutritional status of infected populations. In fact, some proportion of HIV-infected individuals on treatment and care are often overweight, whereas others are obese. This was evident by a research “Nutritional Status of HIV Sero-Positive patients in *Niteroi*, Rio de Janeiro, Brazil” carried out by Senna et al., (2014), which found out that 37.1% of the study patients had excess weight. While it is true that Senna et al., 2014 sentiments on the occurrence of overweight and obesity amongst HIV-infected persons, the study failed to consider certain factors such as food security status of households of HIV-infected persons, which are some of the core determinants of nutritional status.

HIV infection presents with specific symptoms such as lack of appetite, nausea, and vomiting, which hinder adequate food intake amongst the infected populations (Onyango et al., 2014). In certain cases, anti-retroviral medications worsen the occurrence of such symptoms. Persistent occurrence of the symptoms often result in undernourishment of HIV sero-positive individuals; hence, resulting in poor nutritional status. HIV sero-positive individuals experience increased needs for micro and macronutrients, which makes them prone to malnutrition (Obi et al., 2010). Obi et al. (2010) further assert that discrimination and stigmatization of HIV sero-positive persons, which is common in developing nations result in lack of support for the HIV sero-positive persons

contributing to further inadequate dietary intake. Nagata et al., (2014) in a study on adults living with HIV and AIDS in Nyanza, Kenya suggests that HIV infection augments under-nutrition by weakening the body's metabolic functioning through impaired utilization and storage of nutrients. In addition, replication of HIV virus in infected individuals requires energy, and this result in increased energy needs amongst HIV-infected persons. Altogether, various factors associated with HIV and AIDS increase the occurrence of poor nutritional status amongst the infected populations. Poor nutritional status amongst HIV-infected populations worsens their immune status; hence, predisposing them to infections that result in further deterioration in the nutritional status of these populations. As noted by Koethe and Heimburger (2010), wasting that is often associated with HIV is a known predictor of HIV progression to AIDS, which contributes to further development of under-nourishment.

## **2.5 Food Security Status and Nutritional Status of HIV Sero-Positive Persons**

Food insecurity is linked to adverse health outcomes including nutrient inadequacy, which hinders nutrient utilization; hence, resulting in poor nutritional status. Concurrent occurrence of HIV and AIDS and food insecurity worsens the situation since HIV alone impairs an individual's nutritional status by undermining nutrient intake, absorption, and utilization. Latest estimates indicate that 795 million people around the globe continue to be food insecure and chronically malnourished (FAO, IFAD, & WFP, 2014). These statistics provide a substantive indication that the occurrence of food security results in the occurrence of malnutrition. According to Sztam et al. (2013), HIV infection impairs nutritional status in that it undermines nutrient intake, absorption, and utilization. HIV-infected adults have 10%-30% higher energy requirements than normal adults without

HIV (Sztam et al., 2013). Addressing food security factors in the context of HIV and AIDS treatment and care results in good nutritional status outcomes amongst the HIV sero-positive people.

A study by Mokono (2015) conducted in Homabay, Kenya established that household food security status is a core determinant of good nutritional status. Mokono's study further found that food security status and dietary intake have a positive association. These two factors: food security status and dietary intake influence the nutritional status of an individual. While it is true that Mokono (2015) study offers critical insights on the associations between food security status and nutritional status, the study is weakened by the fact that it utilized Household Food Insecurity Access Scale (HFIAS) as its core measure of food security status. HFIAS does not produce an efficient measure in various settings and does not allow for comparison of food security situation across various cultures (Ballard et al., 2011). This research addressed this gap in that it used Household Hunger Scale (an improved/revised and validated version of HFIAS) as a measure of food security status, which is more efficient and allows for cross-cultural comparison.

HIV sero-positive people, particularly those in resource poor settings do not have access to adequate quantities of nutritious foods, which results in poor nutritional status. According to Tiyou et al. (2011), food insecurity often prompts some of HIV sero-positive person's to discontinue treatment because of lack of adequate food, which is crucial when taking anti-retroviral medications. As a result, the immune status of HIV sero-positive persons who discontinue treatment is negatively affected, which in turn affect their nutritional status. Concisely, HIV and AIDS, food security, and nutritional

status are closely intertwined. Negative deviation of either of the three causes a negative deviation of the others.

## **2.6 Summary of Literature Review**

Socio-demographic factors affecting food security during specific seasons such as during periods of reduced food production have not been comprehensively explored. The current research was done at a time when the study population experienced harvest losses caused by maize necrosis disease. This was effective in that changes in food security status of a population are accurately captured during periods of greatest food shortages (Swindale & Paula, 2006). Reviewed literatures did not focus on how food-production based occupations and non-food production based occupations are related to HDDS, which was well addressed by the study.

The reviewed literatures are based on studies carried out in urban settings. The current study utilized a hospital setting as an entry point, which eased positive identification of HIV sero-positive clients. The study also addressed gaps in household food security amongst HIV sero-positive persons drawn from rural livelihoods. Literature review shows that previous researches recommend the need to integrate food security interventions as a crucial package in the care, treatment, and support of HIV sero-positive person's. Despite such recommendations, effective food security based interventions are still lacking. This study endeavoured to assess household food security status and nutritional status of HIV sero-positive clients at Longisa County Hospital; hence, developed crucial insights that offer a comprehensive platform crucial in enhancing the effectiveness of HIV and AIDS care and treatment modalities.

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Research Design**

The study used a cross-sectional analytical design to examine variables of interest in a sample of participants assessed at one point in time and the relationship among them determined. Justification of the study design used aligns with the fact that it reduced bias as it allowed for random selection of representative sample and the results can be generalized to other populations (Weber, 2014). Analytical part of the design used offered a platform that allowed for the testing of hypothesis and comparison of variables. The study design also permitted for collection of quantitative data.

### **3.2 Research Variables**

#### **3.2.1 Independent Variables**

Independent variables included household food security status (assessed using Household Hunger Scale (HHS), Household Dietary Diversity Score (HDDS), occupation, 24-hour dietary recall and food consumption patterns), demographic factors (marital status, religion, and gender), and socio-economic factors (education, occupation, and monthly household income).

#### **3.2.2 Dependent Variable**

Dependent variable was nutritional status, which was assessed using Body Mass Index (BMI) and Mid Upper Arm Circumference (MUAC).

### **3.3 Study Setting**

Longisa County Hospital is situated within Bomet County in the Southern part of Rift Valley Province. The hospitals' Comprehensive Care Clinic (CCC) has been operational for the past seven years and it offers both adult and paediatric clinics. Longisa County Hospital CCC offers daily Human Immunodeficiency Virus (HIV) Antiretroviral Therapy (ART), Tuberculosis (TB), and Voluntary Counselling and Testing (VCT) services. The Hospital currently serves as a referral hospital and receives referrals from lower level hospitals within Bomet County. Apart from clients emanating from Bomet County, the Hospital also offers treatment and other health care services for those drawn from Narok and Kericho Counties.

### **3.4 Target Population**

A total of 3500 HIV sero-positive patients are enrolled at the facility: however only 1200 of the enrolled clients were active (adherent) on care and treatment. Out of this, 32% (380) were adults (Longisa County Hospital Records, 2015). The study targeted adult male and female HIV sero-positive clients active on care at Longisa County Hospital CCC.

#### **3.4.1 Accessible Population**

The accessible population comprised of adult HIV sero-positive clients aged 18-55 years, active on care and treatment at Longisa County Hospital CCC during the time of data collection.

### **3.4.2 Inclusion Criteria**

Only HIV sero-positive adults aged 18-55 years attending Longisa County Hospital CCC at the time of study who upon informed consent were willing to participate in the study.

### **3.4.3 Exclusion Criteria**

HIV sero-positive adults aged 18-55 years who are mentally ill and with other chronic health conditions such as cancer and diabetes were not be included. Before enrolment, participants underwent a medical history session to ascertain if they were free from chronic illnesses.

### **3.5 Sample Size Determination**

Longisa County Hospital CCC records indicated that 380 adult clients were active on care and treatment. The records further indicated that monthly CCC attendance by adult clients was 210. For this reason, a comprehensive sample (100%) for a month's period was used. Use of comprehensive sample is acceptable in instances when the number of units are small (Ary et al., 2013), which was apparent in the case of adult client CCC attendance at Longisa County Hospital. A month's attendance was appropriate because most of the clients visited the hospital within a month for review and treatment.

### **3.6 Sampling Techniques**

Purposive sampling was used to select Longisa County Hospital based on the fact it is the main referral CCC and serves a larger proportion of HIV sero-positive clients in Bomet County. Comprehensive sampling was used to select individual participants for the study sample as they arrived at the CCC for review and treatment.



### **3.7 Research Instruments**

#### **3.7.1 Questionnaire**

The researcher administered a pre-tested questionnaire (Appendix B) to collect information on demographic and socio-economic features of the respondents. Data on the socio-demographic and socio-economic features of the participants were collected with the sole intent of assessing variables such as monthly household income, marital status, occupation, religion, gender, educational level, and age. The questionnaire also collected information on dietary intake practices by use of various methods including Food Frequency Questionnaire (FFQ; Appendix B-3, 24-Hour Dietary Recall; Appendix B-4, and Household Dietary Diversity Score (HDDS); Appendix B-6). Household Hunger Scale (HHS); Appendix B-7 and HDDS were used to collect data on food security. The questionnaire had a section on anthropometric measurements, which yielded information on nutritional status of the respondents. The questionnaires complemented each other and collected different pieces of information, which were collated together in order to provide a clear understanding of the study objectives.

#### **3.7.2 Food Frequency Questionnaire**

A seven-day food frequency form was used to collect information on the frequency of consumption of locally available foods. Two weeks prior the research, the researcher visited two local markets (Mulot and Longisa) to identify and generate a list of locally available foods. Eleven (11) food groups were identified and listed, which were: cereals, green leafy vegetables, other vegetables, fruits, meats, eggs, fish, legumes, milk, oil and fats, and sugars.

### **3.7.3 24-Hour Dietary Recall Questionnaire**

The 24-hour dietary recall questionnaire was used to assess nutrient intake indicated by all foods and beverages consumed by the respondents in the past 24 hours or in the previous day. The questionnaire also assessed the number of meals consumed by the respondents in a day (24 hours).

### **3.7.4 Anthropometric Instruments**

Anthropometric measurements were used to compute the nutritional status of the respondents. Weight was taken using SECA bathroom scale (Model 876, made in China) and height taken using a stadiometer (Holtain Model 602VR, made in UK). The SECA calculator model 491 was used for accurate determination of the Body Mass Index (BMI). Body Mass Index was used as a method of assessing nutritional status because it cheap, fast to conduct, and provides specific results that are reproducible (Welch & Craggs, 2010). Nutritional status of the respondents was also assessed using Mid Upper Arm Circumference (MUAC) measurement that was taken using a MUAC tape.

### **3.7.5 Household Dietary Diversity Score Guide**

Household Dietary Diversity Score (version 2) indicator guide adopted from Food and Nutrition Technical Assistance (FANTA), 2006 was utilized to obtain data on dietary diversity. The HDDS was further used as a proxy measure of food access component of food security because enhanced food access ensures intake of more diverse diets within the household.

### **3.7.6 Household Hunger Scale Questionnaire**

Household Hunger Scale (HHS) questionnaire adopted from Ballard et al. (2011) collected data on food access and food stability by measuring food deprivation in respondent's households. The HHS assessed coping strategies aligned with skipping meals adopted by household members during periods of food scarcity.

### **3.8 Pretesting of Research Instruments**

Research instruments were pre-tested on 10% (21 respondents) of the study sample population to check for reliability of the tools, sensitivity and clarity of data collection instruments (Whitley & Kite, 2012). The pre-test was carried out at Kapkatet County Hospital CCC. Situated in Kericho County, Kapkatet County Hospital has features similar to those of Longisa County Hospital CCC. Data collection tools were restructured accordingly after the pre-test as a means of enhancing their validity and reliability.

#### **3.8.1 Validity of Research Instruments**

Three food and nutrition security experts including University supervisors; one from Kenyatta University, and one from Maseno University and a nutritionist from Longisa County Hospital assessed content validity. The three assessed relevance of content and identified vague questions and gaps in questionnaires.

### **3.8.2 Reliability of Research Instruments**

Reliability of the research instruments was determined using test re-test method whereby questionnaire were administered on 21 respondents, which was 10% of the anticipated study sample and repeated after two weeks, prior the actual study (Whitley & Kite, 2012). Results from the two tests were compared to assess the precision of the responses from the same respondent when asked a similar set of questions. A correlation coefficient of 0.84 was derived from the comparison, which is deemed acceptable (Gliner et al., 2011). With input from the respondents, questions that were inconsistent were revised.

### **3.9 Training of Research Assistants**

Six research assistants with a minimum qualification of diploma in nutrition related disciplines were recruited and trained for three days on various aspects of the study. The Principal Researcher trained them on purpose and objectives of the study, ethical issues, contents of the questionnaires, data collection techniques: interviewing skills, responses expected from each question, and taking of anthropometric measurements.

### **3.10 Data Collection Procedures**

#### **3.10.1 Primary Data**

Were collected using structured questionnaires, dietary and anthropometric assessment tools. The questionnaires were counter-checked daily for accuracy and completeness. A pre-tested questionnaire (Appendix B) allowed for administration of interview schedules on the respondents, which yielded information on their demographic and socio-economic features.

For the FFQ, respondents were asked to state the number of times in a week when they consumed foods in each of the 11 listed food groups. The 11 food groups were: cereals, green leafy vegetables, other vegetables, fruits, meats, eggs, fish, legumes, milk, oil and fats, and sugars.

Clinical records were used to obtain information on the specific location of the respondent's residence (s) for follow-up for 24-Hour Dietary Recall. The 24-hour dietary recall was conducted at respondent's households whereby a structured interview with specific probes was administered in person. Foods consumed by the respondents during festive or ceremonial days were not included. The recall used was interactive as it allowed for estimation of food quantities and sizes. The participants were thoroughly probed as a means of ensuring that no food consumed were forgotten. The time of food consumption was also recorded. The researcher visited the local market to identify local utensils used for serving foods. The utensils were calibrated before the study to help respondents approximate the amount of food consumed at each meal. For fruits and other foods consumed raw such as sugarcane and carrots, samples were collected from the local market in order to help respondents approximate the exact size of such foods. The weight (in grams) of individual foods consumed was approximated using South African Food Photo Manual (Temple & Steyn, 2016). The manual utilizes photos of estimated food portions and their corresponding weight in grams. During the study, actual food sizes reported by the respondents through the 24-hour dietary recall questionnaire were equated to those in the photos and the corresponding weight in grams assigned. The gram equivalents of foods consumed by the respondents showed the nutrient adequacy. From

the 24-hour dietary recall, number of meals consumed by each respondent was also recorded.

The HHS and HDDS questionnaire captured data on household food insecurity status. The HHS comprised three questions on experiences (coping strategies) common in households experiencing food deprivation. HDDS captured data on dietary diversity whereby the number of food groups consumed by the household in the last 24 hours was recorded. A set of 12 food groups was used to assess the HDDS. The 12 food groups were cereals, root and tubers, vegetables, fruits, meat/poultry/offal, eggs, fish/seafood, pulse/legumes/nuts, milk and milk products, oils/fats, sugar/honey, and any other foods such as coffee or tea. HDDS data were further used as a proxy measure of food access in that it assessed the socio-economic level or status of the household.

With the use of SECA bathroom scale to assess weight of the respondents, the scale was calibrated to zero, respondents asked to take off heavy clothing, and weight readings taken at precision of 0.1 kg. Height was taken using stadiometer, which was fixed to a firm surface, respondent asked to stand perpendicular to the base of the board with their arms and legs straight, and head raised above the chin. The height was taken by pulling the headpiece onto the respondent's head and reading the corresponding measurement on the scale at a precision of 0.5 cm.

The procedure for taking MUAC entailed asking the respondent (s) to remove clothing that covered the less active arm (left arm for right-handed individuals and right arm for left-handed individuals). Standing straight, alert, and sideways, each respondent was then asked to look straight on in a relaxed position. The mid-point of the arm was then located

by first locating the shoulder bone (acromial process), then locating the tip of the elbow (olecranon process). The respondent's arm was put at 90° then the length of the arm measured and the mid-point identified, which was where the MUAC measurement was done using a MUAC tape (shirkir strip). Assessment of nutritional status with the use of MUAC was crucial especially for pregnant respondents whose BMI could not give a true value of their nutritional status (Lam et al., 2016). All the anthropometric measures (weight, height, and MUAC) were taken thrice and the average value used as the final measurement. This ensured accuracy and reliability of the measurements.

### **3.11 Data Analysis and Presentation**

For the FFQ, consumption of a given food group more than thrice in a week was considered regular consumption. Consumption of a given food group less than thrice in a week was considered irregular consumption.

Data from the 24-hour dietary recall was analyzed using Nutri-Survey Software for amount of energy, proteins, fats, vitamin A, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, C, iron, and zinc consumed. Intake of these nutrients was compared with the Recommended Dietary Intake (RDI) to establish percentage adequacy in meeting the RDI. The mentioned nutrients were of significant focus in the study due to their importance amongst HIV sero-positive persons. From the 24-hour dietary recall, number of meals consumed by each respondent was also recorded for comparison with other research variables.

With HDDS, a scale of twelve food groups was used. Households consuming  $\leq 4$  food groups out of the 12 food groups were considered to have a low dietary diversity score indicating reduced food access; hence, household food insecurity. Households consuming

$\geq 5$  food groups out of the 12 food groups were considered to have a high dietary diversity score indicating enhanced food access; hence, household food security (Swindale & Paula, 2006).

The responses given by the HHS Questionnaire measured the frequency of food deprivation categorized into three: rarely (1-2 times), sometimes (3-10 times), and often (more than 10 times). Categorical variables were created using the scale score whereby a score of 0-1 indicated little to no household hunger, 2-3 indicated moderate household hunger, and 4-6 indicated severe household hunger (Ballard et al., 2011). As such, the level of household hunger indicated the respondent's food security status because food deprivation and actual hunger are characteristic of food insecurity.

BMI values obtained from SECA calculator model 491 were compared to WHO (2006) cut-off points for BMI :  $< 18.5$  denoted underweight,  $\geq 18.5$  to  $24.99$  denoted normal nutritional status,  $\geq 25.0$  to  $29.99$  denoted overweight, and  $\geq 30$  denoted obesity.

Data entry was done using Statistic Packages for Social Science (SPSS) software version 22. Data on socio-demographic, socio-economic, FFQ, HHS, HDDS, and anthropometrics were cleaned, coded and entered into the software. Level one data analysis involved descriptive statistics of demographic and socio-economic data using the measures of dispersion and central tendency utilizing median, mode, mean, and standard deviations. Anthropometric data analysis entailed display of mean and standard deviation of BMI and disaggregation of BMI mean and standard deviation according to education level, socio-economic features, and religion. The mean and standard deviation (SD) were calculated for weight, height, BMI. Inferential statistics were analyzed using Chi-square



for association between categorical variables (HDDS, HHS, income levels, and education levels) and Pearson's product-moment correlation to analyze continuous variables (dietary intake, BMI, and MUAC). Independent-Samples t-test was used to determine if there were significant difference between HDDS, dietary intake, and nutritional status among male and female respondents. A significance level of  $p < 0.05$  was used as the criterion for statistical significance.

### **3.12 Logistical and Ethical Considerations**

The research proposal was approved by Kenyatta University Graduate School (Appendix E) and ethical clearance obtained from Kenyatta University Ethical Review Committee (Appendix F). Research permit (Appendix G) was obtained from National Council of Science, Technology and Innovation (NACOSTI). Respondents gave a written consent before administering a questionnaire (Appendix A). Participants received full disclosure on the nature and benefit of the study.

## **CHAPTER FOUR: RESULTS**

### **4.1 Introduction**

The findings of the study are presented in this section according to the study objectives. The demographic, socio-economic characteristics, dietary intake, nutritional status, and food security status of HIV sero-positive clients attending Longisa County Hospital are described. The study targeted 210 participants, but a sample of 204 was accessible. Six (6) were rejected as they were incomplete; hence, the results are reported for 198 respondents.

### **4.2 Demographic Characteristics of the Respondents**

#### **4.2.1 Age Distribution amongst the Respondents**

The study population comprised of adults aged 18 to 55 years. Age is crucial because it is a core determinant of an individual's socio-economic status, which determines the individual's food security status. A higher proportion of the respondents (40.4%) were aged 35-44 years (Table 4.1).

#### **4.2.2 Gender of the Respondents**

Gender determines various aspects of life including food security. Table 4.1 shows that the study respondents comprised more females (61.6%) than males (38.6%).

#### **4.2.3 Marital Status of the Respondents**

Marital status is closely associated with stability whereby food security is often deemed higher amongst married populations. Table 4.1 shows that most of the respondents

(51.5%) were married, 21.2% were single, 19.2% were widowed, 5.1% were separated, and 3.0% were divorced.

#### 4.2.4 Religion of the Respondents

The study revealed that majority of the respondents (60.6%) were Protestants whilst 10.1% were Catholics, and 29.3% of the practiced other religions (Table 4.1).

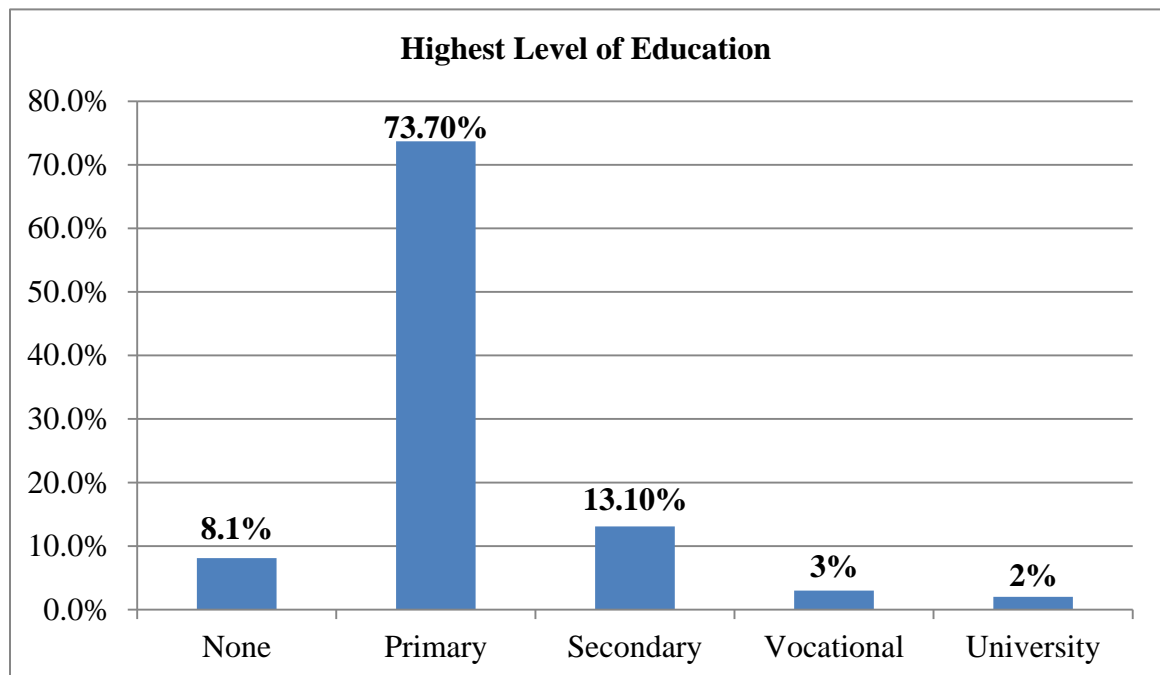
**Table 4.1 Demographic Characteristics of the Respondents**

<b>Demographic Characteristics</b>		
<b>Age Group</b>	<b>N</b>	<b>Percentage (%)</b>
25-34	46	23.2
<b>35-44</b>	<b>80</b>	<b>40.4*</b>
45-54	50	25.3
≥ 55	22	11.1
<b>Gender</b>	<b>N</b>	<b>Percentage (%)</b>
Male	76	38.4
<b>Female</b>	<b>122</b>	<b>61.6*</b>
<b>Marital Status</b>	<b>N</b>	<b>Percentage (%)</b>
<b>Married</b>	<b>102</b>	<b>51.5*</b>
Single	42	21.2
Divorced	6	3
Widowed	38	19.2
Separated	10	5.1
<b>Religion</b>	<b>N</b>	<b>Percentage (%)</b>
<b>Protestant</b>	<b>120</b>	<b>60.6*</b>
Catholic	20	10.1
Other	58	29.3

### 4.3 Socio-Economic Characteristics of the Respondents

#### 4.3.1 Education Level of the Respondents

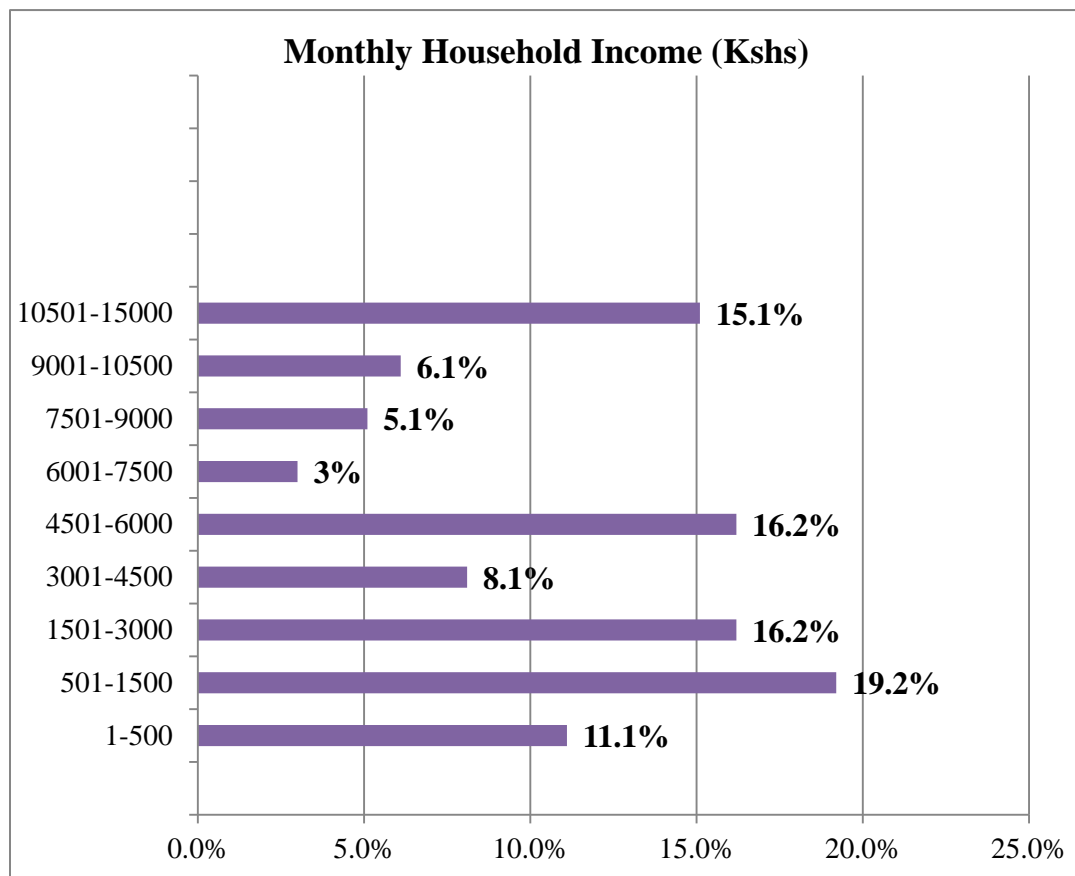
Education plays a colossal role in affecting an individual's level of decision making on the core components of food security, especially food access and availability. The majority of the respondents (73.7%), whereas 8.1% had no formal education (Fig 4.1).



*Figure 4.1 Education Level of Respondents*

### 4.3.2 Monthly Household Income of the Respondents

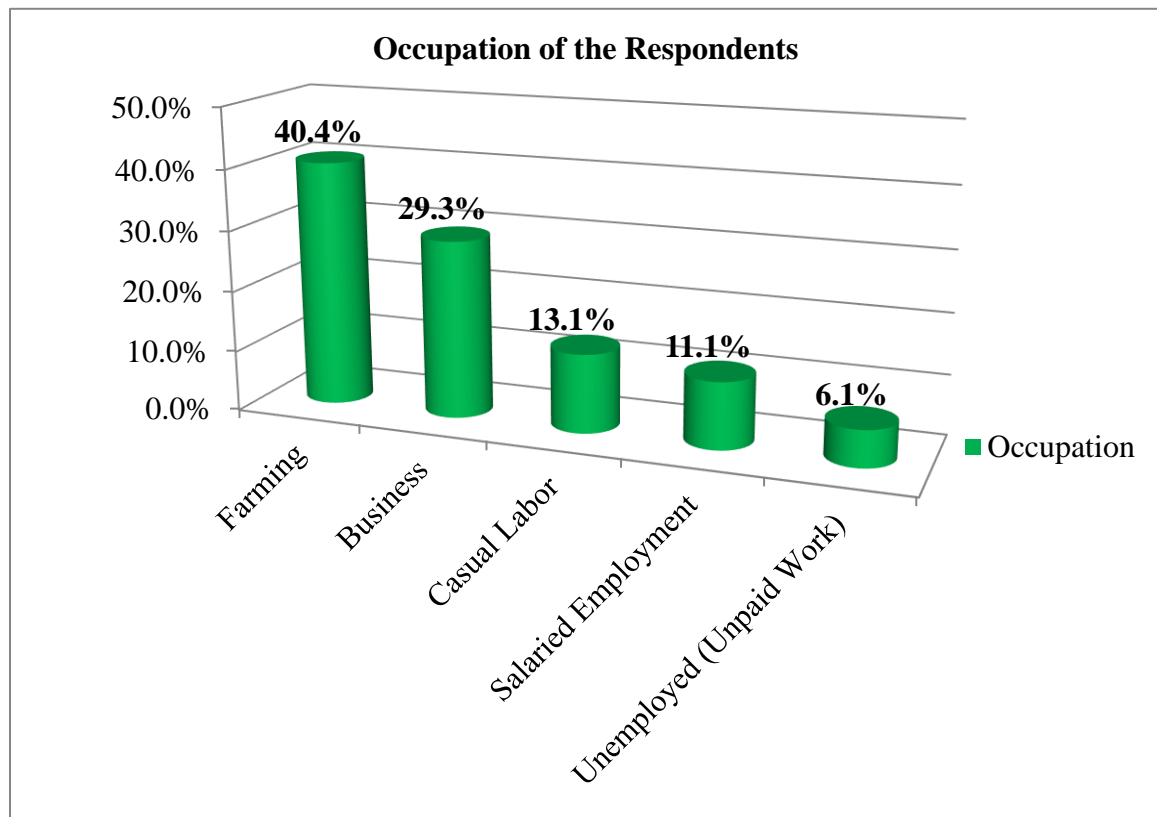
Food access as one of the components of food security is determined by the income earned by a household. A household income mainly connotes to the aggregate household proceeds obtained by household members in various forms including wages, salary, and proceeds from large and small-scale enterprises. The highest proportion of respondent's households (19.2%) had a monthly income of between Kshs. 501-1500 (Fig. 4.2).



**Figure 4.2 Household Income of the Respondents**

### 4.3.3 Occupation of the Respondents

Socio-economic status, which is a core determinant of food security status, is dependent on an individual's occupation. In this study, 40.4% of the respondents were farmers, and a paltry 6.1% were unemployed as shown in Figure 4.3. The results indicate that the main occupation amongst the respondents was farming, which is the main livelihood sustaining endeavor. The low level of salaried employment that is evident aligns with the lower levels of post-secondary education, which was evident in Figure 4.1. In most cases, salaried employment requires higher levels of qualifications obtained from post-secondary education (Park, 2012).



*Figure 4.3 Occupation of the Respondents*

#### **4.4 Dietary Practices amongst the Respondents**

The study examined dietary intake amongst the respondents by looking at the nutrient intake, number of meals the respondents consumed a day prior the study, and weekly food consumption frequency.

##### **4.4.1 Nutrient and Energy Intake amongst the Respondents**

A 24-hour dietary recall was used to collect information on various foods and beverages consumed by the respondent in the previous 24 hours that is a day prior to the interview. Dietary intakes for HIV sero-positive males and females were analyzed differently due to variations in the Recommended Dietary Intake (RDI) for both genders.

Of the male respondents, 47.4% met the RDI for energy, 44.7% met the RDI for proteins, and 43.4% met the RDI for fats. All the male respondents (100%) met the RDI for vitamin A. With regards to vitamin B<sub>1</sub>, 60.5% of the male respondents met the RDI. Up to 75.0% of the male respondents met the RDI for vitamin B<sub>2</sub>. Amongst the male respondents, 94.7% met the RDI for vitamin B<sub>6</sub>. Most of the male respondents; 71.1% met the RDI for vitamin C. Iron intake by the male respondents was commendable as 89.5% met the RDI. However, 71.1% of the male respondents did not meet the RDI for zinc.

Half (50.0%) of the female respondents met the RDI for energy and a significant percentage (68.0%) met the RDI for proteins. Amongst the female respondents, 53.3% met the RDI for fats, 100% met the RDI for vitamin A, and 65.6% met the RDI for vitamin B<sub>1</sub>. Majority, 86.1% of the female respondents met the RDI for vitamin B<sub>2</sub> and a

high percentage (89.3%) met the RDI for vitamin B<sub>6</sub>. Intake of vitamin C by the female respondents was satisfactory as evidenced by the fact that 71.3% of them met the RDI. Iron intake by the female respondents was low as 89.3% did not meet the RDI. Among female respondents, was 63.1% met the RDI of zinc intake. Table 4.2 provides a summary of the mean intake of energy and nutrients by the respondents in line with the Recommended Dietary Intakes for HIV sero-positive clients.

**Table 4.2 Mean Energy and Nutrient Intake and Nutrient Adequacy of HIV sero-positive Persons**

Nutrient	Mean Intakes±SD	RDI for PLWHA	% Adequacy	p-value
Energy (Kcal)	1934.489±49.88	Male 2200	47.4	<0.001
	1925.489±39.26	Female 2000	50.0	<0.059
Protein (g)	59.592±2.69	Male 56	44.7	<0.185
	58.604±2.09	Female 46	68.0	<0.001
Fat (g)	63.642±3.47	Male 73	43.4	<0.009
	63.252±2.74	Female 67	53.3	<0.174
Vitamin A (RE)	3526.14±169.75	Male 600	<b>100*</b>	<0.001
	3492.38±131.60	Female 500	<b>100*</b>	<0.001
Vitamin B <sub>1</sub> (mg)	1.216±0.035	Male 1.2	60.5	<0.651
	1.213±0.028	Female 1.1	65.6	<0.001
Vitamin B <sub>2</sub> (mg)	1.461±0.045	Male 1.3	75.0	<0.001
	1.452±0.035	Female 1.1	86.1	<0.001
Vitamin B <sub>6</sub> (mg)	2.924±0.12	Male 1.3	94.7	<0.001
	2.951±0.09	Female 1.3	89.3	<0.001
Vitamin C (mg)	125.084±6.94	Male 100	71.1	<0.001
	125.153±5.37	Female 100	71.3	<0.001
Iron (mg)	12.645±0.44	Male 8	89.5	<0.001
	12.672±0.35	Female 18	<b>10.7*</b>	<0.001
Zinc (mg)	11.429±0.44	Male 14	<b>28.9*</b>	<0.001
	11.351±0.35	Female 9.8	63.1	<0.001

(Reference for RDIs: WHO, 2003). (Findings based on recall from the respondents).



#### 4.4.2 Number of Meals Consumed by the Respondents

The study obtained information on the number of meals consumed by the respondents from the 24-Hour Dietary Recall, whereby information was obtained on the number of meals and snacks consumed. Per day, the highest proportion (41.9%) consumed three meals per day, 39.3% consumed four meals and snacks per day, and only 18.2% consumed five meals and snacks per day. The mean number of meals consumed by the respondents was  $3.76 \pm 0.05$  (Table 4.3).

**Table 4.3 Number of Meals Consumed by the Respondents**

Number of Meals	n	Percentage %
3	83	<b>41.9*</b>
4	79	39.9
5	36	18.2
<b><u>Mean= 3.76±0.05</u></b>		

The independent samples t-test to test for differences in number of meals across the categories of gender was not statistically significant ( $p=0.994$ ). It is observed that the mean value of the number of meals consumed by females (3.76) is same as that of males (3.76).

#### 4.4.3 Frequency of Food Consumption

The study used a seven-day food frequency questionnaire to look into the frequency of consumption of different foods in a week. Respondents were asked to state the number of times in a week when they consumed each of the 11 listed food groups. As shown in Table 4.4, regular consumption (consumption of a given food more than thrice in a week) was evident in the following food groups: oils and fats, cereals, sugars, green-leafy vegetables, milk, legumes, fruits, and other vegetables. Irregular consumption

(consumption of a given food less than thrice in a week) was evident in the following food groups: meats, eggs, and fish.

***Table 4.4 Food Consumption Frequency amongst the Respondents***

<b>Food Consumption Frequency</b>		
<b>Food Group</b>	<b>Mean</b>	<b>Standard Error</b>
Oil and Fats	4.59	0.041
Cereals	4.35	0.045
Sugars	4.12	0.032
Green Leafy Vegetables	3.92	0.039
Milk	3.87	0.055
Legumes	3.36	0.065
Fruits	3.11	0.072
Other Vegetables	3.06	0.058
Meat	2.65	0.061
Eggs	2.40	0.069
Fish	1.60	0.062

The seven-day food frequency questionnaire further obtained information on how often respondents consumed 11 listed food groups in a week. The study found that most of the respondents; 154 (77.8%) used sugar 7-9 times in a week. Fish was the least consumed as 60.1% (119) of the respondents reported never consuming it (Table 4.5).

**Table 4.5 Food Consumption Patterns of the Respondents**

Food Item (n=198)	Weekly Food Consumption Frequency				
	Never n (%)	1-3 Times n (%)	4-6 Times n (%)	7-9 Times n (%)	More than 10 times n (%)
Cereals	0(0.0)	4(2.0)	5(2.5)	106(53.5)	83(41.9)
Green Leafy Vegetables	0(0.0)	4(2.0)	26(13.1)	150(75.8)	18(9.1)
Other Vegetables	12(6.1)	16(8.1)	122(61.6)	40(20.2)	6(3.0)
Fruits	16(8.1)	30(15.2)	79(39.9)	60(30.3)	12(6.1)
Meats	22(11.1)	51(25.8)	97(49.0)	26(13.1)	0(0.0)
Eggs	46(23.2)	47(23.7)	81(40.9)	22(11.1)	0(0.0)
Fish	119(60.1)	34(17.2)	34(17.2)	4(2.0)	0(0.0)
Legumes	10(5.1)	20(10.1)	63(31.8)	94(48.0)	0(0.0)
Milk	0(0.0)	10 (5.1)	39(19.7)	109(55.5)	34(17.2)
Oil and Fats	0(0.0)	0(0.0)	8(4.0)	62(31.3)	122(61.6)
Sugars	0(0.0)	0(0.0)	10(5.1)	154(77.8)	34(17.2)

#### 4.5 Food Security Status of the Respondents

##### 4.5.1 Household Dietary Diversity Score

The HDDS captured data on household food insecurity status (food access). The mean HDDS score was  $7.36 \pm 0.16$ , indicating that most of the respondent's households consumed more than 7 food groups out of 12; hence, were food secure. The minimum HDDS recorded was three (3) and the maximum HDDS was twelve (12). The study established that 82.3% of the households were food secure as they consumed  $\geq 5$  groups daily (Table 4.6).

**Table 4.6 Food Security Status of the Respondents as indicated by HDDS and HHS**

<b>Food Security Status of the Respondents</b>	<b>n</b>	<b>%</b>
<b>HDDS of the Respondents</b>		
Food Insecure ( $\leq 4$ food groups)	35	17.7
Food Secure ( $\geq 5$ food groups)	163	<b>82.3*</b>
<b>HHS of the Respondents</b>		
Little or No Household Hunger ( <b>0-1</b> )	134	67.7
Moderate Household Hunger ( <b>2-3</b> )	17	8.6
Severe Household Hunger ( <b>4-6</b> )	47	23.7
<b><u>Mean HHS Score = 1.56<math>\pm</math>0.061</u></b>		

#### **4.5.2 Household Hunger Scale**

Household Hunger Scale (HHS) questionnaire assessed the food security status of the respondents as data was collected on food access and food stability by measuring food deprivation in respondent's households. Most of the respondents (67.7%) experienced little or no household food insecurity, 23.7% experienced severe household food insecurity, and 8.6% were moderately food insecure (Table 4.6).

## 4.6 Nutritional Status of the Respondents

### 4.6.1 Body Mass Index of Respondents

The study found out that 64.6 % of the study respondents had normal BMI of 18.5-24.9 and only 2% of the respondents were obese (Table 4.7).

**Table 4.7 Nutritional Status of the Respondents as indicated by BMI and MUAC**

<b>Nutritional Status of the Respondents</b>	<b>n</b>	<b>%</b>
<b>BMI of the Respondents</b>		
<16.5 ( <b>SAM</b> )	15	7.6
16.5-18.4 ( <b>Moderate/Mild</b> )	30	15.2
18.5-24.9 ( <b>Normal</b> )	128	<b>64.6*</b>
25-29.9 ( <b>Overweight</b> )	21	10.6
30-33 ( <b>Obese</b> )	4	2
<b>MUAC of the Respondents</b>		
≤18.5cm ( <b>SAM</b> )	9	4.5
>18.5cm to ≤22cm ( <b>MAM</b> )	43	21.7
>22 ( <b>Normal</b> )	146	73.8
<b><u>Mean MUAC = 25.291±0.2913</u></b>		

#### **4.6.2 MUAC of the Respondents**

Results from anthropometric measurements using MUAC indicated that 73.8% of the respondents had a normal nutritional status indicated by a MUAC of  $>22\text{cm}$  and only 4.5% had Severe Acute Malnutrition (SAM) indicated by a MUAC of  $\leq 18.5\text{cm}$  (Table 4.7).

#### **4.7 Relationship between Food Security and Nutritional Status**

Food insecurity is linked to adverse health outcomes including nutrient inadequacy, which hinders nutrient utilization; hence, resulting in poor nutritional status. Concurrent occurrence of HIV and AIDS and food insecurity worsens the situation since HIV alone impairs an individual's nutritional status by undermining nutrient intake, absorption, and utilization.

##### **4.7.1 Differences in Food Security Status (HDDS) and Nutritional Status (BMI)**

The differences in food security status as indicated by HDDS and nutritional status as indicated by BMI were compared using one-way ANOVA. The ANOVA tested for differences in HDDS across the BMI categories ( $<16.5$ : Severe Acute Malnutrition, 16.5-18.4: Underweight, 18.5-24.9: Normal, 25.0-29.9: Overweight, and 30-33: Obese) at 0.05 level of significance. ANOVA showed a significant difference in HDDS across the BMI categories of the respondents at the  $p < 0.05$  level for the five BMI categories [ $F(4,193) = 4.976, p=0.001$ ]. As such, the research concluded that there is a significant difference in HDDS across the BMI categories; hence, there is a correlation between HDDS and BMI.

Post hoc comparisons using the Tukey HSD test indicated that the mean score for BMI category of 30-33: Obese ( $M = 10.50, SD = 2.887$ ) was significantly different from the

BMI category of <16.5: Severe Acute Malnutrition (M = 5.47, SD = 1.060). Means score BMI categories of 16.5-18.4: Underweight (M =7.13, SD = 1.060). 18.5-24.9: Normal (M = 7.58, SD = 2.552), and 25-29.9: Overweight (M = 8.24, SD = 2.211) did not differ significantly from each other.

Overall, the results indicate that dietary diversity has an association with BMI. A higher level of dietary diversity enhances an individual's BMI. As such, a significant relationship between food security status (HDDS) and nutritional status (BMI) of the respondents was observed.

#### **4.7.2 Relationship between Nutritional Status (MUAC) and Food Security Status (HHS)**

Chi-square test of association was used to analyse the relationship between nutritional status as indicated by MUAC and food security status as indicated by HHS. As shown in Table 4.8, it is evident that  $\chi^2 (4, n=198) = 17.905, p =0.001$ . This means that there is a significant association between food security status measured by HHS and nutritional status as assessed by MUAC. The association is bidirectional whereby an increase in HHS prompts attainment of normal MUAC. On the other hand, a reduction in HHS predisposes one to low MUAC; hence, under-nutrition.

**Table 4.8 Association between Nutritional Status (MUAC) and Food Security Status (HHS)**

<b>Household Hunger Scale</b>					
	0-1 Little or No Household Hunger (n)	2-3 Moderate Household Hunger (n)	4-6 Severe Household Hunger (n)	$\chi^2$	p-value
<b>MUAC</b>					
$\leq 18.5$ cm	4	0	5	17.905	<b>0.001**</b>
$>18.5$ cm to $\leq 22$ cm	21	4	18		
$>22$ cm	109	13	24		
<b>Total</b>	134	17	47		

**\*\*:** Chi-Square test p value

#### **4.8 Relationship between Study Variables**

To bring out a clearer picture and understanding of food security and nutritional status of the study respondents, this section presents information on the relationships and associations between the study variables.



#### **4.8.1 Relationship between Nutritional Status (BMI) and Education Levels**

ANOVA showed that there is no significant difference in Nutritional Status (BMI) across the categories of education at the  $p < 0.05$  level [ $F(4,193) = 0.680, p=0.606$ ]. Therefore, the research derived a conclusion that there is no significant difference in Nutritional Status (BMI) across the categories of education levels.

#### **4.8.2 Relationship between Nutritional Status (BMI) and Religion**

ANOVA showed that there is no significant difference in Nutritional Status (BMI) across the categories of religion at the  $p < 0.05$  level [ $F(2,195) = 1.471, p=0.232$ ]. For this reason, the study concluded that there is no significant difference in Nutritional Status (BMI) across the categories of religion.

#### **4.8.3 Associations between Nutritional Status (BMI) and Income Levels**

The ANOVA test for differences in BMI and income levels is statistically significant at the  $p < 0.05$  level [ $F(8,189) = 2.739, p=0.007$ ]. From this, it is apparent that there is a significant difference in BMI across the income level categories. BMI level differs across the categories of income ( $p= 0.007$ ). This means that respondents in lower income categories have different BMI's when compared with those in higher income categories.

#### **4.8.4 Comparison between Dietary Intake (Energy/Calorie Intake) and Nutritional Status (BMI)**

The differences in dietary intake as indicated by daily energy/calorie intake of the respondents and nutritional status as indicated by BMI were compared using one-way ANOVA. The ANOVA tested for differences in energy/calorie intake across the BMI categories (<16.5: Severe Acute Malnutrition, 16.5-18.4: Underweight, 18.5-24.9: Normal, 25.0-29.9: Overweight, and 30-33: Obese) at 0.05 level of significance. ANOVA showed that there is no significant difference in energy/calorie intake across the BMI categories of the respondents at the  $p < 0.05$  level for the five BMI categories [ $F(4,193) = 0.492, p = 0.742$ ]. As such, the research concluded that there no significant difference in dietary intake indicated by daily energy/calorie intakes across the BMI categories.

#### **4.8.5 Comparison of Nutritional Status and Food Security Status across the Gender Categories**

An independent-sample t-test was conducted to compare BMI (Nutritional Status) amongst males and females. There was a significant difference in BMI of males ( $M = 20.09, SD = 2.84$ ) and females ( $M = 21.63, SD = 3.99$ ) gender categories:  $t(196) = 2.93, p = 0.004$ . As a result, the research established that there is significant difference in the BMI of male and female gender categories. The mean BMI value for females (21.63) is higher than the mean BMI value for males (20.09). The results suggest that gender has an effect on an individual's nutritional status whereby females are more likely to have an appropriate nutritional status than males.

An independent-sample t-test was conducted to compare HDDS (Food Security Status) amongst males and females. There was no significant difference in HDDS of male (M=7.58, SD=2.65) and female (M=7.42, SD=2.40) gender categories:  $t(196) = 0.441$ ,  $p = 0.66$ . Consequently, the research established that there is no significant difference in HDDS amongst the male and female genders. Variations in HDDS may not be attributed to an individual's gender.

#### **4.8.6 Relationship between Dietary Intake and Gender**

Independent samples t-test tested for differences in the dietary intake values as indicated by FFQ across the categories of gender and was found to be statistically significant ( $p=0.001$ ). The study thus concluded that there is a significant difference in dietary intake values for males and females at 95% confidence level. The dietary intake value of females (38.37) is higher than the dietary intake value of males (36.30).

#### **4.8.7 Comparison of Income Categories and Household Hunger Scale**

Differences in Household Hunger Scale (HHS) and income levels were tested using one-way ANOVA. The ANOVA tested for differences in HHS across the income categories at 0.05 level of significance. ANOVA showed that there is a significant difference HHS across income categories of the respondents at the  $p < 0.05$  level [ $F(8,189) = 0.6271$ ,  $p=0.000$ ]. As such, the research concluded that there is a significant difference in HHS across the income categories. This means that respondents in lower income categories have different HHS score when compared with those in higher income categories.

#### 4.8.8 Correlation between Dietary Intake and Household Dietary Diversity Score

A Pearson product-moment correlation was conducted to determine the relationship between dietary practices indicated by FFQ and dietary diversity as indicated by HDDS at 0.05 level of significance. There was a weak, positive correlation between dietary intake values and HDDS, which was statistically significant ( $r= 0.478$ ,  $n= 198$ ,  $p=0.001$ ) as shown in Table 4.9. This means that there is a strong positive correlation between dietary intake and HHDS whereby intake of more meals in a day results in a more diverse diet; hence, a high HDDS.

**Table 4.9 Co-relation between Dietary Intake Values and HDDS**

		Dietary Intake	HDDS
Dietary Intake	Pearson Correlation	1	.478**
	Sig. (2-tailed)		.000**
	N	182	198
HDDS	Pearson Correlation	.478**	1
	Sig. (2-tailed)	.000**	
	N	182	198

## CHAPTER FIVE: DISCUSSION

This chapter provides a discussion comparing the results of this study with findings of other similar studies. The study sought to assess household food security and nutritional status of HIV sero-positive clients.

### 5.1 Demographic Characteristics of the Respondents

Socio-demographic factors: marital status, gender, religion, and age are crucial factors that impact on the nutritional and household food security status. According to Deshmukh-Taskar, Nicklas & Berenson (2007) individuals drawn from married households are often food secure as evidenced by the fact that they are more likely to consume diverse diets comprising main meals and snacks. Marital status is a core determinant of household stability whereby there exists a common assumption that married people have a higher stability; hence, are more food secure than unmarried individuals. In this study, a high percentage of the respondents were married compared to those who were single, divorced, widowed, or separated. Similar to the notions expressed by Deshmukh-Taskar, Nicklas & Berenson (2007), the current study found a significant relationship between marital status and food security status.

A high portion of the respondents from the current study comprised females and this can probably be attributed to better health seeking behaviours exhibited by females (Thompson et al., 2016). Gender occurs as one of the determinants of household food security. According to Jayawardena et al (2011), and Aidoo et al. (2010), gender does not pose any significant effect on the food security status of an individual. This study found out that there was no significant difference in food security status (HDDS) and gender;

hence, concurring with the findings from Jayawardena et al (2011), and Aidoo et al. (2010). The absence of a significant difference in household food security amongst males and females may be attributed to the fact that the respondents partook in various income generating activities: formal employment and informal employment, which allowed access to diverse foods for all genders.

Concerning religion, most of the respondents in this study were Christians. Religion had a co-relation with dietary diversity in that some researchers have pointed to the fact that Christians consume more diverse diets than other religions such as Muslims (Deshmukh-Taskar, Nicklas & Berenson (2007). The fact that most of the respondents in this study were Christians did not allow for comparison with other religions such as Muslims. The study found no significant association between food security statuses across the various Christian religions of the respondents,

The age of an individual impacts on their food security status in that an increase in age enhances food production decisions made by an individual (Salary Survey (cover story), 2015). People in an advanced age bracket are more likely to make independent food production decisions that improve their household's food security status (Jacobs-Lawson et al., 2016). However, there is a need to take into account the fact that an individual's productivity reduces as their age progresses to the extreme age bracket (elderly). Therefore, households whose members comprise the elderly are more predisposed to household food insecurity. Results from this study found no significant relationship between food security and age. This study focused on HIV sero-positive clients aged 18-55 years. As such, the respondents were of a productive age; hence, could engage in

various activities that could generate income that improved the food security status of their households.

## **5.2 Socio-economic Characteristics of the Respondents**

Education level, household income, and occupation are some of the most crucial socio-economic indicators that impact on the food security status of a household. In most cases, an individual's level of education determines the form of employment than the individual partakes. According to Dauda (2010) individuals with post-secondary education are more likely to access formal employment than those with education levels lower than secondary education. Most of the respondents in this study had primary level of education. A close analysis of empirical studies comparing education level and socio-economic status depicts the fact that the socio-economic productivity of an individual increases with education level (Beydoun & Wang, 2008). According to Deshmukh-Taskar, Nicklas & Berenson (2007) individuals with more than twelve years of education have a higher dietary diversity as indicated by a high intake of fruits and juices, dairy products, vegetables and cereals. Thornton, Pearce, & Ball (2014) further corroborate this by asserting that higher education levels have a strong co-relation with household food security. Contrary to the findings from Deshmukh-Taskar, Nicklas & Berenson (2007) and Thornton, Pearce, & Ball (2014), this study found no significant relationship between education level and food security status. Most of the households in the study were food secure despite the fact that most of the respondents had primary level of education.

Most of the respondent's households had an income of between Kshs. 501 and Kshs. 1500 per month. The fact that most of the respondents had primary level of education

meant that the respondents could not access formal employments, which could guarantee more pay. According to Bukusuba et al. (2007) and Aidoo et al. (2010), income is a core determinant of food security whereby higher income levels enhances diet quality, quantity, and diversity, which guarantees food security. The study found no significant relationship between income and food security status (HDDS). While it is true that most of the respondents had a low income of Kshs. 501 to Kshs. 1500, food production was the main dietary source amongst most of the respondents; hence, most of the households were not reliant on income as a means of food access. This was contrary to results from Mokono (2015) study, which found the existence of a significant association between income and food security status. However, food access measured by HHS had a significant association with income levels of the respondents. Similarly, the study found no significant association between age and income levels. Subsistence farming and small to middle-scale business engaged in by most of the respondents could be carried out by adults of any age as there was no technical knowledge required to engage in these forms of employment.

Inability to access formal employment due to low level of education amongst the respondents meant that the respondents could only engage in self-employment, especially farming and small-scale to middle-scale enterprises. Evidently, most of the respondents in this study engaged in food-production based occupation that is farming. They grew crops and kept livestock for subsistence and commercial purposes. For this reason, the respondents had enhanced food availability. The study found a significant association between occupation and food security status. The fact that most of the respondents



practiced farming including crop production and animal rearing guaranteed higher dietary diversity, which results in food security.

### **5.3 Dietary Intake of the Respondents**

Human Immunodeficiency Virus sero-positive clients have increased energy demands emanating from HIV and its related infections (ROK, 2006). Therefore, food consumption frequency assessed using a seven day FFQ is a crucial indicator of whether HIV sero-positive clients are meeting their nutrient needs. In this study, results from the seven day FFQ indicated that oils and fats, cereals, sugars, green-leafy vegetables, milk, legumes, fruits, and other vegetables were consumed regularly as evidenced by the fact that they were consumed more than thrice in a week. On the contrary, meats, eggs, and fish were consumed irregularly as they were consumed less than thrice weekly.

According to WHO (2003), HIV sero-positive adults require approximately 50% to 100% more proteins than non-HIV-infected adults. Irregular consumption of meats, eggs and fish by the HIV sero-positive respondents in the current study meant that the protein needs were rarely met. As such, the respondents were more predisposed to protein energy malnutrition. The most frequently consumed source of protein was milk. While it is true that milk is a high biological value protein (animal based protein), there is always the need to complement plant and animal proteins to enhance the nutritional status of an individual. The most probable reason for reduced consumption of proteins by the respondents is the reduced production of such foods in the study area. The most staple food crop in the study location (Bomet County) is maize (Wangai et al., 2012). Nonetheless, there are cases where residents in the study area grow maize with some

proteins-rich foods such as beans. On another note, irregular consumption of certain sources of protein such as fish by the respondents is a result of cultural norms, whereby fish is not considered as a food in the Kalenjin and Maasai cultures who were the major residents in the areas around the study setting (Chege et al., 2015 and Danver, 2015). There is a need to instigate interventions that would ensure an enhanced consumption of the irregularly consumed foods/food groups, as they are crucial to the improvement of the nutritional status of HIV sero-positive persons.

Data from 24-hour dietary recall provided more insights on adequacies in the nutritional intakes of the respondents. Energy intakes of the respondents did not meet the requirements as only 47.4% and 50% of the females met the requirements. According to ROK (2006), HIV infection and opportunistic infections that are eminent amongst HIV sero-positive clients interfere with an individual's ability and desire to eat. As such, it reduces dietary intakes, which results in mal-absorption. Conclusively, the energy intakes amongst the respondents is as a result of clinical symptoms aligned with HIV and AIDS, which hinder dietary intakes amongst HIV sero-positive persons. The results concur with notions developed by Kuria (2010) and Montgomery (2003), which indicate that HIV sero-positive clients present with different clinical symptoms including anorexia, fatigue, vomiting, mouth sores, fever, diarrhoea, nausea, depression, metabolic disturbances, and anti-retroviral drug side-effects. These symptoms have a significant hindrance on dietary intake. Inadequate knowledge and food insecurity amongst the HIV sero-positive persons exacerbated the situation; hence, rendering the PLWHA more predisposed to malnutrition.

The 24-hour dietary recall further obtained information on the number of meals consumed by the respondents. The number of meals consumed by the males and females in this study was not significantly different. The mean number of meals consumed by the respondents was  $3.76 \pm 0.053$  per day. This means that the respondents consumed three to four meals and snacks daily. As a means of addressing reduced intakes caused by HIV related symptoms, it is recommended that HIV sero-positive clients consume small frequent meals and snacks composed of nutrient-dense diets (Klassen & Goff, 2013). This provides a viable platform that allows the HIV sero-positive persons to meet their RDIs. Consumption of three to four meals and snacks by the respondents may have reduced the possibility of the respondents meeting the RDIs. For this purpose, there is a need to scale up nutrition education amongst the HIV sero-positive clients on the essence of consuming more than three to four meals and snacks per day. However, it is of the essence to note that since most of the respondents relied on food production (farming) as a means of livelihood, consumption of more than three or four meals and snacks may not have been feasible. This is due to periods of reduced production caused by unpredictable weather conditions and emergence of crop diseases, which reduce the farm yields (Wangai et al., 2012).

As indicated by Onyango et al., (2009), caloric intakes drawn from 24-hour dietary recall provide a substantive indication of household food security status. Almost half of both male and female respondents met Caloric/Energy needs as indicated by the 24-hour dietary recall was average for and this can be interpreted to mean that most of the respondent's household experienced moderate household food insecurity. Percentage adequacy of nutrient intakes for female respondents was slightly higher (insignificant) for

energy, proteins, fats, and vitamins: B<sub>1</sub>, B<sub>2</sub>, and C than that of the males. There was a great difference in the intakes of Iron and Zinc amongst the male and female respondents. Intake of iron amongst the female respondents was of much concern, as it was significantly low. Percentage adequacy in meeting RDI for Iron amongst women was 10.7% compared to 89.5% amongst males. Iron requirements for women are higher compared to that of men. This is because of increased iron needs amongst women, especially during pregnancy.

Human Immunodeficiency Virus and AIDS causes reduced dietary intake, poor nutrient absorption, and increased nutrient utilization resulting in deficiencies of various nutrients including iron (Montgomery, 2003). Altogether, these factors severely affect the iron-nutrient status of HIV sero-positive females than that of males. Iron supplementation for women on care and treatment for HIV and AIDS may seem to be the most feasible means of addressing iron deficiency (anaemia). However, iron supplementation in the context of HIV and other infection may be fatal because iron promotes the replication and growth of infection disease agents (Liu et al., 2014). For this reason, iron deficiencies amongst HIV sero-positive persons can be best addressed by enhancing iron-nutrient intake from dietary sources (Obirikorang et al., 2016).

Percentage adequacy in meeting RDI for zinc amongst female respondents was higher (63.1%) than that of the male respondents (28.9%). This is of concern because males have higher zinc requirements than females. Zinc plays a vital role in enhancing the production of male hormone: testosterone. In addition, zinc plays other crucial roles including cell division, production of proteins, and enhancing the functioning of the immune system (Hodek et al., 2016). Low intakes of zinc by the male respondent's

means that they were more predisposed to zinc deficiency that is characterized by impaired immune function and loss of appetite. These symptoms can be fatal for the male HIV sero-positive persons because loss of appetitive leads to under-nutrition and impaired immune function can increase their susceptibility to opportunistic infections such as Tuberculosis that can cause death (Hodek et al., 2016). Conclusively, zinc deficiency amongst HIV sero-positive persons can worsen the severity of the HIV infection.

#### **5.4 Food Security Status of the Respondents**

Food insecurity is a major impediment to efforts geared towards mitigating the implications of HIV and AIDS (Hadley, 2016). HIV sero-positive persons are required to consume diets high in quality and quantity in order to meet the increased energy needs. Food insecurity reduces the quality and quantity of diets consumed by the HIV sero-positive persons, which results in chronic under-nutrition (Ivers et al., 2009). According to Mukherjee et al. (2006), food insecurity is a core barrier to access and adherence to anti-retroviral therapy. HIV sero-positive individuals who are food insecure lack sustainable access and adherence to HIV treatment and care. This analysis portrays the implications that food insecurity poses in the context of HIV and AIDS.

The HHS was an efficient measure of household food security because it is an improved/revised and validated version of HFIAS. It is more efficient and allows for cross-cultural comparison. The study found out that there was a significant effect of income levels on HHS at  $p = 0.001$ . This means that there was a strong association between income levels and HHS whereby an increase in income would result in a

subsequent reduction in HHS. The results from the current study concur with results by Mokono (2015), which indicated that food access has a significant relationship with asset ownership, which is determined by income levels.

Data obtained from HDDS showed the food security status of the respondents as it acted as a proxy measure of food access at the respondent's households. About 82.3% of the respondents households were food secure as the household members consumed an average of seven (7) food groups per day. The HDDS had a significant association with BMI whereby an increase in HDDS elicited an increase in BMI. These results are similar to those drawn from Mokono (2015), which indicated that an individual nutritional status is dependent on diversity of nutrient intake. Food security and nutritional status have a strong association in that an improvement in an individual's nutritional status guarantees engagement in sustainable livelihood activities, which assures adequate food security. Similarly, an improved food security status ensures adequate intake of nutrients, which assures adequate nutritional status (Senna et al., 2014). HIV and AIDS compromise both food security and nutritional status of the infected and affected persons. For this reason, there is a need support and implementation of food and nutrition security interventions in HIV and AIDS care and treatment programs.

## 5.5 Nutritional Status of the Respondents

Across all the stages of HIV progression to AIDS, individuals are often at risk to various nutritional deficiencies (Swaminathan et al., 2008). Swaminathan et al., (2008) further assert that the progress of HIV infection to AIDS is strongly determined by the nutritional status of an individual. An impaired nutritional status in HIV sero-positive persons strongly predicts the progression of the disease, as well as the functional status and survival of HIV sero-positive persons in the course of the disease. Nutritional status is a core determinant of the quality of life of HIV sero-positive individuals, whereby, HIV sero-positive clients with an adequate nutritional status have an enhanced quality of life (Thapa et al., 2015).

As reported by ROK (2008), the prevalence of under-nutrition amongst HIV sero-positive adults in Kenya is between 15 and 16%. While it is true that a significant proportion of the respondents had an appropriate nutritional status, the prevalence of under nutrition was 22.8%. According to Kshatriya and Acharya (2016), the occurrence of under-nutrition in a given population is compounded by the occurrence of certain cases of over-nutrition. This was the case in the study whereby 10.6% of the respondents were overweight, whereas 2% were obese. A reflection on developing countries all around the globe depicts the fact that malnutrition has evolved into a double burden elicited by the concurrent existence of both under-nutrition and over-nutrition (Jones et al., 2016). This may be attributed to lifestyle changes adapted by the populations in the developing nations.

The determinants of the nutritional status in this study were gender, dietary diversity, and income levels. Gender remains one of the most critical factors that affect various facets of an individual's life. According to Barbhuiya and Das (2013), women are more prone to under-nutrition resulting from the fact that women have limited access and control over resources when compared to men. A reflection on various cultural settings in Kenya indicates that males often eat first and leave the women to eat the leftovers (Kuria, 2010). Therefore, in cases of limited food availability, women are more likely to consume less or nothing at all. From the above discussion, the nutritional status of women is often expected to be lower than that of men. However, this was not the case in the study as women were observed to have a more adequate nutritional status than men. The most probable reason to this aligns with the fact that women have better health seeking behaviours than men; hence, a better health status amongst women guarantees an adequate nutritional status (Orisaremi, 2016 and Thompson et al., 2016). The notion that women have better health seeking behaviours was apparent in the study as evidence by the fact that more women than men were enrolled to the study as they came for comprehensive health care and review at the hospital (study setting).

According to Hooshmand and Udipi (2013), there is a significant association between nutritional status and DDS. These are similar to notions expressed by Kariuki (2011) indicating that high DDS positively impacts on a person's nutritional status. The study findings support the notions that DDS has a significant association with nutritional status. The study established that there was a significant difference in BMI across different DDS categories. Diverse dietary sources enhance the quality of diets; hence, assuring an adequate nutritional status. In the context of HIV and AIDS, diet quality plays an



important role in defining the health of HIV sero-positive persons. According to Rawat et al. (2013), low dietary diversity is often associated results in low CD4 cell count, which hastens the progression of HIV infection. Nutrient-rich and more diverse diets reduce the progression of HIV to AIDS; therefore, there is the need for continued integration of food assistance in the care and treatment of HIV sero-positive clients. Food assistance in HIV and AIDS care and treatment programs offer a significant contribution on enhancing the diversity of diets consumed by the HIV sero-positive clients (Ivers et al., 2010 and Suttajit, 2007). From this analysis, it is apparent that dietary diversity is important in the context of HIV and AIDS, whereby lack of a diverse diet can be fatal in that it can hasten the progression of HIV infection to its late stages, which can eventually result in death (Rawat et al., 2013).

According to Ota et al. (2016) and Beydoun and Wang (2008), the nutritional status of an individual is often reliant on food intake, which is strongly dependent on an individual's income. The study found a significant relationship between income levels and nutritional status, whereby respondents with high income levels were more likely to have an adequate nutritional status. Households and individuals with high-income levels are more likely to access foods from different sources than low-income households and individuals (Jayne et al., 2011).

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

### **6.1 Summary**

Gender, dietary diversity, and income levels were the major factors that had a relationship with nutritional status of the respondents. More females than males were enrolled in the study due to the perceived positive health seeking behaviours highly regarded by females than males. Most of the respondents in the study were aged 35-44 years. Persons of this age bracket may be perceived to have an adequate understanding of the need to enrolment in CCC's for care and treatment for HIV and AIDS.

While it is true that HDDS had no significant relationship with income levels, HHS had a significant association with the income levels of the respondents. Higher income levels guarantees an adequate nutritional status as it was evident in the study because income enhances food access, which has a positive co-relation to nutritional status. Education level poses a major determinant of employment or occupation. Low levels of education cannot guarantee sustainable forms of employment. The fact that most of the respondents in the study had primary school level education meant that most of them engaged in self-employment. Farming was the main form of employment engaged in by a majority of the respondents. Despite the fact that farming can guarantee adequate food production that assures adequate food security and nutrition status, it is of the essence to note that constantly changing weather and environmental conditions pose negative and at times positive implications on farming. Therefore, farming may not be a sustainable endeavour for HIV sero-positive persons who should always have an adequate food security and nutritional status.

Human Immunodeficiency Virus and AIDS reduces an individual's productivity due to constant visits to hospitals, which result in loss of working hours. Human Immunodeficiency Virus and AIDS result in increased expenditure on care and treatment arising from purchase of medications and other forms of treatments. Farming as the main form of employment engaged in by majority of the respondents does not guarantee adequate food security and nutritional status. This was evident in the 24-Hour Dietary Recall, whereby close to half of male and female respondents did not meet the minimum caloric/energy requirements. A small proportion of the respondents managed to consume five meals and snacks per day. Most of the respondents consumed three to four meals per day, which did not meet the dietary recommendation that HIV sero-positive clients should consume small, frequent, nutrient-dense meals as a means of addressing reduced intakes elicited by clinical symptoms of the disease.

Amongst the study respondents, 64.6% had normal nutritional status with a BMI of between 18.5 kg/m<sup>2</sup> and 24.95 kg/m<sup>2</sup>. A proportion of the respondents presented with under-weight, whereas others were over-weight. Gender had a significant association with nutritional status. Due to the perceived positive health seeking behaviours amongst females, their nutritional status are often adequate when compare to those of men who are perceived to lack positive health seeking behaviours. Income levels and HDDS also significantly affect the nutritional status of HIV sero-positive persons. The study findings indicate that the food and nutritional status of HIV sero-positive clients on care and treatment are closely related. The HIV sero-positive clients on care and treatment in Comprehensive Care Clinics are prone to food insecurity, which is detrimental to their nutritional status. Unsustainable forms of employment resulting from low levels of

education amongst the HIV sero-positive clients impairs food access; hence, jeopardizing their nutritional status.

## **6.2 Conclusions**

Marital status, religion, and age as some of the socio-demographic factors examined in the study did not have a significant relationship with the study variables. Nonetheless, gender was crucial in determining the relationship between the study variables. Gender was a core determinant of the nutritional status of the respondents as evidenced by the fact that more females had an adequate nutritional status than males. Income and education as the socio-economic variables explored in the study indicated that they have significant implication on food security and nutritional status. Education level determined the form of occupation engaged in by the respondents; hence, influencing the income levels. However, income was not the core determinant of food availability because most of the respondents relied on food production for consumption. Nonetheless, there was an observed difference in the HHS of high-income households and low-income households. This was substantive evidence that income levels are related with household food security and nutritional status. Hunger scales in high-income households are reduced; hence, limiting the occurrence of food insecurity and nutritional deficiencies.

Half of the male and female respondents met Caloric/energy intake requirements. Most of the respondents met the minimal requirements for all the analysed vitamin intakes. Male respondents did not adequately meet the minimum requirements for proteins, fats, and zinc. With the exception of Iron, female respondents met all the minimum requirements for other nutrients. Low dietary intake of iron amongst the female respondents was of

concern, as it renders them more predisposed to iron-deficiency anaemia, which is a difficult deficiency disorder to manage in the context of HIV. The number of meals consumed by males and females was similar. Low zinc intake by the males is also worrying because an HIV infection causes zinc deficiency, which elicits a reduction in the number of T lymphocytes, a core component of white blood cells that aid in enhancing immunity that is vital in the context of HIV and AIDS.

While it is true that dietary intake has a direct influence on the nutritional status of an individual, this was not the case in the current study. ANOVA showed that there is no significant difference in energy/calorie intake across the BMI categories of the respondents at the  $p < 0.05$  level for the five BMI categories [ $F(4,193) = 0.492, p = 0.742$ ]. Energy/calorie intake amongst the respondents was not a determinant of their nutritional status (BMI). Hypothetically, other factors such as disease occurrence may have been the main determinants of nutritional status of the study population. There are instances where HIV sero-positive persons consume adequate nutrients, yet their nutritional status deteriorates. Replication of Human Immunodeficiency Virus requires energy. For this reason, HIV sero-positive persons may meet the recommended dietary intakes, but viral replication utilizes most of the nutrients resulting in depletion; hence, poor nutritional status.

The null hypothesis that there is no significant relationship between dietary intake and nutritional status is accepted. The study concluded that other factors such as disease occurrence and viral replication in the context of HIV and AIDS is responsible for deterioration in nutritional status. The null hypothesis that there is no significant relationship between food security status and nutritional status of HIV sero-positive

patients is rejected. The study concludes that household food security status is a core determinant of the nutritional status of HIV sero-positive clients. Food security guarantee intake of diverse diets, which lead to good nutritional status.

There exist discrepancies in the interventions offered at HIV and AIDS clinics. The interventions are specific to certain situations that have an effect on patient's nutritional status. They do not focus on the need to realize the determinants of household food insecurity as a core factor that affects the patient's nutritional status. This necessitated the execution of this study. The study has generated insights that supplement existing knowledge, which are crucial for program implementers seeking to improve food security and nutritional status of HIV sero-positive persons.

### **6.3 Recommendations**

#### **6.3.1 Recommendations for Practice**

- The Ministry of Health at national and county levels and other partners/stakeholders implementing HIV/AIDS programs should scale up HIV/AIDS care and treatment modalities to consider and include socio-demographic, socio-economic, dietary, household and nutritional status features of HIV sero-positive clients as a means of providing suitable interventions for optimizing ART, enhancing rehabilitation and adherence to treatment.
- To enhance the food security and nutritional status of HIV sero-positive persons in Bomet County, the Government of Kenya (GoK), County Government of Bomet (CoGB), and HIV and AIDS program implementers/partners should

consider educating HIV sero-positive on viable food insecurity coping strategies such as Kitchen gardening.

- To enhance adequate dietary intakes by HIV sero-positive persons in Bomet County, the GoK, CoGB, and other stakeholders could provide food aid for the severely food insecure households in Bomet County.

### **6.3.2 Recommendation for Policy**

- The national and county governments should devise policies aimed at enhancing income generating opportunities for HIV sero-positive clients as means of enhancing food access, which enhances food security and nutritional status of PLWHA.

### **6.3.3 Suggestion for Further Research**

- There is the need for longitudinal surveys aimed at providing more concise view of food security and nutritional status factors in the context of HIV and AIDS.

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## **APPENDICES**

### **APPENDIX A: Introduction and Informed Consent**

My name is Kenneth Kipngeno Tonui. I am a postgraduate student in Kenyatta University studying a Master of Science in Food, Nutrition and Dietetics. I am undertaking a study on household food security and nutritional status of HIV Sero-Positive clients attending Longisa County Hospital Comprehensive Care Clinic. The information obtained is useful for the Ministry of Health because it provides guidance on policy issues aligned with food insecurity and HIV in this hospital and other hospitals in Kenya.

#### **Procedure to be followed**

Participation in this study will require that I ask you some questions and examine you. I will record the information from you in a questionnaire. You have the right to refuse participation in this study and your decision will not change the care you will receive from the Hospital today or any other time. Participation in this study is voluntary and you may refuse to respond to any questions or stop the interview at any time without any consequences to the services you receive from this hospital. You may also ask questions related to the study at any time.

#### **Discomforts and Risks**

You may refuse to answer any question that may cause embarrassment or any form of discomfort. You may also stop the interview at any time. The interview may add approximately 30 minutes to the time you spend in the hospital receiving health care.

**Benefits**

If you participate in this study, you will help us understand the manner in which household food security influences the nutritional status of HIV Sero-Positive clients, which will aid in improving management of HIV. You will also benefit in being screened for Body Mass Index (BMI) and Mid Upper Arm Circumference (MUAC) and if you are found to have an inadequate BMI or MUAC, you will be referred to the relevant health worker.

**Reward**

By agreeing to participate in this study, you will not receive any form of reward.

**Confidentiality**

The interview and examinations will be conducted in a private setting within the clinic. Your name will not be recorded on the questionnaire. The questionnaire will be kept in a locked cabinet for safe keeping at Kenyatta University. Everything will be kept private.

**Contact Information**

If you have any questions, you may contact Dr Eunice Njogu on 0722862052 or Dr Christine Agatha on 0721847364 or the Kenyatta University Ethical Review Committee Secretariat on [chairman.kuerc@ku.ac.ke](mailto:chairman.kuerc@ku.ac.ke) or [secretary.kuerc@ku.ac.ke](mailto:secretary.kuerc@ku.ac.ke)

**Participant's Statement**

The above information regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that I will still get the same care and medical treatment whether I decide to leave the study or not and my decision will not change the care I will receive from the hospital today or that I will get from any other hospital at any other time.

Name \_\_\_\_\_ of \_\_\_\_\_ Participant

.....

Signature/ Thumb Print: ..... Date: .....

**Investigator's statement**

I, the undersigned, have explained to the volunteer in a language s/he understands the procedures to be followed in the study and the risks and benefits involved.

Name \_\_\_\_\_ of \_\_\_\_\_ Interviewer:

.....

Interviewer Signature: ..... Date.....



**APPENDIX B: Questionnaires****Demographic Characteristics**

Client's Code ..... Questionnaire Number .....

Household/Client Number .....

Indicate your age, gender, marital status, and religion

<b>Age (Years)</b>	<b>Gender`</b>	<b>Marital Status</b>	<b>Religion</b>
1=18-24	1=Male	1=Married	1=Protestant
2=25-34	2=Female	2=Single	2=Catholic
3=35-44		3= Divorced	3=Muslin
4=45-54		4=Widowed	4=Other
5=>55		5=Separated	
Enter Code	Enter Code	Enter Code	Enter Code

### Socio-Economic Characteristics

Highest Level of Education Attained	Occupation	Monthly Household Income (Kenya Shillings)
1=None	1=Casual Labor	1=1-500
2=Primary	2=Farmer	2=501-1500
3=Secondary	3=Business	3= 1501-3000
4=Vocational	4=Unemployed	4=3001-4500
5=University	5=Salaried Employment	5=4501-6000
		6=6001-7500
		7=7501-9000
		8=9001-10500
		9=10501-15000
Enter Code	Enter Code	Enter Code

### Food Frequency Questionnaire

Please check how many times per week that you consume the following foods. If possible, please list the type of food or how it is prepared

<b>FOOD</b>	<b>1=NEVER</b>	<b>2=1-3 TIMES</b>	<b>3=4-6 TIMES</b>	<b>4=7-9 TIMES</b>	<b>5=MORE THAN 10 TIMES</b>
Cereals					
Green-leafy vegetables					
Other vegetables					
Fruits					
Meats					
Eggs					
Fish					
Legumes					
Milk					
Oils and Fats					
Sugars					

**24-Hour Dietary Recall**

Household Number ..... Date of Interview .....

24-hour dietary recall RECORDING SHEET

**Tick the day of the week, which you are recalling (it should be the day before the interview)**

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Yesterday from the time you woke up to the time you went to sleep, remember the foods and drink you consumed then tell me. Pose for a minute then continue

Remembered Foods	Forgotten Foods (Prompted).  Did you consume any cakes, sodas, sweets, fruits, chewing gum, energy drinks including soda, any snacks, etc.?

Now transfer the foods above to the following table

Time of day	Food items consumed	Detailed description of the item as well as preparation  Ingredients, method of preparation  e.g. whole/brown bread, with or without spread (b/band or margarine), size of slices-thin, medium, large tea with sugar and milk, fruit salad-specify fruits, sugar spoons-levelled or heaped, cooking fat or oil, boiled or fried rice, Ugali - unga ya kusiaga or packet, meat pieces-use matchbox sizes etc.	Amounts in HHD measures  Cups, spoons (tea, table serving spoons), bowls, plates, etc.	Weight (metric)
Breakfast				
Midmorning snack				
Lunch				
Afternoon snack				
Supper/ Dinner				
Evening snack				

**Anthropometric Measurements**

Height, Weight, and MUAC were taken for all participants in the study. All measurements were taken twice and weight rounded off to the nearest 0.1kg, height to the nearest 0.5 cm, and BMI to the nearest 0.1 kg/m<sup>2</sup>.

Measurement	1 <sup>st</sup>	2 <sup>nd</sup>	Average
Weight (kg)			
Height (cm)			
BMI			
MUAC			

**Household Dietary Diversity Score**

	<b>QUESTIONS AND FILTERS</b>	<b>CODING CATEGORIES</b>
1	<p>Now I would like to ask you about the types of food that you or anyone else in your household yesterday during the day and at night</p> <p>READ THE LIST OF FOODS. PLACE A ONE IN THE BOX IF ANYONE IN THE HOUSEHOLD ATE THE FOOD IN QUESTION, PLACE A ZERO IN THE BOX IF NO ONE IN THE HOUSEHOLD ATE THE FOOD</p>	
A	<p>Any [INSERT ANY LOCAL FOODS, E.G. UGALI, NSHIMA], bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice wheat, or [INSERT ANY OTHER LOCALLY AVAILABLE GRAIN]</p>	A ..... [ ]
B	<p>Any potatoes, yams, manioc, cassava or any other foods made from roots or tubers?</p>	B ..... [ ]
C	<p>Any vegetables?</p>	C ..... [ ]
D	<p>Any fruits?</p>	D ..... [ ]
E	<p>Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or any other organ meats?</p>	E ..... [ ]
F	<p>Any eggs?</p>	F ..... [ ]
G	<p>Any dried fish or shellfish?</p>	G ..... [ ]
H	<p>Any foods made from beans, peas, lentils, or nuts?</p>	H ..... [ ]

I	Any cheese, yoghurt, milk or other milk products?	I ..... [ ]
J	Any foods made with oil, fat, and butter?	J ..... [ ]
K	Any sugar or honey?	K ..... [ ]
L	Any other foods such as condiments, coffee, or tea?	L ..... [ ]

### HHDS Indicator Tabulation Plan

HHDS (0-12)	Total number of food groups consumed by members of households.  Values from A through L will be either “0” or “1”  Sum (A+B+C+D+E+F+G+H+I+J+K+L)
-------------	--

### Household Hunger Scale

Using the codes provided, answer the questions indicated in the table.

No.	Question	Response	Code
Q. 1	In the past (4 weeks/30 days), was there ever no food to eat of any kind in your house because of lack of resources to get food?	0= No (Skip to Q2)  1 = Yes	[ ]
Q. 1a	How often did this happen in the past (4weeks/30 days)	1= Rarely (1-2 times)  2= Sometimes (3-10 times)	[ ]



		3= Often (more than 10 times)	
Q. 2	In the past (4 weeks/30days), did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (Skip to Q3) 1 = Yes	[__]
Q. 2a	How often did this happen in the past (4weeks/30 days)	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times)	[__]
Q. 3	In the past (4 weeks/30days), did you or any household member go a whole day and night, without eating anything at all because there was not enough food?	0 = No (Skip to Q2) 1 = Yes	[__]
Q. 3a	How often did this happen in the past (4weeks/30 days)	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times)	[__]

## APPENDIX C: Approval Letter from Kenyatta University Graduate School



### KENYATTA UNIVERSITY GRADUATE SCHOOL

E-mail: [dean-graduate@ku.ac.ke](mailto:dean-graduate@ku.ac.ke)

Website: [www.ku.ac.ke](http://www.ku.ac.ke)

P.O. Box 43844, 00100  
NAIROBI, KENYA  
Tel. 810901 Ext. 57530

#### Internal Memo

FROM: Dean, Graduate School

DATE: 17<sup>th</sup> May, 2016

TO: Kipng'eno Tonui Kenneth  
C/o Food, Nutrition & Dietetics Department.

REF: H60/CE/23718/13

SUBJECT: APPROVAL OF RESEARCH PROPOSAL


=====

This is to inform you that Graduate School Board, at its meeting of 11<sup>th</sup> May 2016, approved your Research Proposal for the M.Sc. Degree Entitled, "Household Food Security and Nutritional Status of HIV Seropositive Clients Attending Longisa County Hospital Comprehensive Care Clinic, Bomet County, Kenya".

You may now proceed with data collection, subject to clearance with the Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking forms per semester. The form has been developed to replace the progress report forms. The supervision Tracking Forms are available at the University's website under Graduate School webpage downloads.

Thank you.

  
EDWIN OBUNGU  
FOR: DEAN, GRADUATE SCHOOL



c.c. Chairman, Department of Foods, Nutrition & Dietetics

Supervisors:

1. Dr. Eunice Njogu  
C/o Department of Foods, Nutrition & Dietetics  
Kenyatta University
2. Dr. Christine Agatha Onyango  
C/o Department of Foods Nutrition & Dietetics  
Kenyatta University

## APPENDIX D: Ethical Review by Kenyatta University Ethical Review Committee



### KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE

Email: [chairman.kuerc@ku.ac.ke](mailto:chairman.kuerc@ku.ac.ke)  
[secretary.kuerc@ku.ac.ke](mailto:secretary.kuerc@ku.ac.ke)  
[ercku2008@gmail.com](mailto:ercku2008@gmail.com)  
 Website: [www.ku.ac.ke](http://www.ku.ac.ke)

P. O. Box 43844 - 00100 Nairobi  
 Tel: 8710901/12  
 Fax: 8711242/8711575

Our Ref: KU/R/COMM/51/751

Date: 20<sup>th</sup> June, 2016

Kipngeno Tonui Kenneth  
 Kenyatta University,  
 P.O Box 43844,  
 Nairobi

Dear Kipngeno,

APPLICATION NUMBER PKU/534/1627 – “HOUSEHOLD FOOD SECURITY AND NUTRITIONAL STATUS OF HIV SEROPOSITIVE CLIENTS ATTENDING LONGISA COUNTY HOSPITAL COMPREHENSIVE CARE CLINIC, BOMET COUNTY, KENYA.”

#### 1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic, “Household food security and nutritional status of HIV seropositive clients attending Longisa County Hospital Comprehensive Care Clinic, Bomet County, Kenya.” received on 31<sup>st</sup> May, 2016 and discussed on 14<sup>th</sup> June, 2016.

#### 2. APPLICANT

Kipngeno Tonui Kenneth, Department of Food, Nutrition & Dietetics

#### 3. SITE

Longisa County Hospital, Bomet County, Kenya

#### 4. DECISION

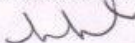
The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines AND APPROVED that the research may proceed for a period of ONE year from 20<sup>th</sup> June, 2016.

#### 5. ADVICE/CONDITIONS

- i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
- ii. Serious and unexpected adverse events related to the conduct of the study are reported to this board immediately they occur.
- iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
- iv. Submit an electronic copy of the protocol to KUERC.


When replying, kindly quote the application number above.

If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

  
 DR. TITUS KAHIGA

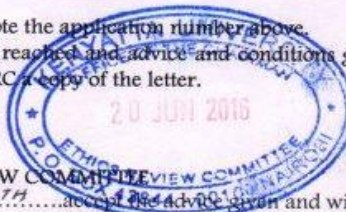
CHAIRMAN ETHICS REVIEW COMMITTEE

I, KIPNGENO TONU, KENNETA, accept the advice given and will fulfill the conditions therein.

Signature.....  ..... Dated this day of 27/06/2016 2016.

cc. Vice-Chancellor

DVC-Research Innovation and Outreach





**Appendix F: Map of Bomet County**

