ASSESSMENT OF DETERMINANTS OF UNDER-NUTRITION AND FOOD SECURITY AMONG THE ELDERLY IN MOIBEN SUB-COUNTY, UASIN GISHU COUNTY

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DECLARATION

Declaration by the Student

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This thesis has been submitted for examination with our approval as University supervisors.

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DEDICATION

I dedicate this work to my family, my colleagues and friends for their sincere support and understanding during my study period.

ABSTRACT

Food insecurity is an issue of great concern across the globe. Attainment of food security is a prerequisite towards realization of vision 2030 and the Sustainable Development Goals (SDGs) of which Kenya is a signatory. nutritional status of the elderly is an important determinant of their health and quality of life. Under-nutrition among the elderly people is becoming significantly high regardless of the progress on health care system. The aim of this study was to assess the determinants of under-nutrition and food security among the elderly aged 60 years and above in Moiben Sub- County, Uasin-Gishu County. To achieve this the following objectives were used; To establish factors associated with nutritional status, determine the nutrition status of the elderly, assess the household food security status of the elderly and lastly to determine nutrition related morbidity ailments of the elderly in Moiben Sub-County. A cross sectional survey was done using questionnaire and anthropometric measurements to collect data from 324 elderly persons. A multistage proportional-to-size cluster sampling involving four stages was followed to obtain a total of 324 respondents that were used in this study. Data was analyzed using Statistical Package for Social Science version 23. Descriptive statistics like frequency distributions percentages, means and standard deviation were used to describe the socio-demographic characteristics of the elderly people in Moiben Sub-County. Chi- square was used to test the relationship between Food Security nutritional status and the socio-economic factors of the elderly people at 5% level of significance. Majority of the households (50.6%) depended on farming as a source of income. The prevalence of undernutrition according to the findings was (41%). The study found a strong significant relationship between food security and nutrition status of the elderly people (chi-square =291.731[a], df=6, p-value=0.000). The study also showed a strong association between food security and some of the socio-economic factors such as household size, gender, source of income and substance abuse (chi-square= 39.105[a], df=6 and p-value=0.000; chi-square=41.502[a], df=2 and p-value 0.000; chi-square=25.218[a], df=10 and p-value=0.005 and chi-square=26.263[a], df=4 and p-value=0.003) respectively. In conclusion, optimal nutrition in the elderly has implications for improving their health status and general well-being, as well as for reducing the burden on limited health care resources. The challenge is to identify and tackle the basic and underlying causes of food insecurity and poor nutritional status of the elderly in Moiben Sub-County, Uasin-Gishu County. The study recommends establishment of nutrition awareness compaign in Moiben Sub-County, provision of monthly stipend to the elderly people and sensitization of the elderly people on side effects of engaging in irresponsible behaviors like alcoholism and smoking.

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LIST OF ABBREVIATIONS AND ACRONYMS

AMPATH	Academic Model Providing Access To Health Care
AIDs	Acquired Immune Deficiency syndrome
BMI	Body Mass Index
CBS	Central Bureau of Statistics
CCNP	Climate Change National Policy
CDC	Centre for Disease Control
CPP	Cyclone Preparedness Programme
DAO	District Agricultural Office
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization
FNSP	Food and Nutrition Security Policy's
GOK	Government of Kenya
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immunodeficiency Virus
KFSSG	Kenya Food Security Steering Group
KNBS	Kenya National Bureau of Statistics
MoA	Ministry of Agriculture
MoE	Ministry of Education
MTRH	Moi Teaching and Referral Hospital
NCST	National Council of Science and Technology
NGEC	National Gender and Equality Commission
NGO	Non- Governmental Organization
RTI	Research Triangle Institute
SDGs	Sustainable Development Goals
SPSS	Scientific Packages for Social Sciences
UNFPA	United Nations Population Fundation Fund

OPERATIONAL DEFINATION OF TERMS

Elderly-Individuals above 60 years with functional impairments

Food insecure- Household is uncertain of having or unable to acquire enough food to meet basic needs for all household members at some time during the year because they cannot afford enough food.

Food secure -All household members have access at all times to enough food to meet basic needs for an active and healthy life.

Food security-Access by all people at all times to sufficient food required for a healthy and active life during and throughout all the years.

Household-All persons eating and sleeping under the same roof (house) and same cooking arrangement.

Life span- The maximum age to which members of species can live.

Malnutrition -The abnormal physiological condition caused by deficiencies, excesses or imbalances in energy, protein and/or other nutrients.

Morbidity-Refers to sickness or illness

Nutrition security-The condition of having access to all the food, health, social, economic and environmental factors necessary to achieve a nutritional well-being within the appropriate cultural context

Nutritional status-The physiological state of people that results from a combination of food intake, health and sanitation condition

Under-nutrition-A result of prolonged low level of food intake and/or absorption of food consumed and manifestations include wasting, stunting or underweight, reduced cognitive ability, poor health status and low productivity.

Vulnerability-A heightened or increased exposure to risk as a result of one's circumstances.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally, the number of persons aged 60 years and above is growing rapidly. It has risen from 962 million in 2017 and is projected to double to 2.1 billion in 2050 and to triple to 3.1 billion by 2100 (UN, 2017). According to the (KNBS, 2010), the population of persons aged 60 years and above in Kenya was about 1.5 million, representing 4 percent of the total population. Majority of these elderly persons reside in communal areas where they struggle to meet their basic needs and according to (Elia, Russell and Straton, 2010), 51% of the chronically ill are the elderly people above the age of 60 because of unaffordable medical bills that are coupled with physical, functional and cognitive impairment that make them vulnerable to food insecurity.

The elderly are widely acknowledged to be a group which is nutritionally vulnerable due to age related biological factors that increase risk of nutritional deficiencies (Quandt*et al.,* 2011; Virtuoso Jr *et.al.,* 2012). WHO (2016) stated that due to rising cases of Acquired Immune Deficiency Syndrome (AIDS), there has been a rise in the number of orphans who are left in the care of the elderly. FAO (2010) indicated that approximately 5 million elderly persons in Africa were undernourished hence incapable of meeting their dietary needs. Moreover, children orphaned due to HIV AIDS and left under the care of the elderly do not receive the best of care due to ill health of their care givers (Nyambedha *et al.,* 2013). According to Visvanathan and Chapman (2012), the elderly experience early satiety, loss of appetite, physiological changes, physical immobility and swallowing problems. Consequently, the elderly

become vulnerable to malnutrition. Concerns have been raised by FAO, (2016) that the elderly may bear a disproportionate share of the burden of food insecurity and hunger because of poverty and economic stress due to lack of income and assets as well as the competing demands for money such as health care, transportation and housing costs.

For over a decade, the food security situation in Kenya has been precarious with major impacts on the population access to food and water in the overall levels of health and nutrition particularly among the most vulnerable groups (KFSSG, 2012). Despite government efforts to revitalize agriculture through reduced prices of inputs and improving the prices of food commodities, Uasin-Gishu County in which Moiben Sub-Sounty is situated, still experiences food scarcity (KFSSG, 2012).

Agriculture is the main source of food and income for the majority of rural small-scale farmers, and those in Uasin-Gishu County are no exception because 80% of the farmers in the County are small-scale owning less than 5 acres of land and depend mainly on agriculture as source of livelihood (Kimani, 2016). Traditionally maize, wheat and livestock have been relied upon by the farmers in the county as the main source of food and income. Unfortunately reliance on these crops has not been beneficial to the smallholder farmers most of whom are the elderly due to low incomes associated with them and the issue of failure to have enough rains for successful growth of their crops (Mithar *et al,.* 2015). The quality and length of life of the elderly are reduced by nutritional deficiencies whose risk factors are age related. Unless factors that enhance the household's food security are known and ways of promoting them are devised, inadequate access to food and poor intake of nutritious food will continue to compromise the overall health of elderly people in

communal areas (WHO, 2016). In the wake of the Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) crisis, African grandparents are taking on more responsibility for their grandchildren's care. In 2005, an estimated 24.5 million Africans were living with HIVand AIDS accounting for approximately 64% of global HIV and AIDS cases (UNICEF, 2017). The high mortality rates of adults with HIV and AIDS have produced approximately 12 million orphans whose care is largely been left to grandparents and other relatives. Academic Model Providing Access to Healthcare (AMPATH) program, which is under Moi Teaching and Referral Hospital (MTRH) offers treatment to HIV and AIDS patients via satellites clinical sites in several regions of western Kenya including Moiben division. These satellite sites were opened as a result of poor adherence to medication and return to clinic visits by the patients. Ensuring adequate food to meet the nutritional needs of the elderly delays the onset of some diseases, improves management of existing illnesses, strengthen their immune system and reduce the need for and length for hospitalization (Lesley, 2017)

The elderly are considered a vulnerable group because of cognitive, psychological and or physical problems that make them live at risk (Nyambedha, 2013), internal factors such as cognitive impairement,malnutrition and eternal factors such as inadequate housing lack of social networks among others threaten the health and safety of the elderly person. To address some of these shortcomings, collateral information is essential and may come from variety of sources including client's interview, talking to relatives, friend or seeking medical records.The results obtained from limited studies that have been carried out in Kenya on under-nutrition indicate cases of undernutrition and food insecurity among the elderly (Mutisya *et al.,* 2015). Lack of information limits the development of appropriate based strategies to combat under-

nutrition and food insecurity issues. There are numerous challenges faced by the elderly and their households in any given society. For example in the past, the elderly commanded respect and power, they controlled the land and played a role in conflict resolution.These roles are being eroded by change in family structure, migration of the young people to urban areas in such for jobs living the elderly to farm (Tanzania Progress, 2017).

1.2 Statement of the Problem

The number of persons affected by malnutrition has previously been predicted to reach 1 in 6 out of the global population by the year 2018. Moreover the population of the elderly is also expected to rise from 962 million in 2017 and is projected to double to 2.1 billion in 2050 and to triple to 3.1 billion by *2100 (*UN, 2017). In the United States, The Administration of Aging (AOA) reported that one out of four elderly Americans suffers from poor nutrition (AOA, 2015). In Africa the prevalence of under-nutrition in the elderly ranges between 9.8% to 36.1% in men and 13.1 to 27% in women (Charlton *et al.*, 2011).

The elderly persons are faced with many challenges when it comes to issues of nutrition and food security because most of them enter old age after a life time of poverty and deprivation, poor access to health care and a diet that is usually inadequate in quantity and quality (Suraiya, 2013). Poor nutritional status and food insecurity among the elderly increases the risk of morbidity and mortality because, their vulnerability exposes them to increased susceptibility to infections that may delay recovery and prolong hospitalization thus decreasing their quality of life (Ahmed and Haboubi, 2010). This study therefore assessed determinants of under

nutrition and food security among the elderly in Moiben Division Uasin-Gishu County.

1.3 Objectives of the Study

1.3.1 Broad Objective

To assess determinats of under nutrition and food security among the elderly in Moiben Division Uasin-Gishu County.

1.3.2 Specific Objectives

i. To characterize socio-demographic features of the elderly in Moiben Division.
ii. To determine the nutrition related morbidity ailments of the elderly in Moiben Division.
iii. To examine the relationship between food security and nutrition status of the elderly in Moiben Division.
iv. To assess association between socio-economic factors and food security among the elderly derly in Moiben Division.

1.4 Hypothesis of the study

H_{01}: There is no significant relationship between food security and the nutrition status of the elderly people aged 60 years and above.

H_{02}: There is no significant association between socio economic factors and food security among the elderly.

1.5 Justification of the Study

The multi-factorial issues that contribute to under- nutrition and food insecurity among the elderly have been attracting attention of many health practitioners. There is the assumption that nutritional deficiencies are inevitable consequence of aging, disease and that the elderly are food secure because they have reduced responsibilities (Mutisya *et al.,* 2015). Therefore interventions meant for improving their food security status, nutritional assessment and treatment are seen to have limited effect (Lesley, 2017). This is not true because nutritional assessment, treatment and provision of adequate social protection should be routine part of care for all elderly persons (Fletcher,2015).

Nevertheles, there are limited studies focusing on the nutrition and food security especially in the context of Uasin Gishu County. This study aimed at bridging the knowledge gap by assessing the prevalence of undernutrition and food security among the elderly in Moiben Division. This was necessitated with the background knowledge that Moiben is located within the bread basket region of Kenya and is considered an agricultural potential region yet it is food insecure (KFSSG, 2012).

The results of this study provided information relevant for planning, designing and development of policies and programs that will address the nutritional challenges faced by the elderly in Moiben division.

1.6 Assumptions of the Study

This study worked on the assumption that there was interplay between the individual, relationship and societal factors affecting food security and nutritional status of the elderly in Moiben. Among the individual factors identified were age, education levels, gender and income. The size of the family was considered a relationship factors while societal factors were medical care available to the elderly in case of ill health. The

study therefore assumed that some and not all the factors considered would have an impact on the food security and nutritional status of the elderly in Moiben division.

1.7 Limitations of the Study

The study relied largely on the recall ability of the elderly to remember information required. This recall ability of the elders was not expected to affect the results of the study from the data collected but in cases where an elderly person did not recall then there would be cases of missing data.

1.8 Delimitations of the Study

The study was conducted in Moiben Division, Uasin- Gishu-County yet the elderly experience problems throughout Kenya. Great emphasis was put on social determinants affecting the nutritional status of the elderly aged 60 years and above. The United Nations (UN) has not given a standard numerical criterion for definition of the elderly but its agreed cut-off is 60 years (Rashmi, *et al*, 2015) hence the reason for this study's concentration on the age of 60 and above.

1.9 Theoretical Framework

This study adopted the social ecological model to explain the factors that affect food security status among the elderly persons. It adopted the four components; individual, relationship, community and society which interplay in handling a particular issue.

Fig. 1: Socio-ecological framework. Dahlberg and Krug (2012)

This model considers the complex interplay between individual, relationship, community, and societal factors. It allows us to address the factors that put people at

risk for experiencing or perpetrating violence. Prevention strategies should include a continuum of activities that address multiple levels of the model. These activities should be developmentally appropriate and conducted across the lifespan. This approach is more likely to sustain prevention efforts over time than any single intervention. In this study, some of the individual and risk factors tha put elderly people into a threat of malnutrition and food insecurity comprise of the the use of substance abuse such as smoking and alcohol consumption. Based on this theory, these vices can be mimic for a sound health outcome of the elderly people in the rural set up like in Moiben sub county.

Individual

The first level identifies biological and personal history factors that increase the likelihood of becoming a victim or perpetrator of violence. Some of these factors are age, education income substance use or history of abuse. Prevention strategies at this level are often designed to promote attitudes, beliefs and behaviors that ultimately prevent violence. Specific approaches may include education and life skill training

Relationship

The second level examines close relationships that may increase the risk of experiencing violence as a victim of perpetrator. Person's closest social circle-partners and family members influence to their behaviours and contributes to their range of experience. Prevention strategies at this level may include mentoring and peer programs designed to reduce conflict foster problem solving skill and promote healthy relationships.

Community

The third level explores the settings such as, schools work place neighborhoods in which social relationships occur and seeks to identify characteristics of these settings that are associated with becoming victims of perpetrators of violence. Prevention strategies at this level are typically designed to impact the climate, processes and policies in a given system. Social norm and social marketing campaigns are often used to foster community climate that promote healthy relationships.

Societal

The fourth level looks at the broad societal factors that help create a climate in which violence is encouraged or inhibited. These factors include social and cultural norms. Other large societal factors include the health, economic educational to maintain economic or social inequalities between groups in society since the current society is termed as dymamic with multiple dimensions. The ultimate goal is to stop violence before it begins. Prevention requires understanding the factors that influence violence. Centre for Disease Control (CDC) uses a four-level social-ecological model to better understand violence and the effect of potential prevention strategies (Dahlberg and Krug, 2012).

In general, aspects of the theoretical framework which are believed to have an impact on this study include individual factors such as age, education, and income which may affect an individual's nutrition status and their food security status. Moreover, an elder's social circle such as family members in household may influence the choices they make concerning their food intake hence their nutritional and food security status given that the larger the family the more expenditure is incurred on food items.

1.10 Conceptual Framework of the study

A conceptual framework is the system of concepts, assumptions, beliefs and theories that supports and informs the research. Sirey, (2011) indicates that it is a visual or written product that explains either graphically or in narrative form the main things to be studied such as key factors, concepts or variables and the presumed relationships among them. It is the way ideas are organized to achieve a research purpose and helps in the justification of the research.

This study adapted conceptual framework advanced by Dahlberg and Krug, (2012). The study further re-classified the four theoretical factors (individual, relationship, community and societal) into four factors namely (social, economic, substance abuse and health). The factors collectively constituted the independent variables of the study.

The social factors comprised of the age, gender, marital status, education level and religion. The economic factors included source of income, household size and expenditure. The substance abuse factors entailed alcoholism and smoking and finaly, health factors were made up of anthropometry and morbidity. The dependent variable on the other hand comprised of the food security and nutrition status of the elderly people.

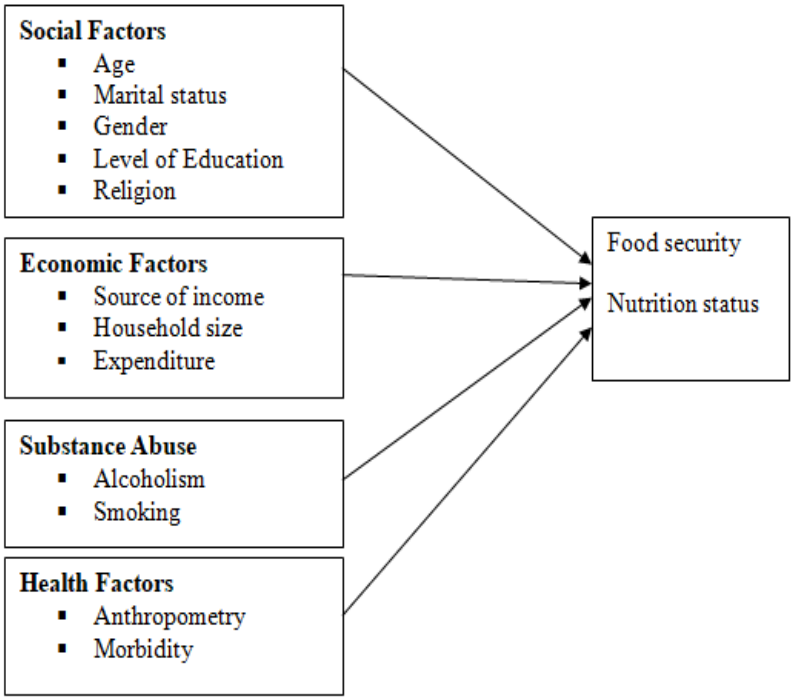


Figure 1. Conceptual framework showing relationship between food security and their determinants

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides literature concerning issues of socio-demographic and economic characteristics of the elderly, health implications of aging on food security; nutritional status of the elderly, physiological changes in elderly age, malnutrition and obesity, nutritional needs of the elderly, food and nutrition security. It reviews literature under the following topics; Food and nutrition security in the world, consequences of food insecurity for the elderly and the social protection system.Revisit

2.2 Socio- demographic and Economic characteristics of the elderly

Studies have shown that socio-demographic and economic factors such as gender, household composition, age, education and income may affect the choice and quality of people's diet (Bantry *et al.,* 2011). The choice of food among both male and women may be affected due sensory changes, dental problems and other physiological changes. However females may be advantaged in that they may prepare meals unlike their male counterparts who may not cook if left alone, may be due to lack of cooking skills (Mahan, *et al.,* 2010). Soaring food prices have also hampered food availability as the elderly cannot afford safe and nutritious food as well as high costs for food production (Brownie *et. al.,* 2016). Socio economic status plays an important role in health behaviours and status of the elderly (Garcia and Grande, 2010).

Healthy and varied diets tend to cost relatively more than energy rich and nutrient poor diets (Drewnowski, 2010). According to Capacci, Mazzocchi & Shankar (2012), healthy foods such as fruits and vegetables cost more than a basket of junk foods

hence, food intake of the elderly decreases not only for the decline of their nutritional needs, but also due to reduced income levels (Garcia and Grande, 2010). This might also be associated with lack of knowledge on healthy diets because the illiterate have difficulty in learning about nutrition related management methods (Gazan *et al.,* 2016).

Food insecurity has been associated with a wide array of negative health outcomes both among the young and the elderly. Research has shown that households suffering from food insecurity are more likely to have adults who have lower nutrient intakes (Kirkpatrick and Tarsuk, 2018). Financial well-being at elderly age, is also clearly important for health as those with more resources can better avoid and combat disease.

2.3 Health Implications of Ageing on Food Security

People become more prone to disease and illness as they age and this provides stress on the available social institutions for medical care (WHO, 2012) as an increase in elderly frail people will be an acknowledged challenge to community and acute care services (Keleher and Joss, 2009).

According to Grobbbler, *et al. (*2016) studies done in developing nations indicate increased prevalence of chronic disease, including heart disease, diabetes, arthritis, hypertension, as well as increased incidences of all cancers that make the elderly become more vulnerable. They may resolve to selling stored food in order to get medication resulting into a negative impact on food security. Food and nutrition status can also be affected by failure to perform basic tasks like meal preparation (Houde and Melillo, 2014). However, it remains unclear if morbidity will increase with ageing if there is good health promotion which may result in a more active healthier

elderly populations but according to Song *et al.* (2013) education is a very significant factor in getting knowledge on how to manage chronic diseases among the elderly. The perception is that literate people are more able to grasp knowledge faster and easier, and can easily access information on nutritional behaviors.

2.4 Nutritional Status of the Elderly

The nutritional status of the elderly is a predictor of disease, death and quality of life. In the current society, nutrition issues has attracted attention of many scientists and scholars in health related discipline (Wolfe *et al.,* 2013). Studies indicate that under-nutrition due to food insecurity leads to an increased burden of disease, Decreased dietary intake for example is associated with increased risk of ill health and functional decline (Ngatia *et al.,* 2016).

Good nutrition through out the lifespan tend to support a healthy. Nutrition has multi-dimensional effects on cognition,functionability and survival. Good nutrition aids in preventing cognitive decline, loss of muscle mass, fraility and loss of funtionability (Quandt *et al.,* 2011).

2.4.1 Physiological Changes

Physiological changes that occur with ageing that have a drastic effect on the diet and nutrition of our senior citizens according to Mahan and Escott-Stump, (2010) are as follows;

Digestion

Impaired digestion due to: Deterioration of digestive enzyme production and efficiency. For example, a decrease in the amount of lactase enzyme required for the digestion of lactose may occur thus interfering with digestion of dairy products and

thus decreases calcium. This may lead to osteoporosis. A decrease in the production of stomach acid (hypochlorhydria), which can occur in up to 30% of older people, may lower absorption of vitamin B_{12} thus causing pernicious anemia. Constipation is a common affliction in the aged due to slower bowel movements caused by inadequate liquid and dietary fiber intakes and a sedentary lifestyle. Studies have shown that elderly people who suffer from constipation tend to eat fewer meals per day, drink too little liquid, ingest too little energy and suffer from depression. Many medications that are taken on a regular basis by our senior citizens, can also contribute to constipation (Mithar *et al.*, 2015).

Mouth and Teeth

Oral health problems like dry mouth or xerostomia due to inadequate production of saliva can affect more than 70% of the senior population and has a significant negative effect on food and nutrient intake (Alexandra *et al*, 2015). Loss of teeth and ill-fitting dentures can seriously affect an elderly person's ability to chew food and may influence micronutrient intakes including Vitamin B_{12} (Elmadfa and Meyer, 2014).

People who wear dentures are known to chew up to 85% less efficiently than individuals who still have their own teeth. Burden of oral disease is more significant among the elderly than young age groups. Lack of own dentition can make older people avoid eating meat, fresh fruit and vegetables which causes energy, iron, vitamin C and beta-carotene deficiencies (Ginter and Simko, 2013).

2.4.2 Food intake and the three Senses

Sensory perception loss is common in the ageing process. Because seniors have an impaired ability to taste and smell their food, they get less pleasure from eating which can reduce food and nutrient intake. This can also expose elderly people to the risk of food poisoning because of their reduced taste perception (dysgeusia) and impaired ability to smell (hyposmia). The lack of these two senses also blunts the metabolic responses of the body especially secretion of saliva, gastric acid, pancreas enzymes and insulin. According to a study conducted in South Africa by Charlton *et al.* (2011) it acknowledged that the elderly are unable to taste in addition to smell and this may reduce the appetite for necessary foods.

Deterioration or loss of sight may also negatively affect food intake because part of the pleasure of eating, is associated with the visual appeal of foods (Mahan and Escott, 2010).

2.4.3 Metabolism Changes

Gazan *et al.* (2016) suggests that there are several metabolic changes that occur in old age. They include reduced glucose tolerance. With each decade of life, our blood glucose levels increase by 1.5 mg/dL thus leading to reduced glucose tolerance and in severe cases to the development of type 2 diabetes. This may worsen the situation for the elderly as indicated by Asif (2014) that prevalence of diabetes leeds to change in lifestyle and diet. People have to let go other foods due to their implications on their health.

As people age and become less physically active their RMR (Resting Metabolic Rate) the energy the body uses to fuel processes like breathing, digestion, blood circulation can decrease by up to 20%. This means that elderly people have a lower dietary

energy requirement. If they continue to eat as much food as when they were younger and more active, the excess energy will be stored in the form of fat causing overweight and obesity (Ginter and Simko, 2013).

Elderly people, particularly women, are more prone to hypertension (high blood pressure) because their blood vessels become less elastic. Raised cholesterol levels are also common leading to heart disease and heart failure. Among the greatest challenges that the elderly people face, are loss of lean body mass (muscle tissue) and increase in body fat. This loss of muscle tissue or sarcopenia amounts to a decrease of 2 to 3% per decade and contributes to deterioration in physical function (Asif, 2014). This coud be due to the consequences of scarponia that is often severe in elderly age, as the strength and functionability declines associated with scarponia can in turn contribute to a number of adverse health outcomes including loss of function, disability and fraility (Dufour, *et al.*, 2013). On the other hand, the body fat percentage in men tends to increase from 15% in youth to 25% at the age of 60 years. In women the increase is even greater, namely from 18-23% in youth to 32% in 60-year-olds. These changes in body composition are due to hormonal changes (lower testosterone production in men and menopause in women), and a reduction in physical activity associated with the ageing process (Mahan and Escott, 2010).

2.5 Malnutrition and Obesity

Under-nutrition or malnutrition is the result of insufficient macro and micronutrients and trace elements that are needed to maintain the health of individuals and play crucial roles in both immune functions and to meet optimal physiological requirements (Lesourd, 2014, Woods *et al,*. 2013). Malnutrition appears to be prevalent among 5-10% of independently living elderly individuals, 30-60% of

institutionalized patients, and 35-65% of hospitalized patients (Brownie, 2016). This is due to frequent overall decline in food intake among the elderly that usually result in more frequent short illnesses according to findings by Sirey *et al.*, (2011).

According to Boulos *et al.* (2013), the biological advantage that women have is taken as a certainity, because the mortality of males is higher than that of females from the very onset of life. Male's mortality rate is 25-30% greater than female because the genetic advantage of female is evident by Xchromosomes.When one X chromosome for both is mutated the extra chromosome for female will compensate to allow better resistance to aging than male. A study by (Ginter and Simko, 2013) found that women lived longer unlike men who were more likely to suffer from malnutrition and to acquire fatal illnesses such as arthritis, chronic back pain, asthma and anemia rendering them more dependent in their daily lives. Under-nutrition is also an important predictor of morbidity and mortality and lowers the quality of life of the elderly who tend to fall sick more frequently (Dionigi, 2015). Most of the elderly had cognitive impairment, falls, hospitalizations and postoperative complications both in developed and developing countries (Banrtry, 2011).

2.5.1 A healthy diet for the Elderly

A healthy diet is an important part of a healthy life style for people of all ages. Elderly individuals may require a healthy diet that has adequate nutrients. A healthy diet with adequate calories and appropriate levels of key nutrients is needed for basic metabolic and nutritional requirements in order to maintain physical and mental functioning (FAO, 2016) whereas inadequate nutrition can lead to loss of functioning and development or progression of disease.

The nutritional requirements are not well defined for the elderly persons and the process of ageing also affects nutrient needs. As people age, the ability to store

nutrients declines and the regulatory and recovery abilities are also affected. However, the nutritional requirements of elderly are diverse and are influenced by health, physiological function and susceptibility to disease. For example, while requirements for some nutrients may be reduced, some data suggest that requirements for other essential nutrients may in fact rise in later life. There is thus an urgent need to review current recommended daily nutrient allowances for this group. There is also an increasing demand worldwide for WHO guidelines which competent national authorities can use to address the nutritional needs of their growing elderly populations (WHO, 2012).

2.5.2 Energy requirements

The energy requirements of the elderly persons reduces as they age due to a reduction in basal metabolic rate as a result of ageing, and a possible reduction in levels of activity because, elderly people require less energy than younger adults. The level of energy required is dependent on a number of factors including age, gender, body composition, weight and activity levels (Virtuoso *et al.*,2012). Generally energy requirements continue to decrease with increasing age due to loss of fat free mass. As a consequence, resting energy expenditure is found to be lower in elderly subjects when compared to young subjects (Frisard, *et al.*, 2014). According to Wu and Sullivan, (2011) women have a higher proportion of body fat compared to men and they consume fewer kilojoules per kilogram lean mass and burn fat more preferentially during exercise compared to men.

2.5.3 Protein requirements

Elderly persons are vulnerable to protein-energy malnutrition associated with a progressive decline in body protein manifested by declining fat-free mass (FFM). The reduction in FFM is attributed mainly to the loss of skeletal muscle and is associated with reduced muscle strength as well as predisposition to many metabolic disorders. Dillion (2013) looked at whether a high protein diet of 3.0 g protein per kg and what they classed normal protein diet of 1.5 g per kg had any effect on post absorptive muscle changes in ageing by using young and elderly volunteers. They found a high protein diet did not stimulate muscle protein synthesis in elderly people. The high protein diet did not have an adverse effect on insulin sensitivity, but it did have a potentially negative effect on glomerular filtration in elderly people, causing concern about the potential adverse effect on kidney function. It is possible that the maximal benefit from dietary proteins is already achieved with a normal protein diet

2.5.4 Fat requirements

Although there are no specific recommendations other than those for the adult population as a whole, it is worth considering fat intake. Increased fat intakes are associated with higher levels of overweight and obesity, cardiovascular disease, some forms of cancer and Type 2 diabetes. These conditions are associated with increased levels of morbidity and mortality and as such could impact on a person's ability to live independently. Fats provide the most concentrated source of energy of any food item and contribute significantly to the feeling of satiety after eating. It act as carriers for fat-soluble Vitamins and enhances palatability of other foods (Owuor, 2010).

2.5.5 Vitamins and Minerals requirements

In general, energy requirement continue to decrease with increasing age due to loss of body muscle stores and reduction in activity levels (Kirkpatrick and Tarasuk, 2018). Despite reduced energy intake for the elderly, the vitamins and minerals should be provided in adequate amounts.

2.5.6 Folate and Vitamin B6 requirements

The metabolic demand for Vitamin B_6 to maintain glucose tolerance and normal cognitive function tends to increase in elderly people, possibly resulting in increased requirements for Vitamin B (Mutisya *et al.,* 2016). Furthermore, in conjunction with B_{12} and folate, Vitamin B_6 confers protection against elevations that might occur in homocysteine, an independent risk factor for cardiovascular disease and depression.

2.5.7 Vitamin C requirements

Vitamin C is needed for several functions in the body including formation and maintenance of healthy tissues as well as good wound healing (Kakwani *et al.,* 2015). Anti-oxidant action helps to protect the body from damage caused by toxins. Vitamin C requirements for elderly people are the same as younger adults, but unfortunately intakes are often sub-optimal (Mahan and Escott-Stump, 2010)

2.5.8 Vitamin D requirements

Vitamin D is among the essential vitamins for both the elderly and children primarily for bone health and for calcium absorption a scientific review by Kirkpatrick and Tarasuk (2018) showed a moderate relationship between Vitamin D and muscle strength suggesting a role for Vitamin D in the development oand preservation of muscle mass and function. Deficiency may result in rickets for children and osteomalacia in adults (Tanchoco, 2011). Osteomalacia was associated with increased

risk of fractures in elderly persons More recently low Vitamin D status has been implicated in a range of diseases including osteoporosis, several forms of cancer, cardiovascular diseases, tuberculosis, multiple sclerosis and type 1 diabetes (Neeraj *et al.*, 2012).

2.5.9 Vitamin E requirements

Vitamin E is a very effective chain-breaking, lipid-soluble antioxidant present in the membrane of all cells and has been found to generally improve cell-mediated immune function in healthy elderly when given vitamin E supplementation (Suraiya, 2013).

Most of the research relating to the elderly people's nutrition has been carried out in developed countries but opinions are changing as the extent of research in this area increases. Furthermore, it is debatable whether some of their commendations are correct for African populations.

The nutritional requirements listed in Table are those that are widely accepted and relevant.

Table 1.The recommended vitamin allowance for the elderly.

WHO, (2011) **>60 yrs: lower**	**Coastes *et al.*, (2007)** **>51yrs: upper**	**Adequacy of RDA for older people**	**Adequacy of RDA for older people**
Vitamin A	500-600ug RE	800-1000ug RE	RDA may be too high. However, Vitamin A is important for antioxidant properties
Vitamin D	3.2ug	5.0ug	RDA may be too low
Vitamin E	-	8-10mg	Limited data, important for antioxidant properties; may Contribute to improved immune system.
Vitamin k	-	65-80ug	No data
Thiamin	0.9mg	1-1.2mg	Adequate
Riboflavin (B2)	1.4mg	1.2-1.4mg	Adequate
Niacin	10.3-11.9mg	13-15mg	No data
Vitamin B_6	-	1.6-2.0mg	May be too low
Folate	160ug	180-200ug	Adequate but active form dependent on adequate B_{12} availability
Vitamin B_{12}	-	2.ug	May be too low
Ascorbate (Vit C)	30mg	60mg	Adequate, important for antioxidant properties
Biotin	-	30-100ug	No data

Source:WHO, (2011): Adapted from: Nutrition in older people. Ausman and Coastes *et al.,* (2007)

Table 2.Recommended minerals for the elderly

	WHO, (2011) **>60 yrs: lower**	**RDA (2004)** **>51yrs: upper**	**Adequacy of RDA for older people**
Calcium	-	1000mg-1300mg	Adequate
Iron	15mg (low availability)	10mg (high availability)	Research equivocal
Magnesium	-	280 – 350ug	May be too high
Zinc	-	12 –15 mg	Adequate
Selenium	-	55-75ug	Adequate
Other trace elements e.g chromium, phosphorous, fluoride, iodine, manganese	-	-	No RDAs and/or inadequate information on adequacy for older people

Source: Adapted from: Nutrition in older people. Charlton *et al.,* (2011)

2.5.10 Calcium requirements

Adequate intakes of calcium can help to slow age-related bone loss, which can result in osteoporosis and fracture. According Mithar *et al.* (2015), the elderly persons especially the women, requires adequate intake of Calcium and vitamin D because the higher calcium requirements in estrogen-deprived post-menopausal women are essential to maintain bone and help prevent osteoporosis.

2.5.11 Zinc requirements

Zinc (Zn) is an essential trace element found at the greatest concentration in the bone, liver, kidney, muscle and skin. As Zn is not stored in the body there is a requirement for a constant adequate supply of dietary Zn. Primary food sources of Zn are protein rich foods. Studies have reported that about 40% of adults aged over 70 years had inadequate zinc intake (Fischer and Johnson, 2011) A zinc deficient status leads to cognitive impairments and disturbances of learning, thought, memory attention, and ageing may contribute to the development of frailty, including impaired immune function, and increased incidence of age related degenerative diseases. Whilst many studies have investigated the decline in dietary zinc intake with age, the concept that ageing may have a direct effect on dietary zinc absorption has only begun to be explored (Coleman *et al.*, 2011)

2.6 Emperical reviews on Food Security

2.6.1 Food and nutrition security in the world

According to Tanchoco *et al.* (2011), old age is an inevitable, irreversible and progressive biological phenomenon that is unavoidable hence good nutrition achieved due to food security is important for maintaining good health and personal productivity based on the physiological changes that occur at this stage of life. According to the UNFPA, (2011), the proportion of people aged 60 and above is growing faster than any other age group in almost every country of the world. Households who experience food insecurity can be categorized into two groups; low food security and very low food security. Individuals who experience low food security often experience uncertainty in access to food or reduced diet quality, variety or desirability; however, these households rarely experience disruption of normal

eating patterns (WHO, 2010). Those who experience more severe food shortages are classified as being very low food secure, which is identified by frequently reduced food intake and disrupted eating patterns (Bickel *et al.,* 2010)

Climate change impact, deforestation, degradation and soil fertility decline are causing instability in agricultural production and productivity at various magnitudes in a global context (Omar *et al.,* 2013). Vulnerable to food insecurity are the elderly who are experiencing both psychological and physiological challenges. They are unable to cope with natural disasters because they lack knowledge and skills to reduce their risks (Oxfam, 2013). At the micro level (household or individual), food security depends on a number of factors which are related for most part to various forms of entitlements to income and food producing assets as well as the links between domestic and external markets which is not easily accessed by the elderly in Moiben (GoK, 2009). Farming offers an opportunity to households to produce a variety of food stuffs for consumption of balanced diet.

2.6.3 Food and Nutritional Risks Among the Elderly

According to Brownie, (2016), nutritional status for the elderly is a predictor of disease, death and quality of life and an indicator of health service demands with a higher prevalence among those staying in rural and peri-urban areas (Wolfe *et al.*, 2013). Studies indicate that under-nutrition due to food insecurity leads to an increased burden of disease (DeVries *et al.*, 2009). For example, decreased dietary intake is associated with increased risk of ill health and functional decline (DeVries *et al.*, 2017).

According to Woltil (2012) lack of social support among the elderly predisposes them to food insecurity. This is because the social support accorded to the elderly by

friends and family members in form of safety nets can keep the elderly at bay. For instance, family members may provide assistance to the elderly for a long time unlike friends whose support may be short lived. Other factors that play a crucial role in determining the food and nutrition security of the elderly are skills in food management, high medical bills, limited mobility and physical health complications (Locher *et al.*, 2015). Such factors limit the elderly's ability to obtain and consume food. On the other hand, Woltil (2012) emphasizes that closeness to groceries and good transport network can increase food and nutrition security among the elderly.

2.6.4 Medical Factors and Food/Nutrition Security of the Elderly

According to Visvanathan and Chapman, (2012) there are several medical factors that affect the food and nutrition security of the elderly. Top in the list are chronic illnesses, dementia, depression and poly-pharmacy that tend to reduce intake of food. Moreover, multiple intakes of medications on a daily basis may cause food and drug interactions consequently interfering with food metabolism, absorption and excretion (Herne, 2015).

2.6.5 Consequences of Food Insecurity for the Elderly

Food security and nutritional determinants among the elderly is complex, but the underlying issues are most often decreased nutrient intake and loss of nutrients due to poor accessibility, availability and utilization (Brownie, 2016). Poor health status such as functional decline, disabilities and other age related physiological changes such as decreased sense of taste or smell and polypharmacy affects the ability of elderly people to choose, purchase, prepare, eat, enjoy and even digest foods (DeVries *et al.*, 2017).

Other determinants include poverty among the elderly with few or lack of resources to afford high food prices contribute negatively to diet quality. According to Ginter and Simko (2013), women live longer than men, because men are more likely to suffer from malnutrition and to acquire fatal illnesses such as arthritis, chronic back pain, asthma and anemia rendering them more dependent in their daily lives. Household structure where an elderly person lives alone in social isolation may result in depression (Brownie, 2016). According to the WHO, (2012) Framework for Active Ageing, behavioral determinants of under-nutrition in ageing include limited information or knowledge about nutrition, unsuitable food choices that are not nutritious enough to nourish the body and restrictions to ability to purchase fresh foods and/or prepare healthy meals due to poor socio-economic status or physical or cognitive disablement.

2.7 Social Protection Program System

The UNICEF, (2017) conducted an audit of the cash transfer on the following areas: Programs for the Orphans and Vulnerable Children (OVC), Persons with Severe Disability (PWSD), Elderly persons in 21 sub-counties of Kenya. The audit was limited to 12 counties; Machakos, Kirinyaga, Marsabit, Nakuru, Vihiga, Siaya, Kajiado, Mombasa, Kilifi, Nyamira, Homabay and Baringo to provide the national and county governments with a snap shot account of the implementation of the cash transfer program and the level of participation of the vulnerable populations in programs designed for them (Asfaw *et al*,, 2014). They found out that most elderly people age 60 years and above had severe nutritional problems since they mainly leave in isolations and lack social support from their relatives.

Following this, the Kenyan government has made several efforts to protect and promote the rights of the elderly and have adopted social protection programmes whose main objective is to promote sustainability and alleviate poverty as well as enhance human capacity and development (Rosenberg *et al.,* 2014). This has led to investment and development and expansion or scale up of social protection initiatives as means of protecting the poor and vulnerable with emphasis on the cash transfers as an integral instrument in delivering a more robust social protection framework. Considering that few counties were chosen, majority of the elderly especially in rural set ups are not benefiting from cash transfers because; they lack information on the existence of the programs, bias and discrimination during registration and distribution of cash transfers and unfair criteria for program registration (Asfaw *et al,,* 2014).

2.8 Summary of Literature Review

Nutrition research and interventions have traditionally focused on the needs of the under-five and lactating mothers. It is a fact that very little is known about the specific nutritional needs and food security status of the elderly people in Africa. The elderly are faced with poor financial ability to meet their dietary requirements among other basic needs. Impaired physical and functional ability as well as age associated changes in their physiological and psychological status tend to influence their food intake and food pattern. Immune competence of the elderly is reduced due to increased susceptibility to infections as a result of inefficient functioning of vital organs such as kidney lungs and the gastro-intestinal tract. Presence of chronic generative diseases, dental problems, poor appetite, as well as drug use can also affect food intake, absorption and utilization.

Population aging and the growing number of elderly people are two of the most important demographic changes that have emerged during the last decades of 20th century. An increased number of elderly people in developing countries will however be susceptible to low income, infections and their nutrition status will interact with this conditions and may lead to food insecurity.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter gives the processes that were used in carrying out the study including; research design, description of the study area, target population sample determination, sampling procedures, pretesting of research instruments, data collection and data analysis.

3.2 Study Design

A cross sectional descriptive survey was adopted in this study where quantitative data were collected. This enabled sampling of study subjects from the population of interest that were measured at a single point in time (Cohen, *et al.*, 2015). The design was applied in this study since the intention of the researcher was to examine and report on the nutrition and food security status of the elderly in Moiben at a given point in time and report the situation as it is.

3.3 Study Area

The area of study was Moiben sub county located in the currently known as the Uasin-Gishu County. Although Moiben is classified among the high agricultural potential areas in Kenya, it is faced with challenges such as seasonal food scarcity that hinder sustenance of household food security (KFSSG, 2012). Moiben division consists of 10 locations namely: Moiben, Mumetet, Kaplolo, Karuna, Kimoning, Koitoror, Chepkoilel, Sergoit, Tembelio and Meibeki. Moiben division has a population of 92,717 (KNBS, 2010). The main economic activities in the division include both large and small scale maize, wheat, passion fruit and dairy farming.

3.4 Target Population

The target population consisted of elderly persons above 60 years living in Moiben. This age limit was based on WHO standards (WHO, 2011).

3.5 Eligibility

3.5.1 Inclusion Criteria

1. All elderly people above the age of 60 years.
2. Permanent residents of Moiben who have lived in Moiben for more than one year.

3.5.2 Exclusion Criteria

Any people who refuse to participate in the study and who was seriously sick was excluded.

3.6 Sample Size

The study employed the use of Charan and Biswas, (2013) formula for sample size determination since it suitable when the population is given.

$S=\chi^2NP\ (1-P)/d^2\ (N-1) + \chi^2P\ (1-P)$ ……...……..(3.1)

Where:

S=Sample size

χ^2=Table value of Chi-square for 1 degree of freedom at 95% confidence level (3.841)

N= Population Size

P=population Proportion (assumed to be 0.5 since this would provide the maximum sample size)

d= Degree of accuracy expressed as a proportion (0.06)

Therefore:

S=3.841*3700*0.50(1-0.50)/0.06^2*(3700-1) +3.841*0.50(1-0.50) = 324 ..……..(3.2)

The sample size was then proportionately allocated per location based on their elderly population. The location level population data were obtained from chiefs, sub-chiefs and elders in respective locations. Thus, the estimated number of the elderly persons aged 60 years and above in Meibeki was estimated to be Meibeki 1600, Karuna 1200 and Koitoror 900.

Therefore the number sampled per location in each of the three locations were;

Meibeki = 324 x 0.432 = 140

Karuna = 324 x 0.324 = 105

Koitoror = 324 x 0.243 = 79

3.7 Sampling Procedure

A multi-stage proportional-to-size cluster sampling involving five stages was followed. The first stage, Moiben division was selected purposively for this study since it is the largest division with high number of elderly people according to the 2009 census report. The second stage involved randomly selecting three out of ten locations within Moiben division using lottery method. This was done by selecting the locations involved through writing yes or no on pieces of paper, folded and put in a bowl. The pieces of paper were then thoroughly mixed and a representative from each location picked a folded piece of paper.Those that picked yes participated in the study which made up the 3 selected locations; Meibeki, Karuna and Koitoror. In the third stage, elderly people aged 60 years and above were clustered into three locations

namely Meibeki, Karuna and Koitoror. In the fourth stage, the number of respondents was obtained by determining the proportion of total number of elderly people in each location against the computed sample size of 324 elderly people. In the final stage, a sampling frame table was created and by use of lottery method, representative foreach of the location was asked to pick the required number of the elderly for the study. One elderly person was interviewed per selected house hold, usually the husband as head of the house hold in African context but in circumstances where he was absent or unable then the wife was interviewed. The table below shows the distribution of elderly people across the three locations.

Table 3.6 Distribution summary of elderly people in the three locations

Name of Location	**Population per Location**	**Sample size**
Meibeki	1600	140
Karuna	1200	105
Koitoror	900	79
Total	**3700**	**324**

3.8 Validity

Validity refers to the degree to which evidence and theory support the interpretation of test scores entailed by use of tests. The validity of instrument is the extent to which it does measure what it is supposed to measure. According to Mugenda and Mugenda (2009), validity is the accuracy and meaningfulness of inferences, which are based on the research results. It is the degree to which results obtained from the analysis of the data actually represent the variables of the study (Grobbler *et al.,* 2016). The research instrument was validated in terms of content and face validity. The content related

technique measures the degree to which the questions items reflected the specific areas covered. The study used experts such as nutritionists and statistician to test on the validity of research if research instrument. According to the experts report, the items in the research instrument truly measured the intendend purpose.

3.9 Reliability

Reliability is the ability of a research instrument to consistently measure characteristics of interest over time. It is the degree to which a research instrument yields consistent results or data after repeated trials. If a researcher administers a test to a subject twice and gets the same score on the second administration as the first test, then there is reliability of the instrument. Reliability is concerned with consistency, dependability or stability of a test (Muiruri *et al.,* 2016). The researcher measured the reliability of the questionnaire to determine its consistency in testing what they are intended to measure. This involved administering the same test twice to the same group of respondents who have been identified for this purpose. Questionnaires were pretested in one of the locations in Moiben that was not included in the study. To measure reliability Cronbach's alpha statistic was used to measure reliability of the items.Where a value of 0.8767 was found thus being reliable. It measures how well a set of variables or items measures a single, one-dimensional latent aspect of individuals.

3.10 Data Collection

Data was collected using interviewer administered questionnaires. This technique was chosen since it helped interviewers to clearly explain to respondents all the variables required for the study, assist respondents who do not know how to read and write to fill research questionnaires, enabled researcher to obtain first-hand

information and also to motivate them to participate in the data collection exercise (Alexandra, *et al.,* 2015). Questionnaire for this study was divided into three main sections namely, household demographic characteristics, anthrometric measurements, morbidity and food security assessment. The household food insecurity access score (HFIAS) was adopted from Food and Nutrition Technical Assistance (FANTA) Coates *et al. (*2007) (Appendix 4). Two research assistants with a minimum of high school qualification, some experience in data collection and spoke the local language were recruited and trained for two weeks to assist in the data collection process. They were trained on how to seek consent and the terrain of the area. Community entry was done through the area administration i.e. the chiefs and village elders. A consent was sought from the head of the household and questions were asked in the local language. Data was collected for a period of one month.

3.10.1 Food Security Measurement

The Household Food Insecurity Access Scale (HFIAS) was used to collect food security information. Seifu *et al*. (2015) maintain that HFIAS is useful in assessing whether households have experienced problems with accessing food during the last 30 days. The instrument consisted of nine occurrence questions and nine frequency questions; the questions on HFIAS inquired about the changes households made in their diet or food consumption patterns as a result of limited resources to acquire food. The respondent was first asked if a given condition was experienced (yes or no) and if it was then, with what frequency (rarely, solmetimes or often). The resultant responses were transformed into either a continuous or a categorical indicator. For continuous indicator, calculations for each of the nine questions was scored between 0-3, with 3 being considered the highest frequency of occurrence (often). The score

of each was then added together. The total HFIAS ranged from 0-27 indicating the degree of insecure access. As a categorical variable, households were categorized as mildly moderate or severe food insecure.The three categories created were then matched with the results of the continuous indicator (after scoring each of the nine questions) as follows; 0 to 2 indicated less food secure, 3 to 10 indicated moderately food insecure and 11 to 27 were categorized as severely food insecure. This tool was used to measure the level of food insecurity during the past 30 days as self-reported by the household and results in a continuous measure (0-27 with higher numbers meaning greater food insecurity) (Figure 3.1) or categorical designations (food secure, moderate food insecure and severe food insecure).

Figure 3.1 Scale for food security interpretation.

Source: Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (Coates *et al.*, 2007).

The HFIAS is the only tool that directly measures the household's experience of food insecurity, rather than using proxy measures such as food availability or anthropometry. Food availability has been measured in the past as a proxy for understanding food security; however, while the availability of food can be measured, it does not assure that individuals or households have access to it. Anthropometry, or measurements such as height, weight, arm circumference or even skin folds have been used as proxies for the assessment of food security, but these do not take into account individual variation or illness status (which can be linked to weight loss). While the HFIAS has advantages over these methods, it is also much quicker and easier to

administer and if it is properly adapted to the local setting, it is easy both to administer and interpret (Coates *et al.,* 2007).

3.10.2 Taking Weight Measurement

Weight measurement was done using bathroom scale (seca 760). First, the bathroom scale was placed on a flat surface calibrated measuring standard weights of 500g salt and 1kg, 2kg packs of sugar as described by (Mithar *et al.,* 2015). Participants with heavy clothingswere requested to remove for easy measurements. The clients stood straight with knees not bend, eyes facing 90 degrees angles and arms holding nothing.

3.10.3 Taking Height Measurement

Height measurement was done using height stadiometer and half arm-span. First, the stadiometer was placed on a flat firm surface and the subjects removed their shoes and took an upright posture with heels together. The measurements were then taken with the client standing tall, looking straight ahead with their heads upright and not tilted backwards. The heels of the subject also stayed flat on the floor. Finally, the measure on the stadiometer was lowered until it made contact with the client's head and the measurements were recorded to the nearest centimeter.

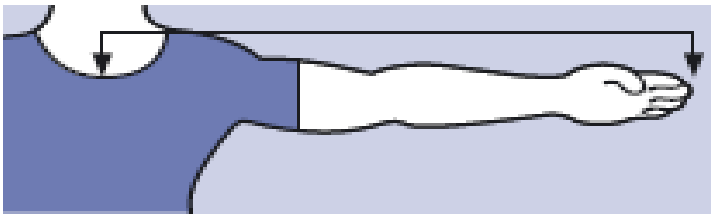
Circumstances arose where the elderly persons could not stand straight or were bending due to aging and other physical problems. In such circumstances half arm span was used to measure their height as proposed by Tanchoco *et al.,* (2011).

3.10.4 Measuring Height using Half Arm-span

Half arm-span is the distance from the midline at the sternal notch to the tip of the middle finger (Fig 3.3). Height is then calculated by doubling the half arm-span. First, the edge of the right collar bone (in the sternal notch) was located and marked. Then,

the participant was asked to place the non-dominant arm in a horizontal position while caution was taken to ensure that the participant's arm was horizontal and in line with shoulders. Using a tape measure, the distance from the mark on the midline at the sternal notch to the tip of the middle finger were measured while the arm was in flat position and the wrist straight. Half arm readings were taken in centimeters and height was calculated by multiplying the half arm-span measurement by 2.

Figure: 3.3. Measuring height using half arm- span



Source: Miranda and Nishimura, (2017)

3.10.5 Body Mass Index (BMI)

After taking the height Body Mass Index (BMI) was calculated. BMI is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2).

3.11 Data Management

Data management involves the process of collection, analysis and safeguarding of data base (Mithar, 2015). In this study, questionnaires were administered to the respondents in the form the primary data. The researcher with the help of research enumerator retrieved back the questions and checked for completeness. The data from the field was cleaned then coded using SPSS version 23. The data was then stored under strict security by use of password before further analysis was conducted.

3.12 Data Analysis

The processed data was analyzed by the use of both descriptive and inferential statistics techniques. Frequencies and percentages were computed to describe the key socio-demographic characteristics of the study sample. The descriptive statistics used tables, pie-charts and bargraphs to characterize both demographic and socio-economic features of the elderly people. An analysis was done using questionnaire that had a number of possible diseases that tend to affect the elderly as they age because their immunity goes down and they become prone to frequent infections (WHO, 2016). In this study, respondents were asked to state some of the diseases they had/have been suffering from within a given time interval. The name of the diseases and time under treatment was used to broadly classify the diseases into acute and chronic diseases. some of the respondents provided their clinical cards and books for their health history.

These can either be acute or chronic diseases. Malaria, typhoid, common cold and diarrhea are some of the acute diseases while tuberculosis, cancer, HIV/AIDS, hypertension, diabetes, peptic ulcers, arthritis and dental diseases are among the chronic diseases.The questionnaire had, a range of diseases in multiple choices to elicit information on some of the diseases that were analyzed in the data. Chi-square test was used to test the relationship between food security and nutrition status as well as association between food security and socio-economic factors. The significance level was constained at 95% for the test statistics.

3.13 Ethical Considerations

Ethical clearance for the study was granted by NACOSTI serial number A 6804. The respondents were requested to sign the consent form before participating in the study. The respondents participation in the study was also voluntarily. This allowed them to fully understand the purpose of the study and participate in the data collection exercise voluntarily. Results of the study was only be shared with the relevant stakeholders in the participant's sites. The information obtained from the respondents was handled with highest level of confidentiality.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter presents the report of the data gathered from the field including demographic in formation, social economic statistics of the respondents, nutrition and food security status of the respondents and lastly morbidity. Data was collected from 324 households in Meibeki, Karuna and Koitoror locations of Moiben division in Uasin Gishu County.

4.2 Socio-demographic Characteristics of Respondents

The demographic of the respondents was sought to give an insight on the respondent's characteristics which include age, gender, marital status, education and religion (table 4.1). More than half (56.17%) of the respondents were females and (65.12%) of respondents indicated that they were married while a very small proportion (3.4%) were either divorced or separated (25.6%) were widows/widowers. Half of the respondents were between the ages of 60 and 69 years on average across all the locations while just about(14.81%) were above the age of 80 years. Majority of the respondents (48.15%) had no formal education while only 8.02% had attained at least secondary education. Education across the different locations followed a similar trend with Meibeki having the highest number of respondents 51.72% without any formal education. This can be attributed to poverty and perception of respondents towards formal education . Households had on average 5 occupants per household with a standard deviation of ±2.5. In general, more than 99% of the respondents were Christians with Karuna and Meibeki having no Muslims at all.

Table 4.1: Socio-demographic Characteristics of respondents

Characteristics	Location			
	Total N=324	Karuna N=97	Koitor N=82	Meibek N=145
Gender				
Male	142 (43.82 %)	39 (40.21%)	35 (42.68 %)	67(46.21%)
Female	182 (56.17%)	58 (59.79 %)	47 (57.31 %)	78 (53.79%)
Civil Status				
Married	211 (65.12%)	63 (64.95%)	47 (57.32%)	101 (69.66%)
Divorced	11 (3.40 %)	3 (3.09 %)	5 (6.10%)	4 (2.76%)
Single	19 (5.9%)	12 (12.37%)	3 (3.7%)	4 (2.765)
Widow	83 (25.62%)	19 (19.59%)	27 (32.93%)	36 (24.83%)
Education				
Primary	142 (43.83%)	44 (45.36%)	42 (51.22%)	56(38.62%)
Secondary	19 (5.86%)	6 (6.19 %)	5 (7.32%)	7 (4.83%)
Tertiary	7 (2.16%)	0 (0%)	0 (0%)	7 (4.83%)
None	156 (48.15%)	47 (48.45%)	32 (39.02%)	75 (51.72%)
Religion				
Muslim	1 (0.31%)	0 (0%)	1 (1.22%)	0 (0%)
Christian	323 (99.69 %)	97 (100 %)	81 (98.78 %)	145 (100 %)
Age				
60-69	164 (50.62 %)	47 (48.45%)	47 (57.32 %)	70 (48.28%)
70-79	112 (34.57 %)	31 (31.96 %)	26 (31.71 %)	53 (36.55%)
Over 80 years	48 (14.81%)	19 (19.59 %)	9 (10.22 %)	22 (15.17%)
House hold size				
Mean(std)	5 (2.5%)	5 (2.7%)	5 (1.8%)	6 (2.6%)

In most households, women took care of their husbands while husband provided for the household needs. The implication is that singles may face the danger of long-term disesses as a result of little or no care.Consumption of nutrituos diets may become a problem for the elderly given the fact that higher percentage (48.15%) had no formal education and only ((7%) had reached tertiary level. This is in agreement with results from Baker *et al.* (2011) who found out that low education attainers have difficulty in learning about nutrition related management methods.

Many religious groups have preferences and restrictions on the kind of foods they eat, which may also have a significant implication on nutrition. Most of the respondents were below 70 years and they were considered an active group becausethey could still take care of themselves, unlike those above 80 years old, who always depended on external care.

4.3. Social Economic Status of the respondents

A wide array of factors such as income, expenditure, medical care and other behaviors that might have an impact on the economic lives of older persons in Moiben division were investigated. Mutually exclusive questions were asked on their socio-economic status, hence each response treated as a variable of its own.

Majority of the households (50.62 %) depended on farming as a source of income; this was followed by remittance from children (26.54%), employment (12.04%), land leasing (8.64%) and finally retirement benefit (2.16%)

There were different expenditures incurred by the eldery households in Moiben Sub County. The study found out that most of the respondents took care of their grand children (34.57%). Other expenses comprised of the food and clothing (28%), fees (26.54%), medical care (8.33%) and rent (2.80). This means that most of the

households were owned by the occupants, since only 2.80 percent of the households mentioned rent as an expenditure.

Concerning the source of food, the majority of the respondents depended on both their farms and buying (44.75 %) as their main source of food. Other sources of food among the elderly people include farming (35.80%) and buying from the market (19.44%)

The proportion of the elderly that consumed alcohol was (77%), while only (23%) of respondents smoked cigarettes. The fact that (35.80%) of the elderly households depend on agriculture as its source of food, puts in danger the household food security because these elderly are not energetic enough to produce enough food because of physiological changes. Further more, these results concurred with (Brown *et al.,* 2014; Elia *et al.,* 2014) who assert that socioeconomic status plays an important role in health seeking behaviors and status of the elderly. Low socioeconomic status brings about unhealthy behavior and poor health status in the elderly. This may be associated with loneliness because according to a study report by (Wilson and Moulton 2010), 63% of the older adults had been diagnosed with drug or alcohol abuse due to loneliness which was linked to poor health behaviours including drug and alcohol abuse and inactivity.

Table 4.2: Socio-Economic Characteristics of the Respondents

Socio-Economics Status of the respondents	Percentage (%)
Source of Income	50.62%
Farming	50.62
Handout from children	26.54%
Employment	12.04%
Land leasing	8.64%
Retirement benefits	2.16%
Total	**100%**
Expenditures	
Taking care of grand children	34.57%
Food and clothing	28.00%
Paying fees	26.54%
Medication	8.33%
Rent	2.80%
Total	**100%**
Source of food	
Buying from the nearest market	44.75%
Farming	35.80%
Relief food	19.44%
Total	**100%**
Substance abuse	
Alcoholism	47%
Smoking	23%
None	30%
Total	**100%**

Farming offers an opportunity to households to produce a variety of food stuffs for consumption of balanced diet (Alexander *et al.*, 2015). This is supported by the fact that most of the respondents' main source of food was farming. Most of the respondents (35.8%) dependend on farming for their livelihoods, which increased their chances of being food secure.Those in employment can afford to buy food and

take care of their day to day nutritional requirements. Since less than half of the population had alcohol and smoking as their lifestyle habits, chances are that most of them may be affected with diseases caused by smoking and/or alcohol intake.

4.4 Nutrition Status of the Respondents

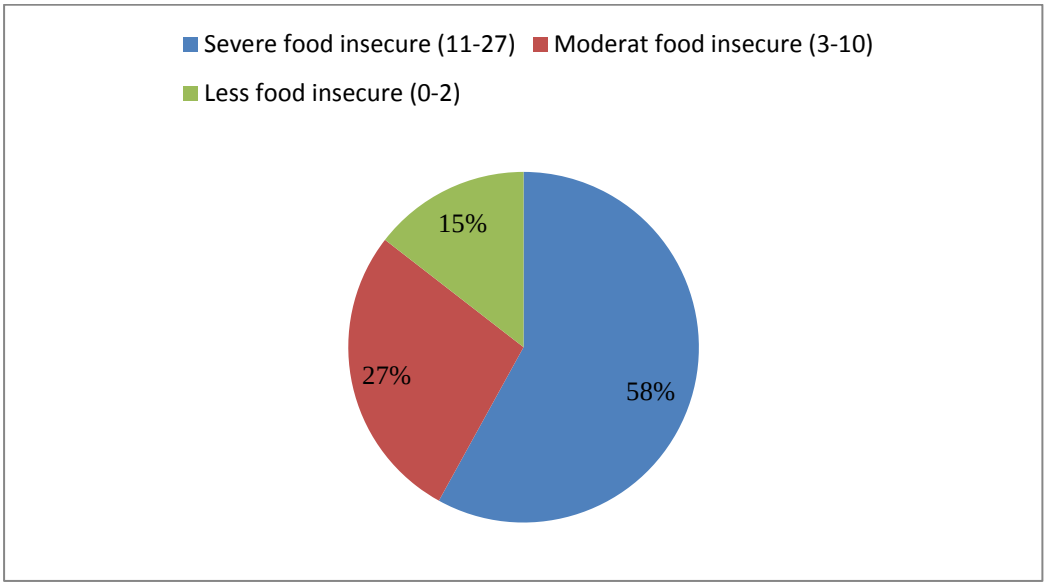
Table 4.3 Nutrition Status of the Respondents

Characteristics	Nutritional Status		
	Under Weight	Normal Weight	Over Weight
Total	135	166	23
Percentage	42%	51%	7%

The nutrition status was as follows; (51%) were normal weight while (42%) were underweight and 23 (7%) were overweight. The prevalence of malnutrition was therefore, 42% in Moiben division which represented all respondents who were under weight.The high prevalence of malnutrition in Moiben Sub County was associated with the low income level of the elderly people and poor living conditions. This subjected the eldely people poor nuttion since they had inadequate economic power to access good diet as required by the nutrionists. The finding was in line with a study by (Wolfe *et al.,* 2013) who reported 29% malnutrition prevalence among the elderly people in the urban setup.

4.5 Food Security Status of the respondents

Figure 4.4.1 Summary of Household Food security status



The majority of respondents experienced food insecurity (58%) followed by moderate food insecure 89 (27%) while less food insecure were 47 (15%). The findings reported most households worried that they would not have enough to eat and most often house hold members had to eat limited varieties of food due to lack of resources. These findings indicate that households in Moiben region are prone to having fewer meals a day and given that majority of the elderly were taking care of their grandchildren inreased households occupants and with hardly enough to eat. In a similar study, Nagata *et al. (*2016) found that lack of social support among the elderly predisposes them to food insecurity because there was not enough food to eat and he attributed this to low income levels especially among the elderly living in rural areas.

4.6 Mobidity status

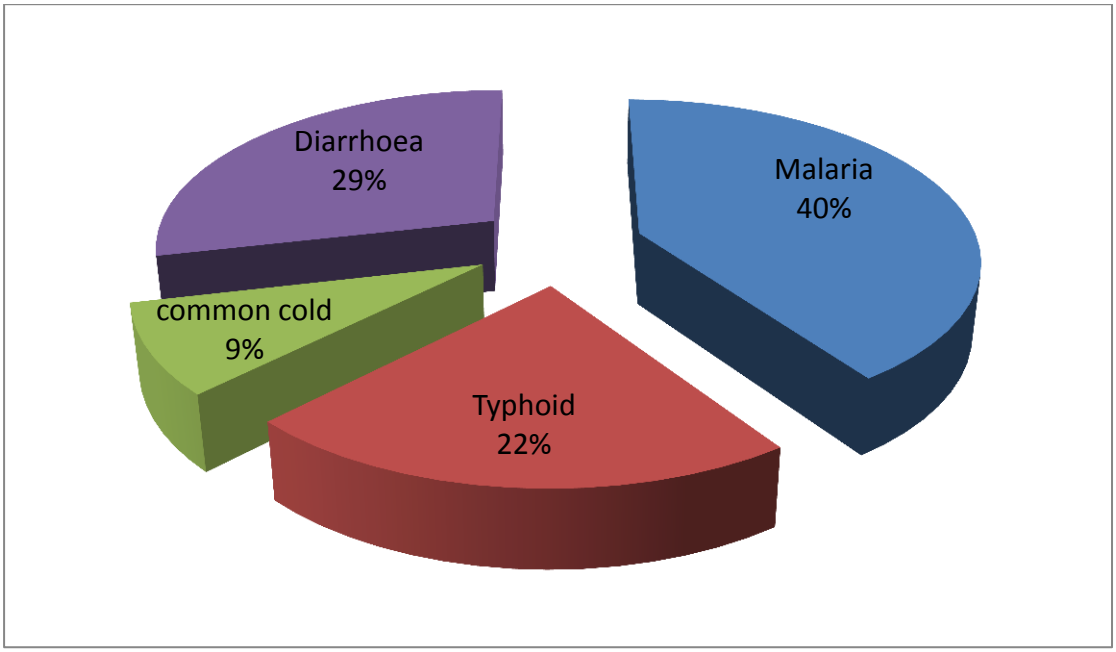
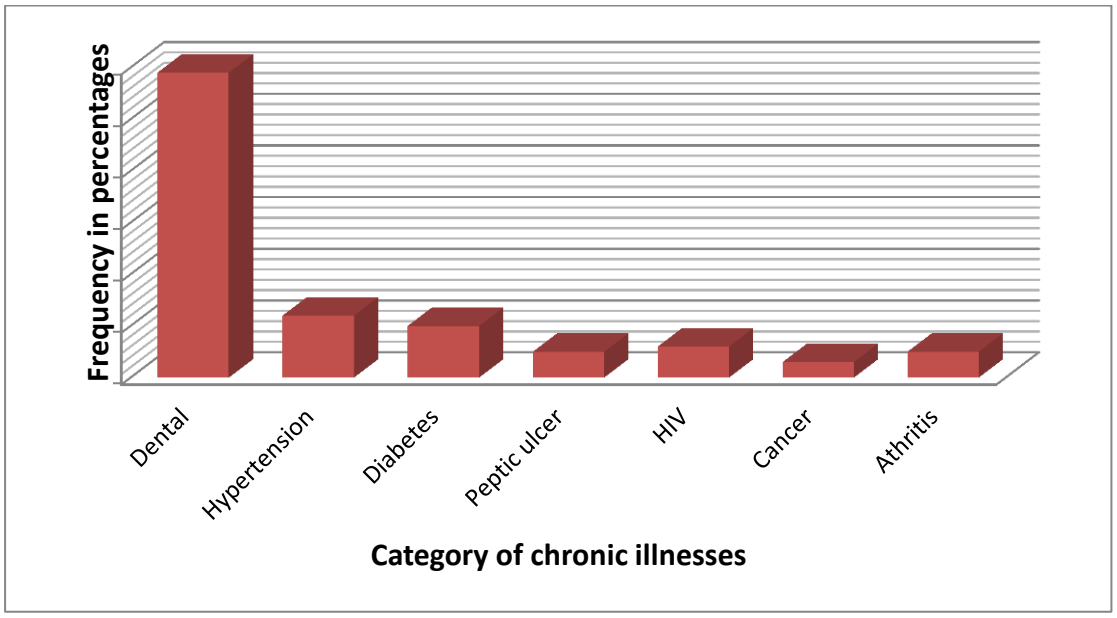


Figure 3. Acute Illnesses/Conditions

Among those who had fallen sick, (40%) had suffered from malaria, (22%) had suffered from typhoid, (9%) had suffered from common cold, (29%) had suffered from diarrhea. This finding was attributed to the fact that some of the elderly people had no supernets and were living in rugged conditions which predisposed them to mosquitos. Moreover, poor hygiene also resulted to outbreak of cholera cases in some of the households. These findings can be compared with study results by Dionigi, (2015) who attributed acute diseases like cholera to be associoated with living conditions and hygiene related causes among the elderly people.

Figure 4.5.2: Chronic Illnesses/ conditions



The study results showed that most of the common chronic diseases associated with elderly comprised of Dental, Hypertension, Diabetes, Peptic ulcer, Athritis, HIV and Cancer (59%,12%,10%,5%,6%,5% and 3%) respectively. The high number of dental conditions is attributed to increased gum decay, poor dental hygiene, decline in sense of taste as well as dry mouth as the elderly people advance in age. The results are in line with the findings by Gazan *et al.* (2016), who found out high prevalence of oral diseases among the elderly people than the young. Other studies showed reduction of micronutrient intakes including Vitamin B_{12} because elder people avoid eating meat, fresh fruit and vegetables which causes energy, iron, vitamin C and beta-carotene deficiencies (Elmadfa and Meyer, 2014).

4.7 Association between variables

Table 4.4 Association between nutrition status and food security

Food security status	Nutrition status				Total	Chi-square (χ^2)
	Under Weight	Normal Weight	Over Weight	Obese		Asymptotic Sig.(5%)
Less food insecure (0-2)	0.0%	21.1%	68.4%	10.5%	100%	
Moderate food insecure (3-10)	0.9%	94.3%	4.7%	0.0%	100%	P-value 0.01
Severe food insecure (11-27)	67.3%	31.2%	1.5%	0.0%	100.0%	
Total	41.7%	51.2%	6.5%	0.6%	100%	

*χ^2=291.731[a], DF=6

The study results showed a strong statistical evidence of association between food security and nutrition status among the elder people (chi-square =291.731[a], DF=6, p-value=0.001). The result further indicated that among the respondents who were less food insecure; none (0.0%) was underweight, 21.1% normal weights, 68.4% overweight and only 10.5% were obese. The study also revealed that among the respondents who were moderate food insecure; 0.9% was under weight, 94.3% normal weights, 4.7% overweight and none (0.0%) was obese. The study results further showed that among the respondents who were severe food insecure; 67.3% were underweight, 31.2% were normal weight, 1.5%were overweight and none (0.0%) was obese. Based on the household survey, the implication was due to the fact that most of the elderly people in Moiben had low intake of calories because there

were often no enough food to eat due to limited resources. Low intake of calories results to poor nutritional status and vulnerability to diseases hence affecting the productivity in the farms because sick elderly cannot work in the farm. In the findings, the elderly resolved to selling stored food in order to get medication resulting into a negative impact on food security.

A similar result was obtained by Baker *et al.* (2011) where they found out that food insecurity is a strong predictor of health problems such as heart disease, cancer, stroke, pulmonary disease or diabetes. Also, a study by Grobbler (2016) indicated increase prevalence of chronic disease, including heart disease, diabetes, arthritis, hypertension, as well as increased incidences of all cancers that make the elderly become more vulnerable especially in the developing countries.

According to the study by Ngatia *et al. (*2016), there was high prevalence of severe food insecurity and underweight among the elderly people in the city of Nairobi. Additional, study by Research Triangle Institute (RT I) International, (2014) identified poor nutrition as a source of chronic illness which can contribute to emotional distress, particularly depression. A recent study by Rashmi *et al.* (2015) also found out the same result of high prevalence of malnutrition among the elderly people in their study about assessment of the nutritional status among the elderly people

Table 4.5 Association between Socio-economic factors and Food Insecurity

Socio-economic factors	Food Security			Total	Chi-square (χ^2)
	Less food Insecure	Moderate food insecure	Severe food insecure		Asymptotic Sig.(5%)
Household size					
1-3 Members	10.4%	32.2%	58.4%	100%	P-value
3-6 Members	4.5%	34.4%	61.0%	100%	0.002
6-9 Members	2.9%	25.7%	71.4%	100%	
More than 9 Members	9.1%	45.5%	45.5%	100%	
Total	**5.9%**	**32.5%**	**61.6%**	**100%**	
Gender of respondents					
Male	4.9%	30.1%	65.0%	100%	P-value
Female	6.6%	34.8%	58.6%	100%	0.001
Total	**5.9%**	**32.7%**	**61.4%**	**100%**	
Substance Abuse					
Alcoholism	8.1%	25.2%	66.7%	100%	P-value
Smoking	4.2%	33.3%	62.5%	100%	0.003
None	4.5%	37.9%	57.6%	100%	
Total	**5.9%**	**32.7%**	**61.4%**	**100%**	
Source of Income					
Employment	8.8%	29.4%	61.8%	100%	
Farming	4.5%	39.3%	56.2%	100%	P-value
Land leasing	0.0%	25.0%	75.0%	100%	0.005
Retirement benefit	14.3%	71.4%	14.3%	100%	
Remitance from children	4.8%	24.2%	71.0%	100%	
Business	14.8%	7.4%	77.8%	100%	
Total	**5.9%**	**32.7%**	**61.4%**	**100%**	

*χ^2=39.105[a], DF=6; χ^2=41.502[a], DF=4; *χ^2=26.263[a], DF=4 and χ^2=25.218[a], DF=10 respectively.

The study findings indicated a very strong relationship between household size and food security (chi-square= 39.105[a], df=6 and p-value=0.002). The study further showed that respondents whose household size ranged between 1-3 members; 10.4% were less food insecure, 32.2% were moderate food insecure and 58.4% were severe food insecure. On the other hand, respondents whose household size ranged between 3-6 members; 4.5% were less food insecure, 34.4% were moderate food insecure and 61.0% were severely food insecure. Additionally, respondents whose household size

ranged between 6-9 members; 2.9% were less food insecure, 25.7%, were moderate food insecure and 71.4% were severely food insecure. Concerning the respondents whose household size were more than 9 members; 9.1% were less food insecure, 45.5% were moderate food insecure and 45.5% were severely food insecure. The probable reason for this finding was that most of the elderly people were taking care of their grandchildren whose parents died from HIV and AIDS and cancer among other chronic diseases. Despite the increase in size of the households of the elderly people, their income levels kept on declining due to their low productivity. This implied that severe food insecurity among the elderly people increases with increase in the number of household size. According to study by Bantry *et al.* (2011), elderly people with more than 9 members faced serious economic crisis as opposed to those with small members(less than 5 members). Some of the economic challenges faced by elderly people with more household members included high cost of food, medical expenseses and ducation among others. However, a study by Kirkpatrick and Tarsuk (2018) revealed that financially stable elderly people do not suffer from food insecurity irrespective of the size of their households.

The study results showed a significant association between gender of the respondents and food security (chi-square=41.502[a], df=2 and p-value 0.001). The findings indicated that among the male respondents; 4.9% less food insecure, 30.1% were moderate food insecure and 65.0% were severe food insecure. Moreover, among the female respondents; 6.6% were less food insecure, 34.8% were moderate food insecure and 58.6% were severe food insecure. From the results, it was evidenced that most of the female gender were likely to suffer from food insecurity than their male counterparts. The reason for this finding was that women lacked economic empowerment and access to productive resources. In most of the households, the

decision makers were either fathers or t elder sons. Nevertheless, women were mandated to prepare food for the entire household irrespective of limited budgetary allocation for meals.

The study results showed a very strong evidence of association between source of income and food security (chi-square=25.218[a], df=10 and p-value=0.005). Out of the respondents who were employed; 8.1% were less food insecure, 25.2% were moderate food insecure and 66.7% were severe food insecure. About the respondents whose source of income was farming; 4.2% were less food insecure, 33.3% were moderate food insecure and 62.5% were severe food insecure. Concerning the respondents whose main source of income was land leasing; none (0.0%) was less food insecure, 25.0% were moderate food insecure and 75.0% were severe food insecure. Pertaining to the respondents whose source of income was retirement benefit; 14.3% was less food insecure, 71. 4% were moderate food insecure and 14.3% was severe food insecure. For the respondents whose main source of income was remitance from children; 4.8% were less food insecure, 24.2% were moderate food insecure and 71.4% were severe food insecure. Finally, among the respondents whose main source of income was business; 14.8% were less food insecure, 7.4% were moderate food insecure and 77.8% were severe food insecure. The findings revealed that majority of elderly who were severely food insecure were farmers (56.2%). The main reason was that elderly people usually becomes less productive as they grow older. The agricultural activities on the other hand are labor intensive which some elderly people were not able to undertake. However, most of the elderly people still relied on this sector as their main economic activity regardless of decline in their productivity per unit of land under cultivation. The outputs obtained from farming were not adequate to feed the households and acquire other basic needs for their households thus, high

prevalence of food insecurity among the elderly people who entirely depended on farming as their main source of income. Nevertheless, a study by Capacci, (2012) revealed the prevalence of under-nutrition is not only related to the occupation of the respondents but also the regional price differences between various type of food substances. Additionally, Drewnowski, (2010) also associated food insecurity with the cost of nutritive value in the United States of America.

The study findings revealed a strong significant association between the respondents behavior engagements and food insecurity (chi-square=26.263[a], df=4 and p-value=0.003). Concerning the respondents who engaged in alcoholism 8.1% were less food insecure, 25.2% were moderate food insecure and 667% were severe food insecure. Pertaining to the respondents who engaged in smoking; 4.2% were less food insecure, 33.3% were moderate food insecure and 66.7% were severe food insecure. Based on the respondents who did not take part in either smoking or 4.5 % was less food insecure, 37.9% were moderate food insure and 57.6% were severe food insecure. The study showed that most of the respondents who engaged in alcoholism and smoking were more food insecure than those who did not participate in either smoking or alcoholism among the elderly people. This meant that the elderly people who participated in irresponsible behaviors of drinking and smoking spent much of their income in these addictive habits while allocating less of their resources in purchasing food items hence high prevalence of food insecurity. The findings were in line with the study by Virtuoso *et al.* (2012) where they found that addictive behavior such as alcoholism and smoking was the main factor contributing to malnutrition among the elderly people in the developing countries of the world.

4.8 Hypothesis testing

This study was made up of two hypotheses. The first stated that there was no significant relationship between food security and nutrition status of the elderly people aged 60 years and above. The study applied the use of Chi-square with 95% level of significant to test this hypothesis.

The study results showed a strong association between food security and nutrition status among the elder people (chi-square =291.731[a], df=6, p-value=0.001). Given this strong statistically significant relationship between food security and nutrition status, this null hypothesis was rejected in favor of alternative hypothesis that there is a significant relationship between food security and nutrition status of the elderly people aged 60 years and above.

The second hypothesis of this study stated that there was no significant association between socio economic factors and food security among the elderly. The study used chi-square at 95% significance level as the test statistic.

The findings of this study revealed that some socio-economic factors such as household size, gender, source of income and behavior engagement indicated a strong association with food security (chi-square= 39.105[a], df=6 and p-value=0.002; chi-square=41.502[a], df=2 and p-value 0.001; chi-square=25.218[a], df=10 and p-value=0.005 and chi-square=26.263[a], df=4 and p-value=0.003) respectively. This null hypothesis was rejected on the grounds that there was enough statistical proof to show that at least some socio-economic factors had strong significant association with the food security among the elderly people.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings, conclusion, policy recommendations derived from the study and suggestions for further research.

5.2 Summary of Findings

In the present study more than half (56.17 %) of the respondents were females. A similar proportion (65.12 %) of respondents indicated that they were married and a very small proportion (3.4%) were either divorced or separated, a quarter were widows/widowers. Half of the respondents were between the ages of 60 and 69 years old on average across all the locations while just about 14.81% were above the age of 80 years. Majority of the respondents (48.15%) had no formal education while only (8.02 %) had attained at least secondary education. Education across the different locations followed a similar trend with Meibeki having the highest number of respondents (51.72%) without any formal education. Households had on average 5 occupants per household with a standard deviation of +2.5. Overall, more than 99% of the respondents were Christians with Karuna and Meibeki having no Muslims at all. A wide array of factors such as income, expenditure, medical care and other behaviors that might have an impact on the economic lives of older persons in Moiben division were investigated. Mutually exclusive questions were asked on their socio-economic status, hence each response treated as a variable of its own. Majority of the households (50.62%) depended on farming as a source of income. This was followed by 26.54% of households who depended on support from their children in terms of remittance. Only two percent of the households mentioned depending on retirement

benefits as a source of income. There were different expenses incurred by the households with food and clothing (28%) being mentioned by most of the households. Most of the households were owned by the occupants, since only three percent of the households mentioned rent as expenditure. More than a third of the households had grandchildren living with the occupants who were their grandparents as evidenced by the expenditure. A small proportion (8.64%) of households spent their income on medical expenses. Approximately thirty six percent of households' depended on farming only as their source of food, while majority (44.75%) of them depended on both their farms and also buying as their source of food. About a third of the elders interviewed took alcohol, while only 9.6% of them smoked cigarettes. The nutrition status was as follows;(51%) were normal weight while (42%) were underweight and (7%) were overweight. The prevalence of malnutrition was therefore, 42% in Moiben Sub County which represented all respondents who were under weight.

The study results showed a significance association between gender of the respondents and food security (chi-square=41.502[a], df=2 and p-value 0.001). The findings indicated that among the male respondents; 4.9% less food insecure, 30.1% were moderate food insecure and 65.0% were severe food insecure. Moreover, among the female respondents; 6.6% were less food insecure, 34.8% were moderate food insecure and 58.6% were severe food insecure. The study findings indicated a very strong relationship between household size and food security (chi-square= 39.105[a], df=6 and p-value=0.002). The study further showed that respondents whose household size ranged between 1-3 members; 10.4% were less food insecure, 32.2% were moderate food insecure and 58.4% were severe food insecure. On the other hands, respondents whose household size ranged between 3-6 members; 4.5% were less food insecure, 34.4% were moderate food insecure and 61.0% were severely food

insecure. Additionally, respondents whose household size ranged between 6-9 members; 2.9% were less food insecure, 25.7%, were moderate food insecure and 71.4% were severely food insecure. Concerning the respondents whose household size were more than 9 members; 9.1% were less food insecure, 45.5% were moderate food insecure and 45.5% were severely food insecure.

The study results showed a significance association between gender of the respondents and food security (chi-square=41.502[a], df=2 and p-value 0.001). The findings indicated that among the male respondents; 4.9% less food insecure, 30.1% were moderate food insecure and 65.0% were severe food insecure. Moreover, among the female respondents; 6.6% were less food insecure, 34.8% were moderate food insecure and 58.6% were severe food insecure.

Study results showed a very strong evidence of association between source of income and food security (chi-square=25.218[a], df=10 and p-value=0.005). Out of the respondents who were employed; 8.1% were less food insecure, 25.2% were moderate food insecure and 66.7% were severe food insecure. About the respondents whose source of income was farming; 4.2% were less food insecure, 33.3% were moderate food insecure and 62.5% were severe food insecure. Concerning the respondents whose main source of income was land leasing; none (0.0%) was less food insecure, 25.0% were moderate food insecure and 75.0% were severe food insecure. Pertaining to the respondents whose source of income was retirement benefit; 14.3% was less food insecure, 71. 4% were moderate food insecure and 14.3% was severe food insecure. For the respondents whose main source of income was hand-out from children; 4.8% were less food insecure, 24.2% were moderate food insecure and 71.4% were severe food insecure. Finally, among the respondents whose main source

of income was business; 14.8% were less food insecure, 7.4% were moderate food insecure and 77.8% were severe food insecure.

The study findings revealed a strong significance association between the respondents substance abuse and food insecurity (chi-square=26.263[a], df=4 and p-value=0.003). Concerning the respondents who engaged in alcoholism behavior; 8.1% were less food insecure, 25.2% were moderate food insecure and 667% were severe food insecure. Pertaining the respondents who engaged in smoking; 4.2% were less food insecure, 33.3% were moderate food insecure and 66.7% were severe food insecure. Based on the respondents who did not take part in either smoking or 4.5 % was less food insecure, 37.9% were moderate food insure and 57.6% were severe food insecure.

Given this strong statistical significance relationship between food security, nutrition status and socioeconomic factors, the null hypotheses were rejected in the favor of alternative hypotheses that there were significance relationships between food security, nutrition status and some socio-economic factors of the elderly people aged 60 years and above in Moiben.

5.3 Conclusions

In conclusion, the socioeconomic characteristic of elderly and showes most of the elderly people dependend on farming as a source of income, main expenses goes to food and clothing and the chief source of food is from the farms and buying from the nearby markets.

On morbility related ailments, malaria and dental conditions are the main acute disease under the chronic ailments.

The elderly people are severely food insecure in Moiben Sub-County.

There is a strong statistical association between food security and nutrition status of the elderly people.

There is a significant relationship between food security and socio-economic factors such as household size, gender, substance abuse and source of income.

5.4 Recommendations

The policy planners should make good use of this study to conduct nutrition awareness compaign in Moiben Sub-County and in rural areas countrywide. This is because nutrition awareness is essential to inform the elderly people to modify their food procurement, preparation and meal patterns to address the prevalence of various micronutrient deficiencies.

The government should strengthen programmes such as pension scheme to supplement the income of the elderly people in Moiben Sub-County as well as country wide. Nevertheless, these social support grammes are poorly managed resulting to unequal distribution of resources in most rural areas in Kenya. The

government through the area chiefs should carry out door-to-door registration to reach the elderly people who cannot walk long distances to access the registration centres where these services are offerred.

The study finding should be used by the ministry of health, donors, NGOs and health learning institutions to formulate viable health programs aimed at addressing various malnutrition and food insecurity among elderly people in the rural areas in Kenya

The county government through the ministry of health should sensitize the side effects of using substance abuse among the elderly people. This will help in reducing the cases associated with the food insecurity among the elderly people who engage in alcoholism and smoking behaviors.

The government should releave some elderly people who stay with their orphan grandchildren by offering help in form of safety nets, medication, food reliefs and school fees to cushion the budget for the elderly.

5.5 Suggestion for Further Research

Finally, the result of this study is not generizable because of the sample size and the selection sample. So, other studies in the future may be conducted with a larger sample size that could present results with general implications. In this thesis data only from rural older persons were presented. Hence, it is important to identify the nutritional status of older urban persons, its determinants and how it influences their functional status.

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APPENDICES

Appendix I: Body Mass Index Classifications

The elderly's body mass index classification

Classification	**BMI(kg/m^2)**	
	Principal cut-off points	**Additional cut-off points**
Underweight	**<18.50**	**<18.50**
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	**18.50 - 24.99**	**18.50 - 22.99**
		23.00 - 24.99
Overweight	**≥25.00**	**≥25.00**
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	**≥30.00**	**≥30.00**
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: Dapted from WHO,1995,WHO,2000 and WHO,2004.

Appendix II: Consent form

Good morning, afternoon/evening, my name is Cynthia Bore and I am a Masters student at the University of Eldoret studying Nutrition. Today I am here in your area so as to conduct a nutritional and food security status assessment on elderly persons above the age of 60 years. First I will need to confirm your age that you are above 60 years, and that we are in a position to communicate with one another before we proceed. Should you agree to take part in this study, please note that I will take your measurements such as height and weight as well as ask you several questions using a questionnaire. It is also important for you to note that this study will not offer any medical intervention such as perform medical tests, draw blood or give drugs/ injections. Your participation in this study is purely voluntary, you have a right to refuse to take part in it now or even while in the middle of the study. Further, there will be no direct benefits to you such as cash or food substances from the researcher but your responses will help scientists and the world gain an understanding of the nutritional and food security status among the elderly in Moiben division. Any information that you provide in this session will be treated with a high degree of confidentiality and will only be accessible to the researcher and the university appointed supervisors. In addition, in the final report of this study there will be no information published that will directly identify you as an individual. This study has been approved by a government body that regulates studies known as NACOSTI. Should you have any other questions in the future concerning this study, please feel free to contact Ms. Cynthia Bore on 0720251835.If you agree to take part, kindly sign below.

Name: …… Signature: …….. Date: ……..

Appendix III: Research Questionnaire

Assessment on Food and Nutrition Security Status Survey Questionnaire for Elderly

Interview No..... Date of Interview……..

DEMOGRAPHIC INFORMATION

DEMOGRAPHIC INFORMATION

1.0 HOUSEHOLD DATA

1.1 How many people live in this household together and share meals? (Household size) ☐

Name of location	Village Name	Household Number	Date of Interview (dd/mm/yy)	Name of Interviewer
			____/____/____	

Appendix IV: ANTHROPOMETRY AND MORBIDITY

Question	Options	Code
1.2 How old are you in years?	1. 60-70 2. 70-80 3. Over 80 years	
1.3 Gender	1. Male 2. Female	
1.4 Marital Status	1. Married 2. Divorced 3. Single 4. Separated 5. Widow 6. Widower	
1.5 Level of education	1. Primary 2. Secondary 3. Tertiary 4. None	
1.6 Religion	1. Catholic 2. Protestant 3. Muslim 4. Hinduism 5. Buddhism 6. Others (specify)……	
1.7 Source of income	1. Employment 2. Farming 3. Land leasing 4. Retirement benefits 5. Hand-outs from children. 6. Others (specify)……	
1.8 Is the source of the income adequate enough?	1. Yes 2. No	
1.9 How do you spend your income?	1. Pay rent 2. Pay fees 3. Buy food/ clothing 4. Caring for grandchildren 5. Medical care 6. Others (specify)…….	
1.10 Do you engage in any of the following behaviors?	1. Alcoholism 2. Smoking 3. Others (specify)……	

Anthropometry
This will be taken three times

Height(m)	Weight(Kgs)	BMI(kg/m^2)

Morbidity

Question	Options	Code
2.2.1 Did you fall sick within the last one month?	1. Yes 2. No	
2.2.2 If the answer is yes, ask what did you suffer from?	1. Malaria 2. Typhoid 3. Common cold 4. Diarrhea 5. Others (specify)……	
2.2.3 Did you get treated?	1. Yes 2. No	
2.2.4 If yes, where did you get treatment from?	1. Government health facility 2. Chemist/ Private clinic 3. Herbalist 4. Spiritual healer 5. Others (specify)……..	
2.2.5 How long did the illness last before you recovered?	1. Less than 3 days 2. 3-7days 3. 1-4wks 4. More than 1 month	
2.2.6 Have you ever suffered from long illness?	1. Yes 2. No	
2.2.7 If the answer to question 2.2.6 yes, ask to name illness:	1. TB, 2. Cancer, 3. HIV/AIDS, 4. Hypertension 5. Diabetes, 6. Peptic ulcers, 7. Arthritis, 8. Dental illness 9. Others (specify)……	
2.2.8 If named any long term illness, then ask are you still on treatment for the illness?	1. Yes, 2. No	
2.2.9 If the answer to question 2.2.6 is no, skip the questions 2.2.7 above.		
2.2.10 During your illness who was taking care of you?	1. Spouse 2. Children 3. Others (specify)…….	

FOOD SECURITY ASSESSMENTS

Question	Options	Code
3.1 What is the main source of food?	1. Farming 2. Buying 3. Aid	
3.2 Did you receive any food aid from the government or any other support organization in the last six months?	1. Yes 2. No	
3.3 If yes, which one?	1. Cereals 2. Legumes/ pulses 3. Blended flours 4. Cooking oil 5. Others (specify)	
3.4 How many times did you receive food aid in the last 6 months?	1. Once 2. Two times 3. Three times 4. more than three times	
3.5 From where?	1. Government 2. NGOs 3. CBOs 4. Church 5. Others (Specify)…….	
3.6 How was it used?	1. Resold in the market 2. Bartered for other items 3. Share with a kin 4. Consumed by household members	
3.7 How long did it last?	1. Less than 3days 2. 3-7 days 3. 1-4wks 4. More than 1 month	
3.8 Are you food secure from the food responses given above?	1. Yes 2. No	
3.9 Did you receive any non -food aid from the government/ any other agencies with your region?	1. Yes 2. No	
3.10 If yes, which ones?	1. Clothing 2. Medicine 3. Money 4.Gifts. Any other specify ……	

4.0 Overall Food Production

Question	Options	Code	
4.1Do you own land?	1. Yes 2. No		
4.2 If yes, what is the size of your land in acres?	1. <1 acre 2. 1-3acres 3. 3-5 acres 4. >5acres		
4.3How do you utilize your land?	1. Crop farming 2. Livestock keeping 3. Leasing		
4.4 If the answer for question 4.1 is yes, then ask the following:			
4.4.1Which type of livestock do you rear?	Livestock	No.	Code
	1. Cattle 2. Goats 3. Sheep 4. Poultry 5. Bees		

4.4.2 What type crops do you grow?	Crop	Acres	Code
	1. Maize 2. Wheat 3. Barley 4. Rice 5. Legumes 6. Fruits 7. Others (specify)……		
4.5How much of your land do you lease out?	1. < 1 acre 2. 1 -2 acres 3. 2-4 acres 4. >4 acres		
4.5.1What is the current rates of land leasing in you region in Kshs?	1. Ksh. <3000 2. Ksh.3000 -5000 3. Ksh. 5000-10000 4. Ksh. >10000		

5. Household Food Insecurity (Access) Scale Occurrence Questions

Question	Options	Code
5.1 In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	….|___|
5.1. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.2 In the past four weeks, were you or any -bnhousehold member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	….|___|
5.2. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.3 In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes	….|___|
5.3. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks)	….|___|

	3 = Often (more than ten times in the past four weeks)	
5.4 In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food?	0 = No (skip to Q5) 1 = Yes	….|___|
5.4.a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.5 In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1 = Yes	….|___|
5.5 a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.6. In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1 = Yes	….|___|
5.6. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1 = Yes	….|___|
5.7. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.8. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes	….|___|
5.8. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten	….|___|

	times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
5.9. In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1 = Yes	….|___|
5.9. a How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|

Appendix IV. Map of Moiben Division

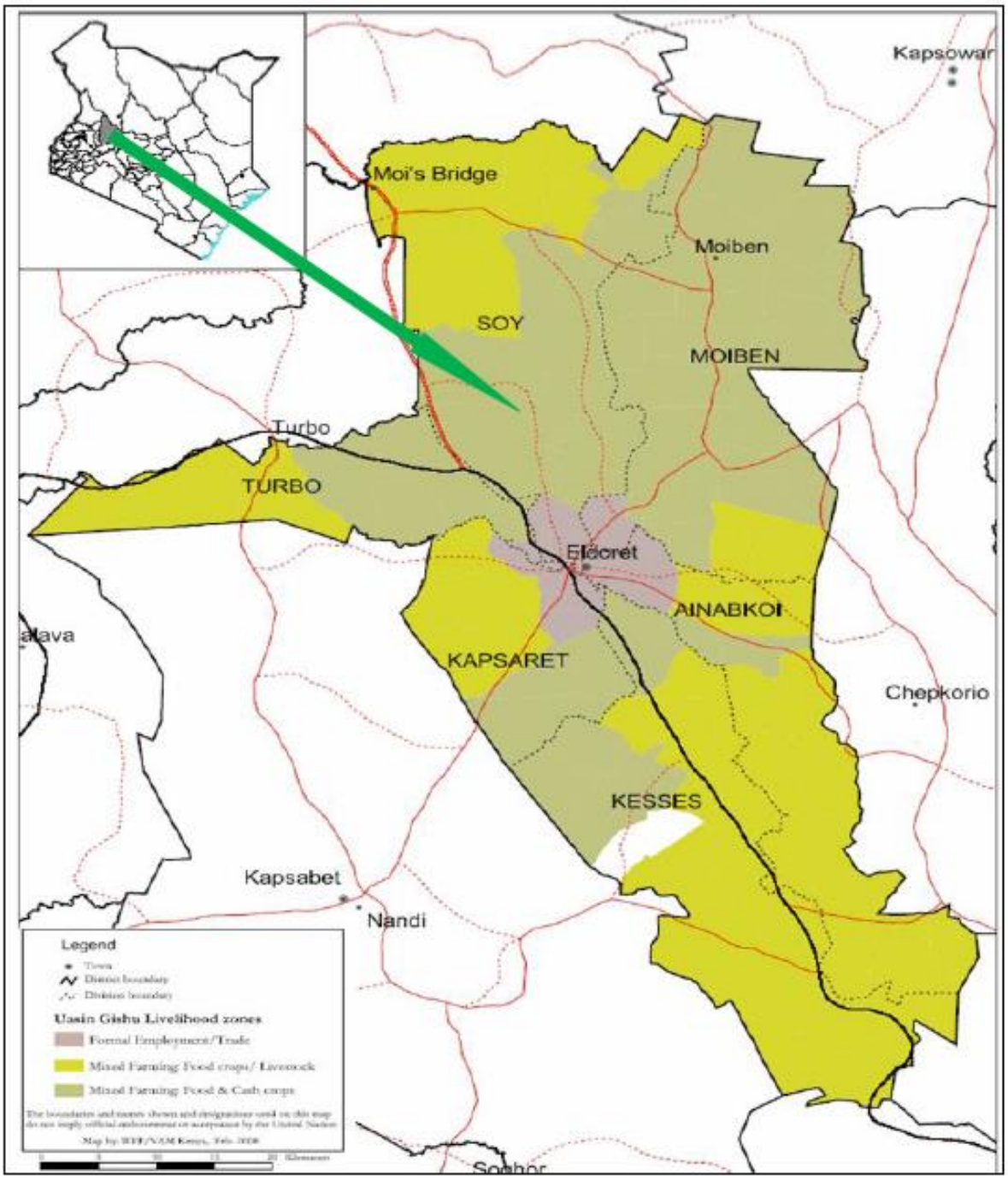

Figure 4.4: Uasin-Gishu County Map.

Source: Adopted from Barazas *et al*. (2008)

Appendix V: Picture showing Field work data collection exercise

Appendix VI: Similarity Index/Anti-Plagiarism Report