FOOD AND NUTRITION SECURITY STATUS OF LOW SOCIO-ECONOMIC HIV AND AIDS AFFECTED HOUSEHOLDS: THE CASE OF NAKURU MUNICIPALITY, KENYA.

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DECLARATION AND RECOMMENDATION

DECLARATION

I declare that this thesis is my original work and it has not been presented for an award of a degree, diploma or certificate in this or any other university.

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Samwel Mbugua

RECOMMENDATION

This thesis has been submitted with our approval as the official University supervisors.

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DEDICATION

... dedicated to my dear wife Mary Wanjiku Gachie and our son John Kimotho Mbugua Jr.

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ABSTRACT

Sub-Saharan Africa is still the worst affected region by HIV and AIDS and is home to 60% of people with HIV. Adequate food and nutrition security is important for optimal health and treatment of HIV and AIDS. The study aimed to establish food and nutrition security status among low socio-economic HIV and AIDS affected households in Nakuru. A Cross-sectional study design was administered using quantitative and qualitative measurement techniques. A purposive sample of 154 households with an index child aged between 2 to 5 years was used. Data was collected on socio-demographic status, Household Food Insecurity Access Scale, Household Dietary Diversity Scale (HDDS), Individual Dietary Diversity Scale (IDDS), 24 hour dietary recall and anthropometric measurements of weight, height, Mid-Upper Arm Circumference, skin fold measure of the index child. Results indicate average household earnings being less than KES. 5000 (USD 70.4) per month. The mean household size was 6.6 persons. Almost all households were food insecure, with severe food insecurity occurring in 73% of households. The mean HDDS was 8.1 out of a possible 12 food groups while mean IDDS was 3.9 out of a possible 8 food groups. Dietary intake indicated that most children met their recommended daily nutrient intake for protein, vitamin A and Iron, but less intake in: fat (47%), calcium (67%) and zinc (70%). Anthropometric indices of children showed stunting rates at 33.1%, underweight 26%, and wasting 12.3%. Low body mass index 8%, low mid-upper arm circumference 4%, and low tricep skinfold was only evident in one child. Bivariate analysis indicated that Household Food Insecurity Access Scale was statistically significantly associated with: years of schooling of head of household ($r = -0.236$), number of people in the household ($r = 0.169$), Individual Dietary Diversity Score ($r = -0.265$), and Household Dietary Diversity Score ($r = -0.356$). In backward multivariable regression analysis, years of schooling of head of household explained 7.2% of the variance ($r^2 = 0.072$) in HFIAS. While HDDS explained 28.3% of the variance ($r^2 = 0.283$) in IDDS. There were statistically significant associations between some of the nutrients and body composition measures. In conclusion high food insecurity is experienced among HIV and AIDS affected households in the study area and malnutrition rates are high. There is therefore need to develop food based strategies to alleviate food insecurity and improve nutrition status.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACC/SCN	United Nations Sub Committee on Nutrition.
AIDS	Acquired Immune Deficiency Syndrome.
ARV	Anti Retroviral Therapy.
AZT	Azidovudine.
BMI	Body Mass Index.
CBOs	Community Based Organizations.
CBS	Central Bureau of Statistics.
CDN	Catholic Diocess of Nakuru.
CGIAR	Consultative Group for International Agricultural Research.
CSPro	Census and Survey Processing System.
FAD	Food Availability Decline.
FANTA	Food and Nutrition Technical Assistance Project.
FAO	Food and Agriculture Organization.
FHI	Family Health International.
HAART	Highly Active Antiretroviral Therapy.
HAZ	Height for Age z-score.
HDDS	Household Dietary Diversity Scale.
HFIAS	Household Food Insecurity Access Scale.
HIV	Human Immunodeficiency Virus.
ICROSS	International Community for the Relief of Suffering and Starvation.
IDDS	Individual Dietary Diversity Scale
KDHS	Kenya Demographic and Health Survey.
KMO	Kaiser-Meyer-Olkin value.
LMS	Least Means Squares.
L&H	Love and Hope.
MDGs	Millennium Development Goals.
MUAC	Mid Upper Arm Circumference.
NHANES	National Health and Nutrition Examination Survey.
PLWHA	People Living With HIV and AIDS.

RDI	Recommended Dietary Intake.
SLA	Sustainable Livelihoods Approach.
SPSS	Statistical Package for Social Sciences.
SSA	Sub-Saharan Africa.
TSF	Triceps Skin Fold.
USAID	United States Agency for International Development
WFP	World Food Programme.
WHO	World Health Organization.
Z	z-score

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The burden of the Human Immunodeficiency Virus (HIV) and the Acquired Immune Deficiency Syndrome (AIDS) especially in Sub-Saharan Africa (SSA) has led to increased death rates and subsequent decrease in life expectancy, particularly amongst the most economically productive members in society and loss of assets. In a continent already experiencing severe challenges in terms of economic development, poor governance, hunger and civil instabilities, Sub-Saharan Africa is facing daunting challenges to food and nutrition security as a result of HIV and AIDS. In 2005 it was estimated that globally approximately 38 million people were infected with the virus, with 24 million residing in Sub-Saharan Africa. Although considered the fourth highest cause of death worldwide, the disease is now the leading cause of death in SSA, and has led to a lowered average life expectancy from 62 to 47 years (UNAIDS, 2006).

Globally, an estimated 800,000 children under 15 years of age, primarily infants, were infected with HIV in 2001, with 580,000 children dying of AIDS (Piot & Pinstrup-Anderson, 2002). In Kenya according to the Kenya Demographic and Health Survey (KDHS) of 2003, seven percent of Kenyan adults were infected with HIV, while urban HIV prevalence stood at 10.0% as compared to 5.6% in the rural areas (CBS, 2004). In 2007, the national HIV/AIDS prevalence stood at between 7.1 – 8.5% (WHO/UNAIDS/UNICEF, 2008). In Nakuru by 1990 the HIV prevalence based on the National Surveillance data was 9.9% (Solo et al., 2005), and by 2003 the adult prevalence stood at 6.7% (WHO, 2006). The 2008 urban HIV prevalence for Nakuru District was estimated to be 5.9%. The total general population for Nakuru Municipality is estimated at 56,269 households constituting 161,261 males and 151,392 females (Republic of Kenya, 2008).

The HIV and AIDS epidemic precipitates or worsens food and nutrition security. Reduced work capacity of caregivers to take care of children or sick members in the household has had negative impact on households and communities while on the other hand, insufficient access to food worsens health and nutrition outcomes (Gillespie & Kadiyala, 2005).

Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). In 2008, 800 million people

were food insecure with majority coming from lower income countries (Grebmer *et al.*, 2008). Sub-Saharan Africa continues to experience a rise in the numbers of hungry people, even as global food production increases. In fact in 2002 to 2004, more than half of the region's population (approximately 350 million) were hungry (defined as the recurrent or involuntary lack of access to food), hence unable to access adequate quantities and quality of food (USDA, 2006). Among the indicators used in assessment of household food and nutrition security status include; socio-demographic factors, dietary diversity, dietary intake and anthropometric measures.

Nutrition security refers to a combination of having access to food, being well cared for and enjoying a healthy life (Frankenberger et al., 1993). This implies adequate dietary intake, adequate care and adequate health and sanitation, with the eventual outcome being nutrition status which is a biological factor seen as growth or body composition. The measures of nutrition security therefore include: clinical examination, Biochemical assessment, anthropometric measures and dietary intake (Morris, 1999).

A study on HIV and AIDS and food and nutrition insecurity in Ethiopia (Kennedy, 2003) measured nutritional status of children under five years using underweight (low weight for age) as an outcome indicator of food insecurity among urban households, and found a prevalence of 28.4%. According to De Waal and Whiteside (2003) food insecurity and subsequent hunger and HIV and AIDS reinforce each other and can lead to 'AIDS-induced famine' which they refer to as 'new variant famine'. In their study among Southern African countries they found that reduced incomes and increased expenditure due to sickness led to less access to food.

As reported by the South African HIV and AIDS information dissemination service (SAfAIDS) study of three Southern African countries, in Swaziland, low productivity and unemployment observed among HIV and AIDS affected household members was attributed to poor nutritional status of the household. In Lesotho, HIV and AIDS affected households were found not to produce enough food and with limited funds to purchase additional foods. They also had more monotonous diets and lower nutrients intake compared to non-affected households. In Botswana, the majority (81%) of respondents reported eating three or more meals per day before their illness, which fell to 49% following illness (SAfAIDS & FANRPAN, 2006). In Kenya, studies to link HIV and AIDS to food and nutrition are few or are not documented, and for those that exist, majority are not undertaken within the context of development (Wagah, 2005). Thus there is need to carry out research.

Statistics for Nakuru indicate an average household size of 3.6 people with life expectancy standing at 52.9 years for males and 58.2 years for females, and absolute poverty at 44% (Republic of Kenya, 2008). It is expected that by 2020 more than half the population of Africa to be living in urban areas, with an expected rural to urban shift and increase in urban poverty, food insecurity and malnutrition (Garret, 2000). Studies on urban agriculture already indicate dependence on urban agriculture among the urban poor as a key livelihood strategy (Maxwell, 1999). By 2002 it was estimated that 40% of the Nakuru town people practiced urban agriculture as a source of livelihood (Foeken *et al.*, 2002). HIV/AIDS has potential negative relationships with food and nutrition security (Gillespie and Kadiyala, 2005). Therefore urban agriculture holds promise as one major intervention strategy.

1.2 Statement of the problem

To our knowledge the food and nutrition security status of HIV and AIDS affected households in Nakuru Municipality has not been documented. Existing reports on food and nutrition security status are based on proxy indicators of per capita calories available, these do not necessarily reflect the food security situation at the household and individual level (Hoddinott, 1999). Thus research on food and nutrition security status among HIV and AIDS affected households is important to assist in developing and evaluating strategies aimed at mitigating the negative impact of HIV and AIDS on urban households. Food based interventions have the potential to increase nutrient dense foods of people living with HIV and AIDS and thus potentially improving their immunity, and indicators of nutrition status such as body composition and lowering the manifestations and outcomes of opportunistic infections (Piwoz & Preble, 2000). Indeed in resource poor settings, inadequate access to food has been found to contribute to low adherence to nutrition recommendations during antiretroviral treatment (Castleman *et al.*, 2003).

1.3 Purpose of the study

This thesis research work was carried out in Nakuru Municipality as part of a project aimed at examining the potential of urban agriculture to mitigate the negative livelihood impacts of HIV and AIDS, and improve food and nutrition security of households affected by HIV and AIDS (Karanja & Yeudall, 2006). The primary objective of this study therefore was assessment of the food and nutrition security status among households affected by HIV and AIDS.

1.4 Objectives of the study

The objectives of the study among HIV and AIDS affected households were:

1. To determine the household food security status through the use of a household food insecurity scale and household dietary diversity.
2. To determine household nutrition security status through individual dietary diversity, dietary intake from a 24 hour dietary recall and anthropometric status using body growth and composition measures in an index child aged 2 to 5 years.
3. To determine the association between socio-demographic characteristics and household food security status.
4. To determine the association between household food security and individual dietary diversity score of an index child.
5. To determine the association between household food security and household dietary diversity score with child dietary diversity and dietary intake.
6. To determine associations between child dietary intake and child anthropometric indicators.

1.5 Research questions

1. What is the household food security status in households affected by HIV and AIDS?
2. What is the household nutrition security status in households affected by HIV and AIDS?
3. What is the association between socio-demographic characteristics and food security score among HIV and AIDS affected households?
4. What is the association between household food security and individual dietary diversity score of a child among HIV and AIDS affected households?
5. What is the association between household food security and child dietary diversity and dietary intake among HIV and AIDS affected households?
6. What is the association between child dietary intake and child anthropometric indicators among HIV and AIDS affected households?

1.6 Significance of the study

The research aimed at improving our understanding of the effect of HIV and AIDS on household food and nutrition security status by providing data within the context of a Kenyan urban setting. Also to provide a baseline measure for an urban agriculture project aimed at

evaluating the potential of urban agriculture to mitigate the negative livelihood and food security impacts of HIV and AIDS. Hence evidence from this study will contribute to the body of knowledge regarding measures of the intervention in urban agriculture on food and nutrition security.

1.7 Scope of the study

The research project was undertaken in Nakuru Municipality. Contact was established among the three main HIV and AIDS support groups; Love and Hope Centre (L&H), International Community for the Relief of Suffering and Starvation (ICROSS), and *Nuru ya Jamii*. These are community support organizations for HIV positive clients living in the low socio-economic status estates in the municipality. The study hence purposively targeted households directly affected by HIV and AIDS and with a child aged 2 to 5 years. The respondent for socio-demographic questions was the household head, while dietary intake data was obtained from the person in charge of food preparation and feeding in the house, and child anthropometry was collected directly from the children.

1.8 Assumptions of the study

1. There was going to be cooperation among respondents in giving the required information.
2. Stigma was not going to lead to lowered participation among the households as the participants were self identified since they were already participating in the support groups.

1.9 Limitations of the study

1. The study used an index child aged 2 to 5 years, yet the most vulnerable age group is under 2 years of age. However, being a baseline study for a food based intervention project used children aged 2 to 5 years as they have greater reliance on food as opposed to breast milk for meeting their nutrient requirements. Also under 2 years of age are highly vulnerable and so their nutrition status is likely to be affected other factors such as sanitation access to primary healthcare services etc. which were beyond the scope of this study.
2. The study also covered HIV and AIDS affected households participating in support groups working in the low socio-economic status estates, hence the results cannot be generalized to all HIV and AIDS affected households in the municipality.

1.10 Operational definition of terms

The following are operational definitions pertinent to this study;

Anthropometry: In this study it refers to the measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition.

Food Insecurity: In this study refers to limited or uncertain availability of nutritionally adequate and safe foods or uncertain ability to acquire acceptable foods in socially acceptable ways.

Guardian: In this study refers to a person who fulfils some of the custodial and parenting responsibilities of the legal parents of a child.

HIV and AIDS affected household: In this study refers to a household in which one or more members have been tested and found to be HIV positive.

Household: In this study refers to a residence group, carrying out domestic activities together, eating together, live together, and whose members all rely on a particular livelihood strategy to fulfil their needs.

Household Head: In this study refers to the person in a home responsible for and in charge of decisions regarding livelihood activities and general care of the other household members.

Household dietary diversity: Refers to the grouping of foods consumed by all members of the household based on foods prepared in the home, or if brought from outside but consumed at home.

Household Food Insecurity Access Scale: An experiential scale used to measure perceptions of fear of food insecurity, quality and quantity of food consumed within the household in the last 30 days.

Human Capital: In this study refers to the set of skills which an employee acquires on the job, through training and experience, and which increase that employee's value in the marketplace.

Individual dietary diversity: Refers to the grouping of foods consumed by the index child during the previous 24-hours.

Livelihoods: In this study refers to the capabilities, assets (stores, resources, claims and access) and activities required for a means of living.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature that focuses on HIV and AIDS prevalence and its global and national impact. Establishment of the link between HIV and AIDS, food and nutrition status, including socio-demographic characteristics. A review of the conceptual framework linking food security, nutrition status and HIV and AIDS is used to explain the relationships amongst various variables.

2.1 HIV and AIDS status and impact

AIDS is a medical condition that leads to a rise in opportunistic infections. The destruction of the immune system is caused by the Human Immunodeficiency Virus (HIV). The first cases of AIDS were reported in 1981in the United States of America. Within a relatively short period of time, epidemiological observations indicated that an infectious agent transmitted by sexual means, by blood products and from mothers to infants was involved. The CD4 cell molecule was identified as the receptor for the virus, and potential targets in the virus replicative cycle were identified (Schechter, 2004). In 1987 the first antiretroviral therapy, zidovudine (AZT) became available. In subsequent years, other agents of the same pharmacological class have been discovered and introduced into clinical use. The regimens are characterized by elevated anti-viral potency, resulting in substantial suppression of viral replication together with a good level of immune reconstitution (Vella & Lucia, 2005). However, the drugs have been reported to cause side effects among patients including; insulin resistance, lactic acidosis, osteopenia, and dyslipidemia (Chow *et al.*, 2003). Studies are indicating that when taken with food, some of the side effects are greatly reduced, making it more possible for patients to adhere to medication as prescribed (World Bank, 2007).

According to the Kenya Demographic and Health Survey (KDHS) of 2003, the prevalence rates of HIV and AIDS are higher in urban areas (10.0%) than rural areas (6.0%). When compared to sex and region, urban women had a 12.0% prevalence compared to 8.0% in rural women and 7.5% for urban men compared to 3.6% for rural men (CBS, 2004). The prevalence rate among adults (15 – 49 years) in Kenya currently stands at 6.1% (PEPFAR, 2008).

The use of antiretroviral therapy has faced challenges too, as of 2005 Kenya's total treatment need stood at 220,000 people. In 2007, 166,400 people were receiving ARV treatment (PEPFAR, 2008).

The AIDS pandemic is recognised worldwide as a massive public health problem. In Kenya, between the reporting of the first case in 1984 and 2001, 2.2 million people had been infected, with higher prevalence rates reported in 15 to 49 year olds. This age group are among the most economically productive segments of the population. The same period an estimated 1.1 million people had died of HIV and AIDS in Kenya. Public health facilities have had to carry the burden of massive hospital admissions with 50 to 70% of hospital bed occupancy related to HIV and AIDS (Ministry of Health, 2001). Between 1984 and 2000 life expectancy in Kenya dropped from 60 to 42 years in large part due to the pandemic (Wagah, 2005).

2.2 Nutrition and HIV and AIDS

Adequate nutrition security is vital for optimal health and well being. Nutrition security is achieved when a household has secure access to food along with the capacity for adequate care, access to health services and sanitation to curb infections and spread of disease (Frankenberger & McCaston, 1998). Lack of adequate food intake leads to undernutrition, which can take many forms including; protein energy malnutrition and micronutrient deficiencies, and which can be assessed through anthropometric, clinical and biochemical measurements. In recognition of the vital role nutrition plays in the mitigation of HIV and AIDS pandemic, the World Health Organization (WHO) has called on member states, to come up with programs and practice recommendation that promote integration of nutrition into programs aimed at managing and mitigating the disease (Saadeh, 2005).

In HIV the cause of undernutrition is more complex and is linked both to food intake and physiological alterations brought about by the viral infection. In general undernutrition results from more than lack of food, but also a lack of key nutrients and in the case of HIV and AIDS altered nutrient requirements and/or utilization. The interaction of HIV and AIDS with nutritional status has been a distinguishing characteristic of the disease since the earliest days of the epidemic as its victims often displayed severe underweight and wasting characteristics. In fact HIV infection progression and poor nutrition are part of a vicious cycle that contributes to further deterioration of the health of patients and that can ultimately lead to death. It is has been established that HIV infection can lead to under nutrition, including micronutrient deficiencies and lean body mass depletion through decreased food intake,

malabsorption, and increased utilization and excretion of nutrients. Micronutrient specific studies have shown that low plasma levels of vitamin A, E and B-12 are related to faster disease progression (Raiten, 2005). In a trial in Tanzania among 1,078 HIV infected women who were not on antiretroviral therapy, daily supplements of multivitamins A, C and E resulted in large and statistically significant reductions in clinical disease progression, and symptoms and signs of HIV disease (Fawzi *et al.*, 2005).

Studies indicate that sub optimal nutrition increases the risk of disease transmission from mothers to babies in addition to the progression of HIV infection. The disease also weakens the immune system leading to diseases that can increase requirements and alter metabolism (Semba & Tang, 1999). In fact, people who are malnourished and then acquire HIV are more likely to progress faster to AIDS because his/her body is already weak and cannot fight illness (Piwoz & Preble, 2000). Undernutrition can also increase fatigue, and decrease physical activity, and work productivity of people living with HIV and AIDS.

2.3 Food security, livelihoods and HIV and AIDS

Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). Poor economic growth and inequalities in wealth distribution among Sub-Saharan Africa countries are some of the factors attributed to food insecurity in the region, making it difficult for households to access foods even when availability is assured (Yaro, 2004). An adequate and appropriate food supply is a necessary condition for eliminating hunger or food insecurity. However, development of agricultural technologies to boost large scale food production alone is not sufficient to guarantee food security since access and utilization has to be assured. Low cost and readily available technologies and practices to increase food production and assets are required by resource poor households to improve their food security (Pretty, Morrison, & Hine, 2003; Gladwin *et al.*, 2000).

A report by the UN Sub Committee on Nutrition discusses the relationship between food insecurity and HIV and AIDS (ACC/SCN, 2004). Briefly, food insecurity can be considered a 'fueling factor' in the spread of HIV and AIDS by increasing the risk of transactional sex and migration of labour. Women in particular are at risk of resorting to transactional sex in order to feed their families when their income generating activities are limited, and household heads risk migrating to where they can earn an income. Additionally, food insecurity with consequent undernutrition is more likely to lead to poor health outcomes

that increase spread of infection and HIV transmission even among pregnant and lactating women, such as lowered immunity and compromised gut and genital mucosal integrity. In turn HIV and AIDS renders affected individuals incapable of performing workloads that are heavy and tiring, and within settings where manual labour is the main source of income or where there is a death of the main income earner, households are unable to produce or procure food leading to food insecurity. In studies done in Malawi, Zambia and Zimbabwe, in households where illness and death of adults was high, increased vulnerability to food insecurity shocks was noted (Gillespie & Kadiyala, 2005).

The rapidly growing trend of urbanization in developing countries has led to expanding urban slums, and increased urban poverty, food insecurity, and nutrition insecurity (Maxwell et al., 2000). By 2007 percentage of the Kenyan population living in urban areas was 21% (WHO/UNAIDS/UNICEF, 2008). Multiple factors influencing food insecurity have been identified (Misselhorn, 2005), and a growing body of research has highlighted the interdependencies between HIV and AIDS and livelihood insecurity in relation to food insecurity (Murphy et al., 2005). Chambers and Conway (1992) define livelihoods as 'the capabilities, assets (stores, resources, claims and access) and activities required for a means of living'. A livelihood is considered sustainable when people can cope with and recover from stress and shocks (i.e. are less vulnerable), maintain or enhance their capabilities and assets, and provide sustainable livelihood opportunities for the next generation. In HIV infection, individuals are rendered less productive once AIDS emerges due to opportunistic infections, thereby directly reducing human capital which is an important component of livelihoods. Other components potentially affected by HIV and AIDS include; financial, social, physical and natural capital which in turn impact on the food and nutrition security of individuals, households, and communities (De Waal & Whiteside, 2003; Drimie, 2003; Gysels, Pool & Nnalusiba, 2002). The link is summarised in the Figure 2.1 (Save the Children & Oxfam, 2002).

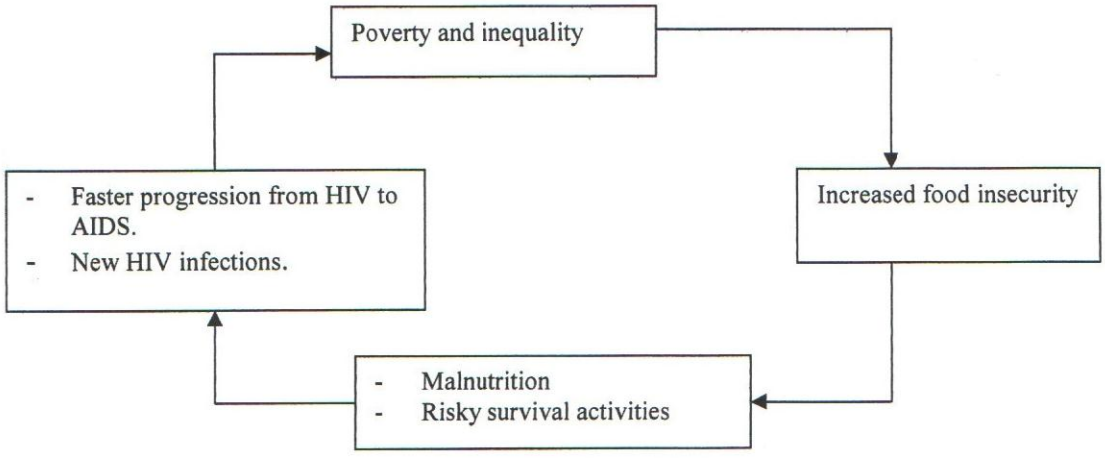


Figure 2.1. The relationsip between HIV and AIDS, food security and nutrition.

The impacts of HIV and AIDS are influenced by the level of vulnerability in a household which in turn is dependant on availability of assets, needs and health status of its members. To understand the impacts of AIDS, we need to know what happens to a household once it becomes affected (O'Donnell, 2004).With HIV and AIDS there is increased cost of care and potential loss of income through illness or death, which increases the vulnerability of poor families. Female headed households and particularly those living in informal settlements are particularly vulnerable, especially if there is limited access to secure livelihoods, healthcare, and information (World Bank, 2003).

Ensuring food security is therefore vital in helping people living with HIV and AIDS to optimize their dietary habits to maintain optimal nutritional status and meet their unique nutritional needs. The hardest hit countries in Sub-Saharan Africa have experienced a life expectancy drop than was 20 years ago. Their economies remain largely agricultural based, hence their capability to produce both in terms of physical strength and availability of resources makes them more vulnerable to the ravages of the pandemic. The nutrition security of the population is expected to influence livelihood outcomes and capability to prevent and mitigate the spread of the disease (Haddad & Gillespie, 2001). Therefore household access to food influences food intakes of individuals within the household and eventually nutrition status. Figure 2.2 summarises the many factors in addition to household access to food that influence, and indeed are influenced by food security of the individual, as measured by food intake.

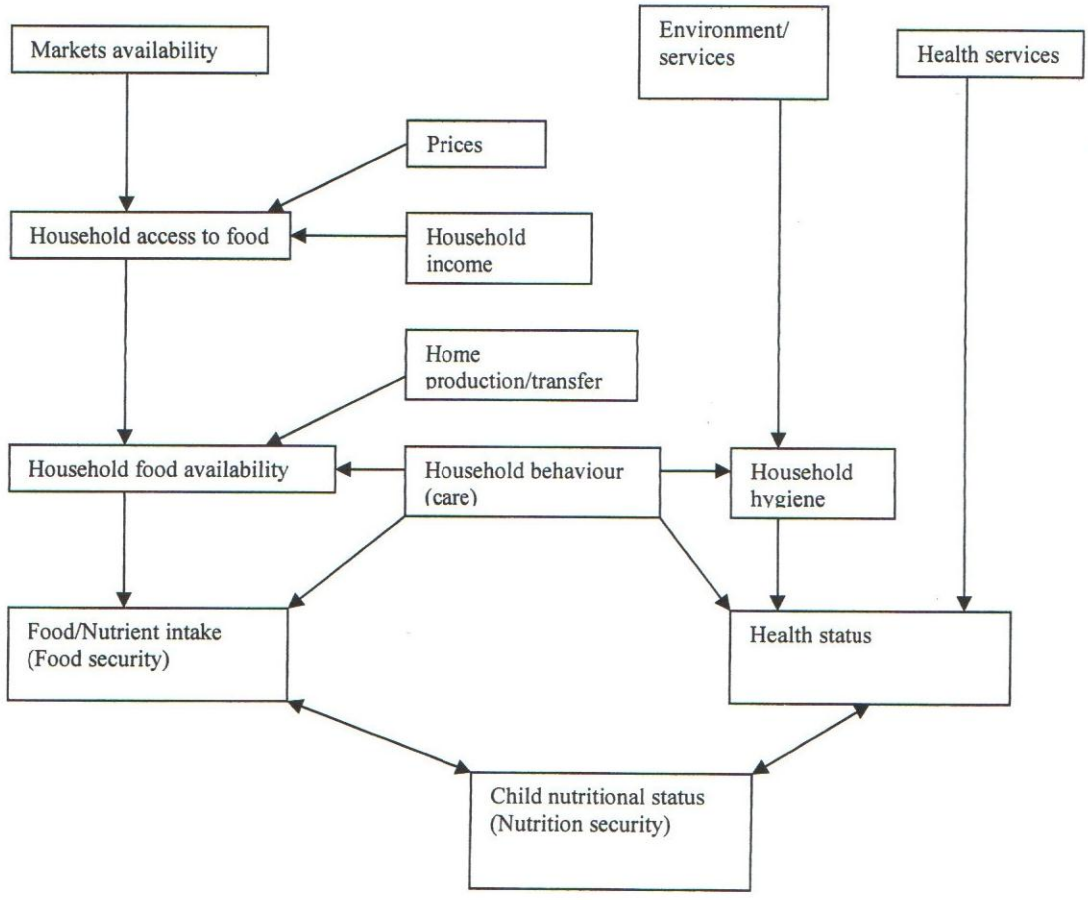


Figure 2.2. Determinants of child nutritional status (Ruel et al., 1998)

2.4 Measuring food and nutrition security

When food security was first measured in the 1970's, the primary focus was on food supply and related factors including natural disasters, price policies affecting the overall economic development of a country and subsequent capability to supply food at a national level, with the assumption that the trickle down effect to the household and individuals was assured. There was also a focus on measures of undernutrition due to extreme food deprivation as measured by height and weight. However subsequent evidence suggests that not only food availability, but also access, and utilization are important steps to assure sufficient food utilization and optimal nutrition security and ultimately health outcomes (Webb *et al.*, 2006)

Outcome measures of food security include: individual intakes (such as 24 hour recall), and measures such as household caloric acquisition, dietary diversity, and indices of household coping strategies or household food insecurity access scale, in addition to dietary intake of individual household members (Hoddinott, 1999).

The Household Food Insecurity Access Scale (HFIAS) on the other hand, first appeared in studies of food security in the US under the Radimer-Cornell study (Radimer et al, 1990). The philosophy behind its development was the assumption that people's experiences of food insecurity were measurable and will indicate food insecurity (access) of a household. Validation trials were first undertaken in the USA then Burkina Faso and Bangladesh. The trials showed that the experiential scale can be applied successfully in different developing country contexts (Swindale & Bilinsky, 2006; Melgar-Quinonez *et al.*, 2006, Coates & Frongillo *et al.*, 2006, Coates & Wilde et al., 2006, Frongillo & Nanama, 2006). The tool was found to be a reliable rapid assessment tool. It was also found to be strongly associated with previously used proxy indicators among socio-demographic indicators such as incomes and assets in Burkina Faso (Frongillo & Nanama, 2006). Other tools in existence examine additional indices of household coping strategies measures and behaviours in response to food insecurity as it relates to consumption such as the Coping Strategy Index (Maxwell, 1996; Maxwell *et al.*, 1999; Maxwell *et al.*, 2003). The measures include multiple types of coping strategies, including strategies to augment household resources, from sending children to be with neighbours, to migrating. The argument for HFIAS as opposed to the Coping Strategy Index (CSI) is that it is based on a statistical theory (Item Response Theory), whereas CSI is not. Also HFIAS has been developed as a generic tool for use across cultures whereas CSI is a location specific indicator, hence difficult to compare results across different settings.

2.5 Conceptual framework

From the above discussion then socio-demographic variables determine the outcomes of food security status, which influences dietary diversity which in turn determines food intake with subsequent anthropometric outcomes. On the other hand there is a reciprocal relationship between HIV and AIDS status with socio-demographic status and household food insecurity which influences dietary diversity then determining child nutrition security in the household through available food for intake and the resultant nutrition status outcome as outlined in the conceptual framework in Figure 2.3

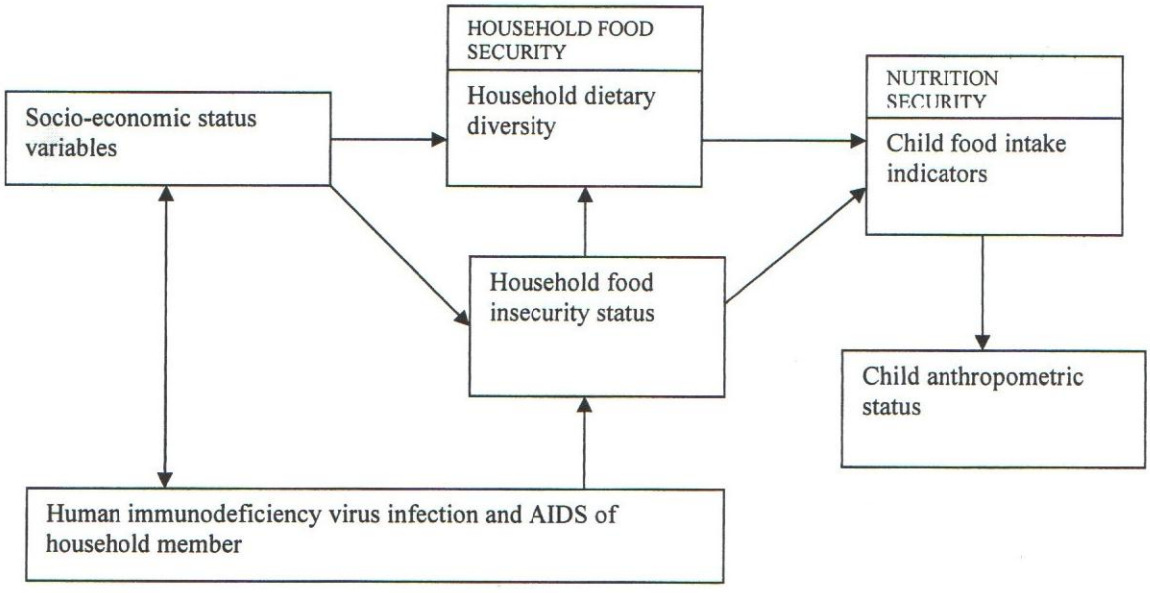


Figure 2. 3 Conceptual framework of the relationship between HIV/AIDS, socio-economic status and food and nutrition security. (Source: Own)

CHAPTER THREE

RESEARCH METHODLOGY

3.1 Introduction

This study aimed at determining the food and nutrition security status of HIV and AIDS affected households within Nakuru Municipality. This chapter discusses the research design adopted, research location, population and sample, instruments used, data collection procedures and analysis.

3.2 Research design

A Cross-sectional study design was used where the data was collected only once among the study population. It involved both qualitative and quantitative measurement techniques. It was cross-sectional in design serving as the baseline for a larger study examining the potential for urban agriculture in mitigating the negative livelihood impacts of HIV infection.

3.3 Study area

The study was undertaken within Nakuru Municipality. Nakuru is a middle-sized Kenyan town with a multi-ethnic composition. Nakuru is located in the heart of the Great Rift Valley between latitude 0010' and 0020' South and longitude 360 and 36010' East, at a distance of 160 km north-west of Nairobi (Appendix 2). According to the District Development Plan 2008-2012 the population for Nakuru municipality is 312,653 people (Republic of Kenya, 2008) with an urban HIV prevalence for the District of 5.9%, which puts the population of HIV affected at 17,864 people.

3.4 Study population

The target population was HIV and AIDS affected households with children aged 2 to 5 years participating in the three major HIV and AIDS support groups in the municipality, namely: Catholic Dioceses of Nakuru (CDN – Love and Hope Centre), ICROSS (International Community for the Relief of Starvation and Suffering), and Family Health International (FHI - *Nuru ya Jamii* group). The choice and purposive sampling of support groups was because a register of all HIV and AIDS affected households to sample from the municipality did not exist to our knowledge.

3.5 Sample and sampling procedure

Households with a child aged between 2 to 5 years of age were selected. Purposive sampling was used to select the desired sample size. In cases where more than one child between two and five years of age was encountered, the index child selected was the child aged between two to three years. This age group was selected because their consumption of breast milk is likely to be minimal and they are therefore more reliant on consumption of food to meet their nutrient needs, and thus more likely to be impacted by an agricultural intervention (Waudo *et al.*, 2005). The child's age was verified from the child health card issued to the mother at the child health and growth monitoring clinic.

3.6 Exclusion criteria

Exclusion from the study included children who reported current or chronic illness as this is a potential confounder of the association between food and nutrition security. Sick children's food intake is likely to be lowered by illness and with the resultant increased nutrient needs, they are likely to have a compromised nutritional status which is not solely as a result of food security of the household.

3.7 Sample size

The study involved multi-indicators therefore the required sample size was determined based on the most demanding variable. The sample size for the study was identified according to the formulae by Magnani (1997). The critical nutrition security indicator status was based on a previous food security study done in Nakuru District which used stunting of children under 5 years of age, and found prevalence to be 28% (Kigutha, 1994). Stunting is preferred for use in household assessment as a nutrition outcome indicator for assessing long term deprivations, as opposed to other indicators such as wasting which measures acute malnutrition, and underweight which is used for national and regional statistics during starvation (Reinhard & Wijayaratne, 2000). Accordingly the sample size was calculated based on the formula below:

$n = D\,[(Z_\alpha + Z_\beta)^2 * (P_1(1-P_1) + P_2(1-P_2)/(P_2 - P_1)^2]$,

Where;

n = Minimum sample size per survey round or comparison group

D = Design effect (a default of 2 is assumed)

P_1 = Estimated level of indicator measured as a percentage taken at the first survey by Kigutha (1994) which found stunting at 28%.

P_2 = Expected level of the indicator either at some future date such that the quantity ($P_1 - P_2$) is the size of the magnitude of change to be detected (an increase of 20% assumed due to HIV/AIDS disease in the household).

Z_α = Z-score corresponding to the degree of confidence with which it is desired to be able to conclude the an observed change of size ($P_1 - P_2$) would not have occurred by chance (α= Level of statistical significance =95% = 1.645)

Z_β = Z-score corresponding to the degree of confidence with which it is desired to be certain of detecting a change of size ($P_1 - P_2$) if one actually occurred (β= statistical power = 80% =0.840)

$n = 2\ [(1.645 + 0.840)^2 * (0.28\,(0.72) + (0.48)\,(0.52) / (0.20)^2] = 139 + 10\%$ attrition = 153.

Sample size = 153.

3.8 Instrumentation

Research data were collected using qualitative and quantitative methods. Qualitative data collection was the first step and involved focus group discussions regarding the household food insecurity access tool among key informants and a group of HIV and AIDS support group members. A pre-test of the quantitative data collection tool was also done using a group of households with similar characteristics to the study group. The quantitative questionnaire was based on standardized validated tools adopted from the Kenya Demographic and Health Survey (CBS, 2004) and the Food and Nutrition Technical Assistance Project (FANTA) (Coates *et al.*, 2006).

Quantitative data collection questionnaire was administered to 154 households, during the first day of interviews the collection of socio-demographic and livelihoods questions and explaining the 24 hour recall memory aid (food calendar) to be filled the following day was done, then on day three the food and nutrition security questions were administered (Appendix 1). Information on household composition and socio-demographic characteristics of the household were collected from the head of the household. Data on household food security and household dietary diversity were obtained from the caretaker, usually female, this was the person responsible for food preparation and feeding the child. Additionally, to assess the nutrition security status of the household the researcher collected dietary intakes using 24 hour recall methodology and anthropometric data (growth measures and body composition measures) of the index child aged 2 – 5 years, with the caretaker reporting on dietary intakes.

3.8.1 Socio-demographic characteristics

Questions on socio-demographic characteristics were adapted from the KDHS 2003 (CBS, 2004). The following variables were assessed: marital status, education and occupation of head of household, in addition to housing characteristics related to size, income, assets and housing characteristics including; lighting, cooking types, agricultural tools and urban agriculture (see Appendix 1).

3.8.2 Food access

The Household Food Insecurity Access Scale (HFIAS) was used to collect data on household food access. The process involves initial cognitive interviews and focus group discussions with community members to understand their understanding of the nine questions and their perceptions therein. Thereafter the local words and experiences are used as examples during actual data collection probing in the community (Coates *et al.*, 2006). The tool is a new concept derived from the original Radimer-Cornell scale (Radimer *et al.,* 1990), and part of the data collection process involved validation steps through focus group discussions, pre-test of the questionnaire, statistical validity and reliability tests of the data as recommended by FANTA (Coates, Swindale & Bilinsky, 2006) among households affected by HIV and AIDS.

A two stage validation process was used. First, cognitive interviews which involved a review of the questionnaire with key informants was conducted to ensure that the food insecurity questions were understood, and a rephrasing of poorly understood terms to fit cultural differences was done. The purpose was to adapt the phrases, definitions and examples to the local context and ensure appropriate understanding of the questions (Coates *et al.*, 2003). Seven key informants were chosen from among the HIV and AIDS home based care staff from Catholic Diocese Love and Hope Centre. Next, refinement of the questionnaire for reliability was done involving the administration of the questionnaire to eleven Love and Hope group members who were representative of the study population, to explore understanding of the questions and meaning (see Appendix 2 for summary of results).

During data collection the respondent responsible for food preparation was asked questions regarding how secure the food supply is for the household, and if any coping strategies to deal with scarcity are practised.

The data collected from the survey were assessed for validity using, construct validity with principal components analysis in SPSS 12.0, including varimax and oblique rotation, internal consistency of the items using Cronbach's alpha, and criterion related validity (Leyna

et al., 2008). The Cronbach's alpha was 0.83 (n = 9) for the HFIAS, implying that 83.7% of the variance in our empirical scale would be held in common with a perfect measure of the same construct. An alpha coefficient of 0.7 or higher is considered reliable (Kendall *et al.*, 1995).

On construct validity the KMO value for the HFIAS questions was 0.8, indicating that patterns of correlations were relatively compact and therefore for component analysis should yield distinct and reliable factors (values greater than 0.5 are accepted).

Further, in rotated component matrix Eigen values (the amount of variance explained by each factor) of 1 or more of factors obtained were retained, and sub scales were then generated for items consistently grouping together the factor loading with an absolute value of 0.4 or more. The rotated component matrix for HFIAS revealed two factors, factor 1 including questions 1 to 6 which predominantly assess anxiety and quality of food intake, with factor 2 having questions 7, 8, and 9 which assess insufficient food intake, factor loading refers to the simple correlations between the questions and each factor as shown in Table 3.1.

Table 3.1. Rotated component matrix with Varimax and Kaiser normalization

ITEM	FACTOR LOADING	
	1	2
Q2. Not eat preferred foods	0.782	
Q1. Worry will not have enough food	0.754	
Q5. Eat reduced portions	0.742	
Q3. Lower variety of foods	0.693	
Q6. Reduced number of meals	0.649	
Q4. Eat less preferred foods	0.627	
Q8. Go to bed hungry		0.810
Q9. Not eat all day		0.784
Q7. No food in the house		0.722

The total variance explained by these two factors was 58.2%. The first factor explained 43.8% and the second factor accounted for 14.4% of the total variance. Two factors were identified indicating eating patterns at the household level, the same has been reported in a Tanzania study by Leyna *et al.*, (2008). The first factor is comprised of questions capturing quality and quantity of food, while the second factor captures the physical consequences of insufficient intake. The lack of clear distinction between quality and

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quantity could be explained by the fact that the population studied is more vulnerable to food insecurity and thus overrode the aspect of quality and quantity (Leyna *et al.*, 2008).

The qualitative assessment of the HFIAS through focus group discussions was done with the aim of gauging the understanding of the main terminologies and concepts used within the local community (Appendix 3), so as to help respondents understand the questions and help guide the interviewer in asking questions. Table 3.2 illustrates the respondents understanding of the terms.

Table 3. 2 Summary focus group discussion responses for the HFIAS questions.

Question	Response
Description of a household	Anyone who lives in the house and eats from the same pot, household members and the material possessions in a house.
Meaning of 'preferred foods'	Cultural specific e.g. a Luo will prefer fish while a Kikuyu will prefer potatoes, beans. Generally rice, vegetables, balanced diet and tasty foods such as chips.
Description of 'lack of resources'	Not working, bed-ridden, single parent, lack of employment and lack of money.
Description of 'limited variety of foods'	Eating a meal that is not balanced e.g. ugali and vegetables every day.
Description of 'foods locally included in a diverse diet'	Balanced meal including protein, vitamin and mineral, carbohydrate rich foods.
Examples of 'less preferred and socially unacceptable foods'	Porridge, tea without milk, lower status vegetables like amaranth, stinging nettle, pumpkin leaves, and among the Kikuyu eating the small dried fish – omena.
Meaning of a meal	Main meal times described as; breakfast, lunch and supper. Though for those on ARV's or TB drugs any time they feel hungry.
Terms that describe the concept of 'no food at all'	Starving, going to sleep hungry, no money, inability to access food due to illness.
Meaning of 'going to sleep hungry because there was not enough food'	Head of the house came home empty handed, lack of fuel to cook even when food is available.
Meaning of 'going for a whole day without eating food'	Eating very little due to unavailability, lack of appetite to eat.

Based on responses from the HFIAS, the FANTA method (Appendix 4) was used to categorise prevalence of food insecurity as either; food secure, mildly food insecure, moderately food insecure or severely food insecure (Coates, Swindale & Bilinsky, 2006). Table 3.3 presents the categorization criteria for households.

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Table 3.3 Criteria for HFIAS food insecurity prevalence categorization.

Category	Criteria
Food secure	Experiences none of the food insecurity conditions, or just experiences worry, but rarely.
Mildly food insecure	Worries about not having enough food sometimes or often and/or is unable to eat preferred foods and/or eats a more monotonous diet and/or same food considered undesirable, but only rarely. But does not cut back on quantity nor experience any of three most severe conditions (questions, 7, 8, 9).
Moderately food insecure	Sacrifices quality more frequently by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals rarely or sometimes, but does not experience any of questions 7, 8, 9.
Severely food insecure	Graduated to cutting back on meal size, or number of meals often, and/or experiences any of the severe conditions (7, 8, 9) as infrequently as rarely.

3.8.3 Household Dietary Diversity Scale (HDDS)

Dietary diversity was assessed by the number of different types of foods consumed over the last 24 hours (Hoddinott, 1999). Current studies in nutrition are placing increased emphasis on the importance of consuming a wide variety of foods so as to enhance dietary quality. When assessed at the household level this helps explain further beyond the food insecurity categorization, to show types of foods consumed based on the food groups in the household thereby giving more insight in to the groups of food consumed, and a likely reflection of the nutrient diversity of the foods consumed. The respondent was the person responsible for food preparation in the household.

The HDDS used by the study was from the FANTA dietary diversity scale (Swindale & Bilinsky, 2005). Foods are grouped into 15 different categories (based on FAO food balance sheets) (Appendix 1) and are meant to depict diversity in food groups consumed within the household in the previous 24 hours (Swindale & Bilinsky, 2005). The respondent was instructed to list the food consumed by household members in the home (including if purchased ready made), or prepared in the home for consumption outside the home. Foods not prepared in the home and consumed outside were not included. The researcher then grouped the foods based on the category they belong. A new set of HDDS was generated by collapsing the 15 food groups into 12 by combining all vegetables and all fruits respectively

(opposed to Vitamin A rich and others), and excluding other foods category of condiments, tea and coffee. This is due to the fact that it is more reflective of dietary quality, and excludes low nutrient density foods such as condiments which are more likely to reflect socio-economic status and not nutrient quality.

3.8.4 Individual Dietary Diversity Score (IDDS)

In addition to household level diet diversity, individual diet diversity was also assessed in order to see how much of an influence the diversity of the household diet had on the child's intake, since not all household members necessarily eat the same foods. Individual dietary diversity score was generated based on dietary intake data obtained from the index child in the 24-hour dietary recall. The foods were grouped into 8 food group categories, namely: Grains/roots/tubers, Vitamin A rich plant foods, other fruits or vegetables, meat/poultry/fish, eggs, pulses/legumes/nuts, milk and milk products, foods cooked with oil. The choice of food groups is based on the method of Hatloy and colleagues (1998).

3.8.5 Twenty four (24) hour dietary recall

A twenty four hour dietary recall is the record of all foods consumed in the preceding 24 hours. The interactive 24-hour recall method outlined in Gibson and Ferguson (1999) was used. The method involved distributing a food calendar two days before the actual data collection, and explaining to the respondent that they should mark the foods consumed by the child the following day (Appendix 5). This memory aid has been found to help in recall of foods by respondents, and the method has been validated in a study in Malawi (Ferguson *et al.*, 1995).

The general four stage procedure used at the household during the interview day is outlined below (Gibson & Ferguson, 1999):

1. Complete listing of all foods and beverages consumed during the previous 24 hr period or preceding day. Here the researcher went through the food calendar to review the ticked foods reflecting the previous day intake. Since the intake was for the index child, clarification had to be made that the ticked foods were those consumed by the child. Then the mother was asked to recall in sequence the foods consumed by the child from the time the child woke up to when it slept at the end of the day. This was compared to the ticked foods and where omissions or additions were noted probing was done to seek clarification.

2. Detailed descriptions of all foods and beverages consumed, including cooking methods and time and place of eating was collected. This was done in chronological order for each of the foods stated in procedure one above.
3. Estimates of the amounts of all foods and beverages consumed was assessed. The following tools were used in estimation of the portion sizes for food;
    - Local household utensils – Here the utensil used in serving food to the child was requested for e.g. the cup used, the respondent was then requested to pour the food in to the cup if available and where not available water was poured to the level and then transferred to a standard measuring jug and the reading taken.
    - Food models made from rubber borrowed from the Department of Human Nutrition at Egerton University Food Laboratory were used. They varied in different sizes and the respondent was asked to describe the size of foods such as potatoes, rice etc consumed by the child. The corresponding model number was then recorded.
    - Food items such as bananas were presented and a tape measure used to take the actual length of the consumed portion. Where actual food was available in the household the amount consumed was weighed using an electronic scale. For mixed dishes the food portion size was noted and recipes later generated to help differentiate the individual ingredient portions. For foods such as eggs or sliced bread counts of foods were used.
4. Review of 24-hour recall to ensure all items have been recorded correctly. This was done to ensure complete entry of the data before completing the exercise.

The food portions from the graduated models, lengths, and volumes measured above were converted to gram weights of actual foods by purchasing the foods locally, preparing and weighing using an electronic scale, then recording the quantities. For common mixed and multi-ingredient dishes standard recipe data was used to help calculate food composition values. The process included a review of the foods listed in the 24-hour recall forms. Thirteen recipes were identified, and five women from the study group were convened and given the ingredients for the food items which they then prepared. The following parameters were recorded in the course of developing standardized recipees: ingredients, weight before preparation, weight after preparation, total weight of mixed dish, weight of a serving, number

of servings from the dish, and then gram weight based on the portion reported was used (Appendix 5).

The food intake data was entered into NutriSurvey Computer software (Erhardt, 2007), which is based on the German food database. The FAO International Mini food list and the Kenyan food database were added so as to include local foods. Additionally, those foods not available were imported from WorldFood Dietary Assessment System 2.0 databases. The databases are based on a six countries study of Egypt, Kenya, Mexico, Senegal, India and Indonesia. The program was able to generate nutrient intakes based on the portions consumed, in addition to animal source foods and antinutrients such as phytates (Gibson & Ferguson, 1999). This procedure is summarised in Figure 3.1.

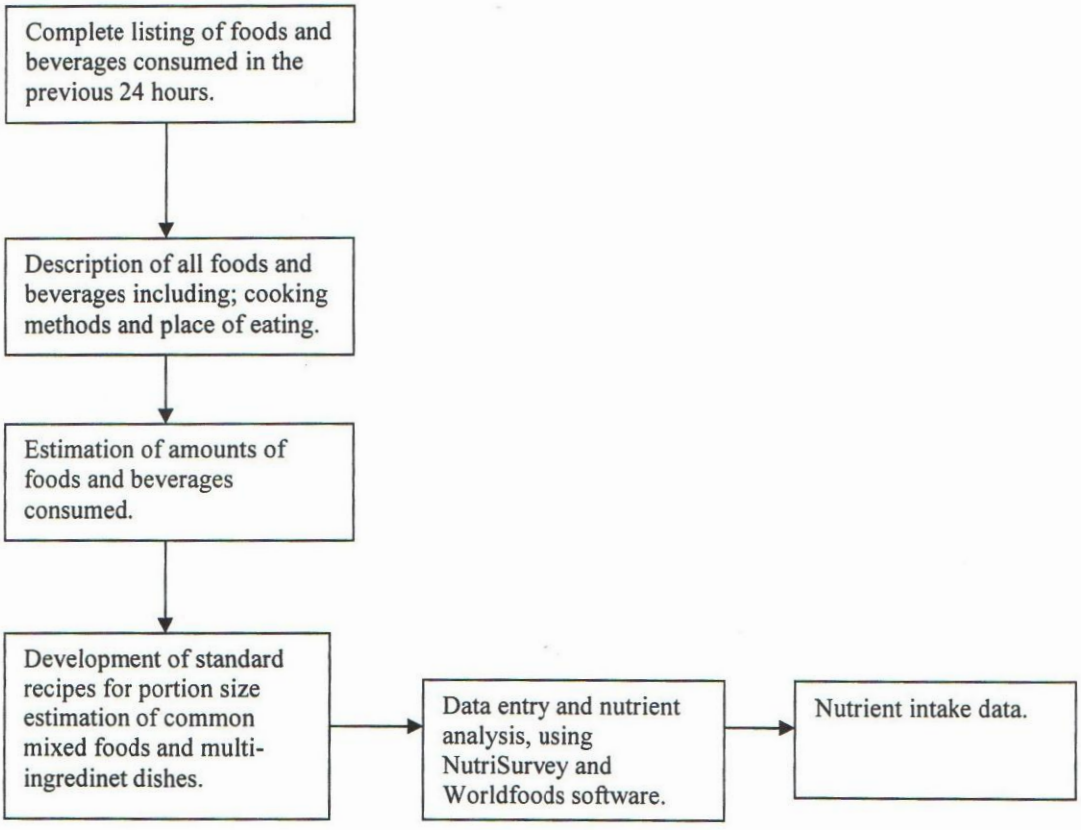


Figure 3.1 Summary dietary intake collection procedure analysis

3.8.6 Anthropometric measurements

Anthropometric measurements of weight, height, mid-triceps skin fold and mid-upper arm circumference of the index child aged between 2 to 5 years were taken. The age of the

child was obtained by asking the household head and confirmed by the researcher checking the child health card. To reduce inter-individual error, the researcher was the only one involved in taking each measurement in triplicate with the mean value used for analyses (Appendix 6).

3.8.6.1 Height and weight measurement

The Frankfurt plane (stadiometer) was used in height measurement. The child was positioned standing straight without any shoes with the head in the Frankfurt plane, feet together, knees straight, and heels, buttocks, and shoulder blade in contact with the vertical surface of the stadiometer. The height measurement was taken in triplicate and the average used for data analysis (Gibson, 2005). A weighing scale was placed on a flat hard surface and adjusted to zero before each measurement. The child was placed in the centre of the platform looking straight ahead, standing unassisted, relaxed but still, and wearing minimal light clothing. The body weight was recorded to the nearest 0.1 kg. All measurements were done in triplicate, and the average used for data analysis (Gibson, 2005). For purposes of quality assurance, height measurements were taken from flat surfaces with a supportive straight wall in place. While for weight measurements the weighing scale was calibrated using a known weight every morning and also placed on a hard flat surface during assessment.

3.8.6.2 MUAC and Mid-Triceps skin fold measurement

The child was made to stand erect and sideways to the anthropometrist. Any sleeved garment was removed. Then the left arm was bent and the lower arm placed across the stomach. The tip of the bone at the back top of the elbow (acromium process) was located and marked with a pen. Next, the tip of the elbow was marked, and the distance between the two points was marked and the distance between the two points was measured and the midpoint marked using a flexible non-stretch tape. Using the same tape, the measurement of the circumference was taken to the nearest 0.1. For mid-tricep skin fold (TSF) measure the arm was extended to hang loosely by the side, then a vertical fold of the skin plus the underlying fat was grasped 2 cm above the marked mid-point, in line with the tip of the olecranon process using both the thumb and forefinger. The skin fold was then gently pulled away from the underlying muscle tissue, the Calliper jaws were then applied at right angles, exactly at the marked midpoint, with the skin fold remaining held between the fingers while the measurement was being taken. All measurements were done in triplicate, and the average used for data analysis (Gibson, 2005).

3.9 Data collection process

1. The study was presented to several review boards including: the Department of Human Nutrition, Faculty of Health Sciences, and the Post-Graduate Studies Board at Egerton University. A letter of permission was obtained from the Post-Graduate Studies Board which was submitted to the Ministry of Science and Technology where a research permit was granted (Appendix 7). In addition, Ryerson University Ethics Board, Canada gave approval. Signed informed consent was obtained from the study participants during data collection after accepting to participate in the study voluntarily (Appendix 8).
2. The research instruments were pre-tested prior to data collection as described in section 3.8.
3. Data was collected through questionnaire and anthropometric measurement. The socio-demographic data was collected with the assistance of trained research assistants while food and nutrition security assessment including anthropometric assessment was done by the researcher.

3.10 Statistical data analysis

After data collection, entry, cleaning and processing was done using Census and Survey Processing System (CSPro) computer software for livelihoods and food security variables. CSPro was preferred as it is compatible with Statistical Package for Social Sciences (SPSS version 12, Inc., Chicago IL) which was used for the general statistical analysis of the data. Conversion of foods to nutrient intake was done using NutriSurvey and WorldFoods Dietary Assessment System 2.0. Anthropometric indices were calculated using WHO Anthro 2005.

Statistical data analysis was done using both descriptive and inferential statistics. For anthropometric data analysis involved generating z-scores for Weight for Age (WAZ), Height for Age (HAZ), Weight for Height (WHZ), and body mass index (ZBMI) based on the new international growth charts released by the World Health Organization (WHO) using the WHOAnthro 2005 Computer software (Tumilowics & Deitchler, 2006). A z-score of below -2 indicates risk of severe malnutrition, whereas scores above +2 indicate obesity (Gibson, 2005). Based on the NHANES I and II data for African Americans z-scores for MUAC and TSF were calculated and classification of status determined based on the same z-score classification above. The Least Mean Squares (LMS) method was used to correct for skewed body composition indices expressed as z-scores (Ogden *et al.*, 2002).

Bivariate associations were first conducted amongst variables. Pearson's correlation was used to explore associations amongst continuous normally distributed variables of socio-economic status, HFIAS, HDDS, and IDDS, and chi-square amongst categorical/dichotomous variables such as approximate monthly income of head of household, sex of head of household and access to land. Spearman's rho was used on non-normally distributed continuous data on dietary intake, normality was measured using histograms with normal distribution curve and significance set at $p<0.05$. Thereafter based on emerging statistically significant associations as hypothesised in the conceptual model (Figure 2.3), backward multivariable linear regression analysis was performed among the dependent (criterion) variable and independent (predictor) variables. Multivariable linear regression is a statistical technique that allows one to predict a score on the predictor variable on the basis of scores of several other independent variables. Linear regression was used as opposed to other methods such as logistic regression because the criterion variables in the two models used were continuous data. A summary of statistical data analysis is presented in Table 3.4.

Table 3. 4 Summary methods of statistical analysis

Research Question	**Variables**	**Analysis**
1.	Socio-demographic characteristics and Household food insecurity access status (using HFIAS and HDDS).	Descriptive statistics
2.	Nutrition security through child IDDS, adequacy of dietary intake through 24 hour dietary recall and anthropometric status.	Descriptive statistics
3.	Associations between socio-demographic characteristics and HFIAS.	Pearson's bivariate analysis, chi-square and backward linear regression.
4.	Associations between HFIAS, HDDS to IDDS.	Pearson's bivariate analysis, and backward linear regression.
5.	Associations between HFIAS, HDDS, and IDDS to child dietary intake adequacy.	Spearman's rho and backward linear regression.
6.	Associations between child dietary intake adequacy to anthropometric outcomes.	Spearman's Rho

CHAPTER FOUR

RESULTS AND DISCUSIONS

4.1 Introduction

Results and discussions of the research work is presented in this section. The areas covered include: socio-demographic status indicators of the household, food security status of the household, and nutrition security status of the index child, and associations among the different variables.

4.2 General household socio-demographic characteristics

Of the 154 households, the age of the household head was available for 151 respondents. Across these households, the mean age of the head of household was 40 years, with an overall range of 20 to 75 years. Male headed households comprised 55% (n=83) compared to 45% (n=68) that were headed by females. The mean number of household members was 6.7. Table 4.1 presents the household size as compared to the Kenya Demographic Survey (KDHS) findings for urban residents of 2003.

Table 4.1 Percent distribution of head of household by sex and household size compared to Urban households in the KDHS 2003.

Characteristic	**Study households (N = 154)**	**KDHS 2003 Urban Residence (N = 2,136)**
Head of household	**%**	**%**
Male	55.0	74.4
Female	45.0	25.6
Number of household members	%	%
1	none	22.6
2	0.6	18.1
3	7.1	16.3
4	14.3	14.9
5	17.5	11.2
6	18.2	7.9
7	10.4	4.4
8	11.7	2.5
9+	20.2	3.0
Mean size	6.6	3.5

Whereas in the KDHS comparison by sex of head of household indicates a threefold majority in the number of male headed households (74%), among the study participants the

ratio is almost equal between male and female headed households (55% and 45% respectively). This suggests that HIV and AIDS disease is having a dramatic influence on the sex composition of heads of households, either through death of more men or majority of the women being single mothers or widowed and not able to re-marry. Further investigations are needed to understand this shift. In addition the number of people residing in the household is increasing among HIV and AIDS affected households, whereas the trend is reverse among the general urban population as depicted in the KDHS data. This study may not have been representative of a general urban population as it was purposely selected based on assistance by organizations which gave more emphasis on lower socio-economic groups.

Of the 154 index children, 53.9% were boys while 46.1% were girls. Among the boys the age distribution indicated 22.9%, 44.6%, and 32.5% at two, three and four and above years respectively. While among the girls it was 25.4%, 49.3% and 25.7% respectively. Hence among both sexes majority of the children came from the 3 year category. Age dependency ratio is defined as the sum of all persons under 15 years or over 64 years of age, divided by number of persons age 15 – 64, multiplied by 100 (CBS, 2004). It is a measure of the number of dependants in a household. For the general Kenyan population it was 92 in 2003, while for the study group was 143. According to Topouzis (1998), AIDS related morbidity and mortality usually results in a rise in the number of dependants including orphans within a household relying on a smaller number of productive members. Also the fact that this study purposely selected households with children aged under 5 years might be the reason for the high dependency ratio. This findings therefore add value to Topouzis view, while also bringing out the new understanding that in Nakuru household dependency among HIV and AIDS affected households is on the rise and so measures to sustain household units through support programs are needed.

Compared to the national average figures on age of head of household among study participants and KDHS 2003, there were fewer heads of households aged below 24 years across sexes with the majority being above 30 years of age, as summarised in Table 4.2 below. This could be attributed to the inclusion criteria of a household with a child aged 2 to 5 years.

Table 4.2 Percent distribution of head of household by age and sex compared to national KDHS 2003.

Age distribution in years (N=151)	Male in study group	KDHS 2003	Female in study group	KDHS 2003
15 – 19	NA	23.9	NA	22.6
20 – 24	2.4	19.0	4.4	20.6
25 – 29	15.4	14.2	8.9	16.9
30 – 34	22.8	11.6	11.7	13.3
35 – 39	18.0	11.1	22.1	10.6
40 – 44	12.0	8.7	16.1	9.6
45 – 49	14.6	5.5	13.2	6.4
50 – 54	6.0	6.0	10.3	NA
55 and above	9.6	NA	13.3	NA

NA = not available

Half of the household heads were in a monogamous marriage, while twenty six percent were headed by widows or widowers. When separated by sex of head of household, male headed households were more likely to be in a marriage (96.41%) compared to females (8.6%). In comparison to the urban population in the KDHS 2003, there were more widowed heads of households in HIV and AIDS affected households. The higher number of female headed households among study participants could be due to the fact that even within the marital status analysis, there were more widows among study participants compared to KDHS 2003 (52.9% and 4.2% respectively). There was a higher proportion of female widows (53.6%) compared to men (3.6%). This might be explained by the cultural practice that allows men to re-marry upon the death of a spouse as opposed to females. The household size average of 6.6 persons per household was far much higher than the national urban average of 3.5 people per household (CBS, 2004). This could be attributed to households having to take in orphans who have lost their parents, a phenomenon common in HIV and AIDS.

Level of education for the household head shows that the majority of the respondents had primary school level education (58.3%), the results disaggregated by sex of head of household and compared to KDHS 2003 are summarized in Table 4.3. Education level appears quite similar with the exception of being lower in terms of advanced secondary and beyond, particularly for female heads of households while higher in terms of ordinary secondary (secondary education between form 1 and 4) for female heads of households.

Table 4.3 Percentage of years of schooling by sex of head of household

Schooling (n = 150)	Male head of household	KDHS 2003	Female head of household	KDHS 2003
No formal schooling	4.9	6.4	13.0	12.7
Primary schooling	56.8	56.7	62.3	58.0
Ordinary secondary	30.9	30.9	23.2	12.3
Advanced secondary & beyond	6.3	10.2	1.4	10.2

On income and occupation, over one third (38.8%) of the household heads listed ownership of an informal business as their primary occupation, followed by casual labour (28.3%), salaried employement (18.4%), and formal business ownership (5.3%). When examined by sex of household head, the most commonly cited primary occupation of female heads was informal business ownership, while males were more likely to be engaged in casual labour (54.4% and 35.4% respectively). It is important to note 63 that respondents reported that it was difficult to estimate earnings as they depended on day to day job availability which was not consistent enough to predict income and hence only 91 respondents reported estimated income per month. The estimated level of income for the household head indicates that 68.1% earn between KES. 1,000 to 5,000, 15.4% earn less than 1000, 13.2% earn between KES. 5,000 and 10,000, while 3.3% earn more than KES. 10,000. The results are summarised in Table 4.4.

Table 4.4 Percent level of income and primary occupation by sex of head of household.

Primary occupation (N = 152)	% Male	% Female
Cant' work	-	1.4
Unemployed	2.4	5.7
Farmer	2.4	1.4
Salaried employee	26.8	8.6
Formal business owner	7.8	2.9
Informal business owner	25.6	54.3
Casual labourer	35.4	20.0
Caretaker	-	5.7
Level of income in KES. (N = 91)	**% Males**	**% Females**
Less than 1,000	11.3	21.1
1000 – 5,000	62.3	76.3
5,000 – 10, 000	20.8	2.6
Over 10,000	5.6	0.0

On housing, majority of respondents (n=151) resided in one roomed houses (48.3%). The main source of fuel for the households was charcoal (72.7%), followed by firewood (24.7%) and kerosene (2.6%). While for the majority, lighting was by use of kerosene (68.2%), electricity was used by close to a third of the households (31.8%). Data on number of rooms in the household indicate that 41.5% of male headed households lived in one roomed houses compared to 56.5% of female headed households, while 58.6% of male headed households lived in two rooms or more compared to 43.4% for female headed households, a summary of other housing characteristics are presented in Table 4.5.

In terms of urban farming characteristics, of the 154 respondents 34.4% had access to land for farming compared to 65.6% that did not have access, 53.9% had no agricultural tools or animals, while 42.9% had manual farming tools, and 2.3% kept chicken and 0.6% kept sheep or goats.

Table 4.5 Housing characteristics compared to KDHS 2003 for urban dwellers.

Housing characteristics	**Percent**	**KDHS 2003**
Floor (n = 146)		
Brick/cement	46.5	71.4
Wooden	2.1	0.9
Mud	51.4	18.8
other	0.0	8.9
Roof (n = 146)		
Cement brick	1.4	12.6
Tin	7.5	0.3
Corrugated	90.4	73.3
Grass	0.7	4.0
Other	0.0	9.8
State of dwelling (n = 153)		
Completely dilapidated	1.3	2.3
Needs major repairs	34.6	17.3
Needs few repairs	64.1	79.5
Ownership of house (n = 154)		
Own	26.0	19.3
Leased	73.4	76.2
Other (squatter, given etc.)	0.6	4.5

4.3 Food security and diet diversity

4.3.1 Household food insecurity access status

The conceptual framework of the HFIAS tool is based on cross-cultural studies that have shown a commonality in the continuum of food insecurity at household level. It has been shown that the first experiences are perceptions of vulnerability followed by behavioural responses within the household. The HFIAS is therefore categorised into three domain questions, namely: anxiety and uncertainty (question 1), insufficient quantity (questions 2,3,4), insufficient food intakes, and finally its physical consequences (questions 5,6,7,8,9) (Coates *et al.*, 2007).

Analysis of the individual household food insecurity questions revealed that half of the households often worried that they will not have enough food, were often not able to eat preferred foods and ate a limited variety of foods, all due to lack of enough resources. Over a third of the households often ate foods they did not prefer and ate fewer meals in a day due to lack of resources. Figure 4.1 presents the summary results of the household food insecurity access related conditions.

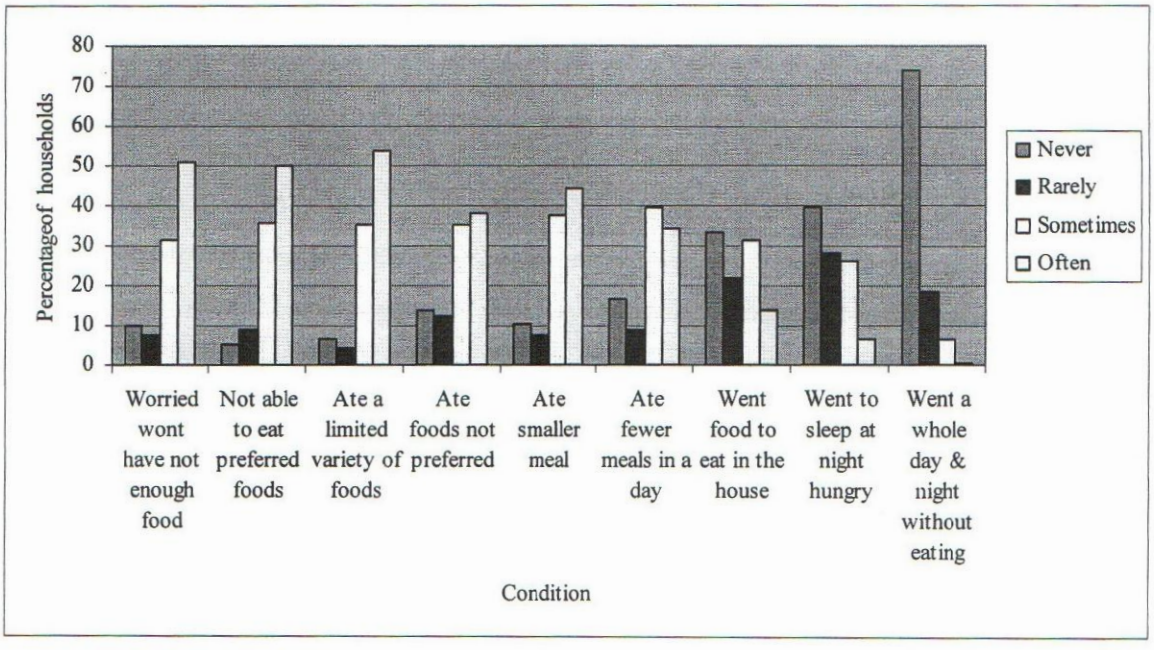


Figure 4.1 Summary of household food insecurity status conditions (N = 154)

Determination of the prevalence of household food insecurity status was done, and involved converting the continuous HFIAS data variable into categorical data using the FANTA SPSS syntax (see appendix 7) based on their answers to the 9 questions. Households

are categorised as being: food secure, mild food insecure, moderately food insecure, or severely food insecure. The level of severity of food insecurity is based on affirmative responses to more severe conditions (insufficient intakes and its consequences) and/or frequency of experiencing those conditions. The summary results are presented in Table 4.6.

Table 4.6 Summary household food insecurity prevalence (HFIAP)

Status	Percentage
Food secure	0.6
Mildly food insecure	1.9
Moderately food insecure	24.0
Severely food insecure	73.4

From the results obtained it is apparent that food insecurity was very high among this low income HIV and AIDS affected households population, with almost all households reporting some level of food insecurity, and over half of the households often worrying about running short of food and eating less variety and foods that were not preferred.

4.3.2 Household dietary diversity

Increased dietary diversity is recommended within food based dietary guidelines, it is viewed as a measure of food quality since through a diverse diet nutrient needs are more likely to be met with resultant improvement in health (Steyn *et al.*, 2005). Household dietary diversity score was analyzed based on the FAO food group categorization of 15 food groups, as recommended in the FANTA manual (Swindale & Bilinsky, 2005). The mean dietary diversity was found to be 8.1 (95% CI 7.8, 8.4).

The mean diversity score was 7.1 from a possible 12. The HDDS results indicated a high frequency of consumption of oil/fat. Cereals, vegetables and sugars were generally high, while there was a very low frequency in intake of meats. This implies a low intake of protein from animal source foods which are better sources of bio-available iron, zinc and vitamin A. It is important to note that this scale does not quantify portion sizes, therefore conclusions regarding nutrient adequacy cannot be made.

There were no statistically significant differences by sex of household head ($r = 0.062$, $p = 0.445$) in terms of HDDS. The HDDS score was correlated with socio-demographic characteristics, food insecurity and food intake variables and the individual dietary diversity score. The Pearson bivariate correlation indicated the 12 food group score HDDS had statistically significant associations with the following variables; HFIAS ($r = - 0.356$, $p = 0.000$). Even though animal source foods ($r = 0.188$, $p = 0.019$) and age of the index child (r

= -0.188, p = 0.020) were statistically significant, their r-values were very low hence may not be of practical significance. The inverse relationship with age of index child shows that as the child ages they no longer receive diverse diets but get absorbed in to the mainstream household diet which is less diverse, while increasing food insecurity results in less diverse diets, and affording animal source foods indicates likelihood of increased dietary diversity.

4.3.3 Individual Dietary Diversity Score (IDDS)

A total of 154 children aged 2 to 5 years participated, with males constituting 54% (n = 83) and females 46% (n = 71) of the sample. An IDDS was generated from the index child 24-hour dietary recall data, the mean dietary diversity score for the index child was 3.9 (95% CI 3.8, 4.1) out of a possible 8 categories of food groups. The number of food groups and generation from recall data was based on the method of Hatloy and colleagues which has been previously validated in individuals (Hatloy *et al.*, 1998).The results are summarized in Table 4.7. The most frequently consumed food group was grains, roots and tubers (99.4%) followed by cooking oil (98.1%), while the least consumed food groups was eggs (7.1%), followed by milk and milk products (14.3%). This indicates a low intake of animal source foods amongst the children. As was the case for HDDS, there was no statistically significant difference when analysed by sex of head of household (r = 0.006, p = 0.940). Also the significance of oil/fat contribution would require further verification in terms of quantities.

Table 4.7 Proportion of children's consumption of food groups in the previous 24 hours.

Food group	Score % (n=154)
Grains, roots and tubers	99.4 (153)
Foods cooked with oil	98.1 (151)
Other fruits and vegetables	93.5 (144)
Pulses, legumes and nuts	31.2 (48)
Meat, poultry and fish	29.2 (45)
Vitamin A rich plant foods	20.1 (31)
Milk and milk products	14.3 (22)
Eggs	7.1 (11)

4.4 Dietary intake for children 2 - 5 years of age.

In order to estimate the adequacy of nutrient intakes from a single recall, we compared them to Recommended Dietary Intake (RDI). From the nutrient intake analysis based on RDI's for the single 24-hour recall data, the mean intakes for protein, vitamin A and iron were over 100% of the RDI, while carbohydrate followed with % RDI close to 100%, with the rest of the nutrients being low. It is worth noting that inspite of high intakes for zinc and

iron the phytic acid levels are high with a low animal source protein contribution. When compared to studies on dietary intake done in Nakuru Municipality, Kamau-Mbuthia (2006) found similarly low fat (57.5%), and calcium (41.1%) % RDI intake in diets of lactating HIV positive women.

Table 4.8 Mean actual nutrient intake and RDI contribution from the diet of child aged 2 - 5 years of age.

Nutrient	mean intake (95% CI (LowerUpper))	% RDI	% Contribution of total energy
Energy (kcal)	943.7 (805.7, 1082.1)	81.6	
Protein (g)	25.3 (21.4, 29.3)	178.4	10.6
Animal source protein (g)	14.2 (10.1, 18.4)	NA	6.0
Carbohydrate(g)	151.4 (138.7, 164.2)	88.1	68.7
Fats (g)	27.9 (16.6, 39.1)	46.7	20.7
Vitamin A (μg)	500.9 (361.5, 640.3)	115	
Calcium (mg)	275.7 (200.3, 351.1)	66.5	
Iron (mg)	6.9 (5.8, 7.9)	135	
Zinc (mg)	4.1 (3.6, 4.6)	70	
Phytic acid	1160.2 (1043.7, 1276.7)	NA	

NA = Not applicable
RDI from references of the FAO/WHO (2002).

Dietary intake data analysis suggests that fat, calcium and zinc intakes are marginal, further iron and zinc are also likely compromised due to low bioavailability which is not taken in to account when calculating nutrient intake using the nutrisurvey program. This could also be due in part to the fact that the one day's food intake does not reflect usual intake.

4.5 Growth and body composition variables

All distributions were checked for normality by generating a histogram with the normal distribution curve as seen below. As expected HAZ had the most normal distribution followed by Z-BMI, whereas WAZ tended to be slightly skewed towards the right, with Z-MUAC and Z-TSF slightly skewed to the left.

Data on growth indices indicate that the overall prevalence of stunting (HAZ < -2 SD) was 33.1% (n = 51). Stratified by sex, there was a slightly higher prevalence of males at 57% (n = 29) compared to females at 37% (n = 22), which was not statistically significant. With respect to underweight (WAZ < - 2 SD), overall prevalence was 26% (n = 40), with an almost equal number of males (52.5%) and females (47.5%) and not statistically significant. On

wasting (WHZ < -2 SD), overall prevalence was 12.3%, with near equal number of males (52.6%) and females (47.4%) and not statistically significant. The males therefore appear to have slightly higher values of stunting, underweight and wasting. When the children's age was categorised by months as seen in Table 4.9, almost all age categories z-scores even within normal values were on the lower side (0 to -1 z-scores).

Table 4.9 Mean (95% CI) anthropometric indices by age category.

Anthropometry (n = 152)	Age category in months	Mean (95% CI)
HAZ	24 -36	- 1.2 (- 1.9, - 0.9)
	37 – 48	- 1.4 (- 1.7, - 1.1)
	49 – 60	- 1.2 (- 1.7, - 0.8)
WAZ	24 – 36	- 1.2 (- 0.8, - 1.1)
	37 – 48	- 1.3 (- 1.6, - 1.1)
	49 – 60	- 1.4 (- 1.7, - 1.0)
WHZ	24- 36	- 0.6 (-1.0, - 0.2)
	37- 48	- 0.8 (-1.0, - 0.5)
	49– 60	- 0.8 (-1.1, -0.6)
ZBMI	24 – 36	- 0.5 (- 0.8, - 1.0)
	37 – 48	- 0. 6 (- 0.1, - 0.4)
	49 – 60	- 0.8 (- 1.1, - 0.5)
ZMUAC	24 – 36	- 0.4 (- 0.7, - 0.1)
	37 – 48	- 0.5 (- 0.7, - 0.3)
	49 – 60	- 0.8 (-. 1.1, - 0.5)
ZTSF	24 – 36	- 0.7 (- 0.9, - 0.5)
	37 – 48	- 0.2 (- 0.4, - 0.1)
	49 - 60	0.7 (- 0.9, - 0.6)

The prevalence of stunting (33.1%) and underweight (26%) is almost similar to the national average of 35.5% stunting and 25.5% underweight as reported in the KDHS 2003 report. While for wasting the mean is 12.3% compared to the national average of 6% even though the KDHS 2003 reported figures of up to 15% among women with no education. Considering the age group of 2 to 5 years, studies in Kenya have indicated similar levels of under nourishment with stunting levels of between 30 to 37% among studies reviewed (Bloss *et al.*, 2005). Stunting is an indicator of long term undernutrition while underweight is a short term indicator, and the results of this study indicate that based on comparison with the national average the children in the study population are not as vulnerable in terms of anthropometric outcomes despite the high levels of food insecurity reported in the household. This may be attributed in part to the fact that beyond two years of age those

children that survive that vulnerable period are more resilient and that the level of food insecurity in the house tends to affect the child last in terms of food allocation. Wasting on the other hand indicated a higher than national average prevalence. Wasting describes current nutritional status and show levels of thinness for height, among the children with wasting, severe wasting (WHZ < -3) the prevalence was 3.3%, severe wasting is an indicator of elevated risk of mortality and the urban national average as per KDHS 2003 is 1.0% even though among the lowest wealth quantile for the national survey the prevalence stood at 2.3%.

A total of 153 children had data analyzed for body composition since one extreme outlier in the z-scores was eliminated. Low z-score for body mass index (ZBMI < -2) was found amongst only 8% (n = 13) of the children, with a near equal distribution among the sexes (54.0% males and 46.2% females), while a majority of the low < -2 ZBMI were in the middle age category of 37 – 48 months, there were no BMI measures > 2. Only 6 out of the 153 had a low ZMUAC (ZMUAC< - 2 SD), with males constituting 66.7% of the low ZMUAC, while only one child MUAC greater than 2 z-scores. By age categorization half of the low ZMUAC cases were in the lower age category of 24 – 36 months. The low ZMUAC prevalence of 4% compares to 5.3% prevalence recorded amongst under five year olds in an urban-rural study conducted around the Lake Victoria region of Eastern Africa (Waudo *et al.*, 2005). Triceps skin-fold (ZTSF) measure mean was found to be – 0.46, which is within the normal range, only 1 child had a z-score below -2.0. Mid-triceps skin fold measure indicated that all children were within the normal range. There were no statistically significant differences in body composition measures by age categories or sex of the child. The results are presented in Table 4.10.

Table 4.10 Proportion of children with growth failure and low body composition by age categorization in months.

Anthropometric Measurement (N = 154)	Age category in months			
	24 - 36 (n =46) %	37 - 48 (n = 73) %	49 - 60 (n = 35) %	Overall %
HAZ (stunted) <-2 z-score	11.0	17.5	4.5	33.0
WAZ (underweight) < -2 z-score	7.1	12.3	6.5	25.9
WHZ (wasting) <-2 z-score	1.9	7.1	3.3	12.3
ZBMI (Low BMI) < -2 z-score	1.9	4.5	1.9	8.3
ZMUAC (Low MUAC) < -2 z-score	2.0	1.3	0.7	4.0
ZTSF (Low TSF) <-2 z-score	0.6	0	0	0.6

4.6 Associations among different variable characteristics

Bivariate associations among variables indicated that HFIAS had statistically significant associations with years of schooling of head of household ($r = -0.237$, $p = 0.004$, $n = 148$), number of people in the household ($r = 0.169$, $p = 0.037$, $n = 152$), HDDS 12 food group scale ($r = -0.356$, $p = 0.000$, $n = 152$), and IDDS ($r = -0.265$, $p = 0.001$, $n = 152$), number of people in the household ($r = 0.169$, $p = 0.037$, $n = 152$). The negative associations were expected as a decrease in food insecurity would require an increase in income and education, along with fewer dependant people to feed in the household. Access to land and sex of head of household were not statistically significantly associated with HFIAS using chi-square test of association $p = 0.05$ criterion ($x^2 = 34.13$, $p = 0.063$, $n = 152$ and $x^2 = 29.05$, $p = 0.179$, $n = 152$ respectively). Therefore there are associations between HFIAS and socio-demographic indicators

Associations among the independent variables; HFIAS, HDDS and IDDS with dietary intake data from the 24-hour recall results are summarised in Table 4.11. The trend is for negative associations between HFIAS and nutrient intakes, as expected since increased food insecurity result in compromised food access by the household. Individual dietary diversity scores had statistically significant positive relationships with different nutrients other than iron intake which was expected, given that both measures were on the same individual. Nutrients with the most consistent associations with dietary diversity scores were animal source protein and fat. The macronutrients had the most consistent relationships with HFIAS and diet diversity, with the exception of energy in terms of HDDS. In addition, calcium was

statistically significantly positively associated with diet diversity and zinc in terms of IDDS, with the relationship between iron and IDDS approaching significance. In a review of multi-country studies in developing countries, Neumann *et al.*, (2002) found that animal source foods are important in improving diet quality through enhancing absorption of iron and zinc, and intake is related to rate of infant growth, and a positive predictor of child growth and cognitive development.

Table 4.11 Spearman's Rho correlation between HFIAS, HDDS, IDDS and nutrient intake data.

Nutrient	**HFIAS (N= 152)**	**HDDS (N = 154)**	**IDDS (N = 154)**
	r (p)	**r (p)**	**r (p)**
Energy (Kcal)	**- 0.182 (0.025)**	0.112 (0.168)	**0.273 (0.001)**
Protein (g)	**- 0.139 (0.088)**	**0.159 (0.049)**	**0.452 (0.000)**
Animal source protein (g)	**- 0.162 (0.046)**	**0.392 (0.000)**	**0.554 (0.000)**
Fat (g)	**- 0.283 (0.000)**	**0.209 (0.009)**	**0.276 (0.001)**
Carbohydrate (g)	- 0.115 (0.157)	0.023 (0.778)	**0.179 (0.026)**
Vitamin A (µg)	0.041 (0.618)	- 0.058(0.479)	0.051(0.536)
Calcium (mg)	- 0.040 (0.627)	**0.206 (0.010)**	**0.431 (0.000)**
Iron (mg)	- 0.041 (0.616)	- 0.057 (0.485)	0.156 (0.053)
Zinc (mg)	- 0.059 (0.468)	0.026 (0.748)	**0.316 (0.000)**

Correlation is significant at 0.05 level.

There were no significant associations of HFIAS with anthropometric data of the index child, similar results have been reported in a study in Burkina Faso (Frongillo & Nanama, 2006). A possible explanation could be that anthropometric status is influenced not by diet alone, but health condition as well as physiological factors (Figure 1.1). In addition HFIAS appears more sensitive to proximal independent predictors of food insecurity such as socio-demographic factors and more proximal outcome indicators, such as dietary diversity as opposed to distal outcome indicators such as anthropometric status. In the past energy intake or availability alone has long been used to measure food security. However, the new move is to evaluate total diet quality. Dietary diversity is one of the diet quality assessment methods (Torheim *et al.*, 2003). As seen in the correlations above, dietary diversity and HFIAS hold promise among simple tools that could be used, in fact a validation study by Hatloy *et al.* (1998) found that dietary diversity is a useful indicator of nutrient adequacy. A study by Sarry *et al.* (2005) showed that dietary diversity measured at individual level are good proxies of overall dietary quality and also linked with nutritional intake.

The absolute value for proteins and its resultant percentages (% protein, animal source protein, and animal source carbohydrate), iron, zinc, calcium, are important in tissue development. While phytic acid and fibre are anti-nutrients that can impede growth by limiting the bio-availability of key nutrients. The above nutrients and anti-nutrients were therefore correlated with the body growth and composition indices. Dietary intake data did not detect any statistically significant association with anthropometric growth indicators. There were however, statistically significant associations between body composition measures and some of the nutrient intake estimates (see Table 4.13). Significant associations with MUAC z-scores were also generally positive, while those for triceps skinfold z-scores were generally negative. Z-BMI it seems might not be as sensitive to body composition disturbances, also zinc and iron play a key role in lean body mass and fat accretion (Neumann *et al.*, 2002). Specific nutrients with at least two positive associations included percent protein, animal source protein, and animal source kilocalorie.

Table 4.12 Spearman's Rho correlation between child dietary intake and body composition.

Nutrient	**ZBMI (n=154) r(p)**	**ZTSF (n=153) r(p)**	**ZMUAC (n= 153) r(p)**
Protein (g)	- 0.050 (0.540)	- 0.109 (0.178)	0.116 (0.152)
% Protein	0.089 (0.272)	- 0.050 (0.539)	**0.216 (0.007)**
Animal source protein (mg)	0.057 (0.485)	- 0.037 (0.648)	**0.177 (0.029)**
Animal source Kcal (mg)	0.043 (0.596)	- 0.051 (0.535)	**0.190 (0.018)**
Iron (mg)	- 0.147 (0.069)	**- 0.217 (0.007)**	- 0.064 (0.430)
Zinc (mg)	- 0.134 (0.097)	**- 0.187 (0.021)**	0.020 (0.810)
Calcium (mg)	- 0.025 (0.758)	**- 0.185 (0.022)**	0.111 (0.173)
Fibre (mg)	0.140 (0.082)	**- 0.182 (0.024)**	- 0.076 (0.353)
Phytic acid (g)	- 0.104 (0.197)	- 0.144 (0.070)	- 0.070 (0.392)

Correlation is significant at 0.05 level.

Based on the bivariate associations, results with coefficients across paths were summarised in Figure 4.2 as part of the operationalized conceptual framework model (Figure 2.3).

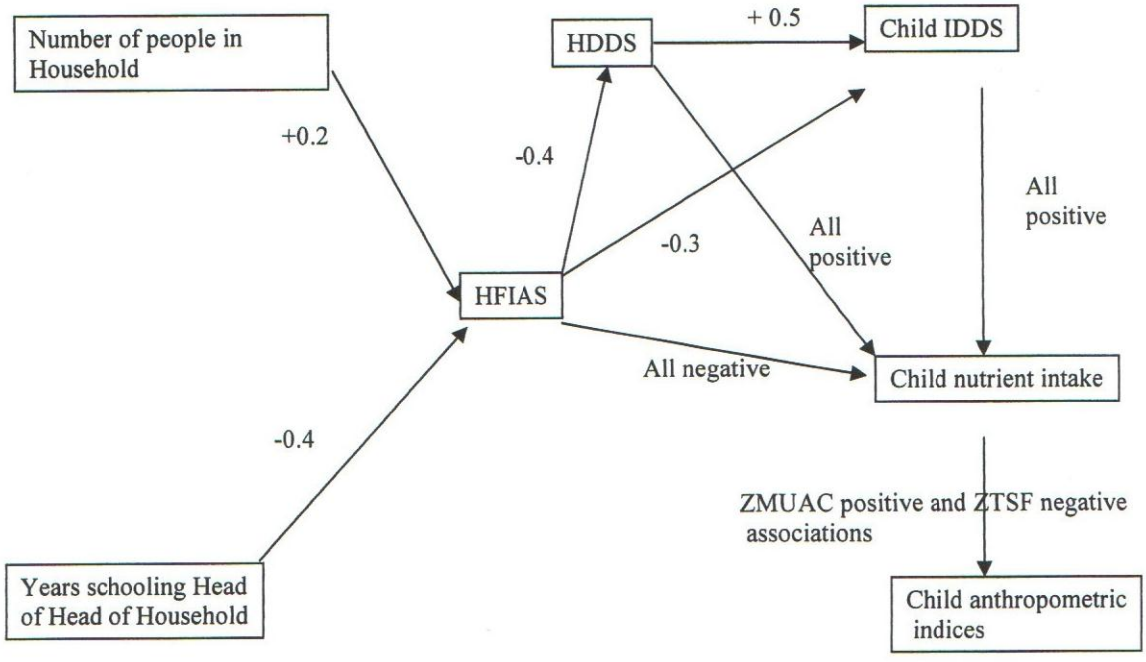


Figure 4.2 Correlations across variables operationalized conceptual model.

Further, a backward multivariable linear regression analysis with HFIAS as the dependent variable and independent variables (years of schooling of head of household and number of people in the household) was done. Education years of head of household was still significantly associated with HFIAS ($R^2 = 0.072$, $F = 5.63$, $p = 0.000$) even after adjusting for number of people in the household which was not significant in predicting HFIAS. The whole regression model explained 7.2% of the variation in HFIAS. There is a 0.339 reduction in HFIAS for each incremental year of schooling of head of household (Table 4.13).

Table 4.13 Backward multivariable linear regression analysis of HFIAS with number of people in the household and years of schooling of head of household.

Variable and constant	**Coefficient B(SE)**	**P-Value**	**95% CI for B Lower, Upper**
Constant	16.3 (1.68)	0.000	12.98, 19.63
Number of people in the household (N=88)	0.285 (0.180)	0.116	- 0.07, 0.64
Years of schooling of head of household (N=88)	- 0.339 (0.125)	0.008	- 0.59, - 0.09

A second backward multivariable linear regression was done with IDDS as the dependent variable, against independent variables; HFIAS and HDDS. (Table 4.15). HDDS was statistically significantly associated with IDDS even after controlling for HFIAS which was not significant in predicting the model. There was a 0.283 increment in IDDS for each food

group increment in HDDS. The whole regression model explained 28.3% of the variation in IDDS (Table 4.14).

Table 4.14 Backward multivariable regression analysis analysis of IDDS with HFIAS and HDDS.

Variable and constant	**Coefficient B(SE)**	**P-Value**	**95% CI of B Lower (Upper)**
Constant	2.15 (0.415)	0.000	1.33, 2.97
HFIAS (N=152)	- 0.015 (0.012)	0.235	-0.04, 0.01
HDDS (152)	0.283(0.04)	0.000	0.20(0.37)

The link between food security and nutrition security has also been studied in Mali where it was shown that dietary diversity was associated with socio-economic status and positively associated with nutrient adequacy (Torheim *et al.*, 2004). While in Mozambique household size was a significant predictor of nutrient intake, that study further recommended that simple and easy to use methods such as dietary diversity be used to collect food group consumption data in the assessment of diet quality (Rose & Tschirley, 2003).

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Conclusions and Recommendations from the research work presented are discussed.

5.2 Conclusions

Household food security status was assessed using HFIAS, and HDDS. The results indicated that food insecurity was very high among this low income HIV and AIDS affected households population, with 73% of households being severely food insecure. Over half of the households often worried about running short of food, eating less variety and foods that were not preferred. The mean household dietary diversity score was 7.1 with no household meeting the maximum possible 12 food groups. The HDDS results indicated a high frequency of consumption of oil/fat. Cereals, vegetables and sugars intake were generally high, while there was a very low frequency in intake of meats. This implies a low intake of protein from animal source foods which are better sources of bio-available iron, zinc and vitamin A. It is important to note that this scale does not quantify portion sizes, therefore conclusions regarding nutrient adequacy cannot be made. The mean dietary diversity score for the index child was 3.9 out of a possible 8 categories of food groups that was not met by any child. The least consumed food groups were eggs, followed by milk and milk products. This also indicates a low intake of animal source foods amongst the children hence explaining the prevalence part of the high undernutrition status.

Nutrition security was measured using child dietary intake, IDDS and anthropometric status. Dietary intake results show protein, vitamin A and iron intakes were over 100% of the Recommended Dietary Intake (RDI), while iron followed with % RDI close to 100%, with fats and calcium bei .g very low. It is also evident that in spite of high intakes for zinc and iron the phytic acid levels are high with a low animal source protein contribution. Data on growth indicate that the overall prevalence of stunting was 33.1%, underweight was 26% and wasting 12.3%. The stunting and underweight is almost similar to the national average of 35.5% stunting and 25.5% underweight as reported in the KDHS 2003 Report while wasting is twice the reported average in KDHS 2003. Also body composition measures indicate low z-score for body mass index was found amongst only 8% of the children, while a majority of the low ZBMI were in the middle age category of 37 – 48 months, there were no BMI measures greater than 2. Only 6 out of the 153 had a low ZMUAC, while only one child

MUAC greater than 2 z-scores. By age categorization half of the low ZMUAC cases were in the lower age category of 24 – 36 months. The low ZMUAC prevalence of 4% compares to 5.3% prevalence recorded amongst under five year olds in an urban-rural study conducted around the Lake Victoria region of Eastern Africa among households with unknown HIV status (Waudo et al., 2005). Triceps skin-fold measure mean was found to be – 0.46 z-score, which is within the normal range, only 1 child had a z-score below - 2.0. Mid-triceps skin fold measure indicated that all children were within the normal range. These results may be attributed in part to the fact that beyond two years of age those children that survive that vulnerable period are more resilient and that the level of food insecurity in the house tends to affect the child last in terms of food allocation.

In bivariate analysis, there was a negative association between household food security score and socio-demographic variables of: number of people in the household and years of schooling of head of household. The negative associations were expected as a decrease in food insecurity would require an increase in education, along with fewer dependant people to feed in the household. An association was found between household food security indicators and individual dietary diversity score of the index child. The association with HFIAS was negative, and that for HDDS positive indicating that an increase in food insecurity results in low IDDS, while increasing HDDS will result in increasing IDDS. While the association between dietary intake and HFIAS, HDDS and IDDS indicated a negative association with HFIAS and positive associations with HDDS and IDDS. Further, multivariable linear regression models indicated statistical associations between HFIAS and years of education of head of household. While IDDS had statistical significance with HDDS.

In terms of associations between child dietary intake and child anthropometric indices, dietary intake data did not detect any statistically significant association with anthropometric growth indicators. There were however, statistically significant associations between body composition measures and some of the nutrient intake estimates. Significant associations with MUAC z-scores were also generally positive, while those for triceps skinfold z-scores were generally negative. ZBMI it seems might not be as sensitive to body composition disturbances, also zinc and iron play a key role in lean body mass and fat accretion.

5.3 Recommendations

There is need for sustainable socio-demographic improvement measures such as income generating activities and micro-credit schemes, this will assist alleviate the high poverty levels evident from the earnings of the study group and other socio-demographic

indicators. Also a gender focus to help women headed households who trail in earnings when compared to male headed households. This could be through income generating activities and improved access to education.

Strategies to improve food security are needed, since it is now evident that food insecurity is a major concern among the study group. Strategies such as urban agriculture need to be explored. Improvement in the dietary diversity of the study population could also help improve the dietary quality and subsequent nutrient availability through availability of animal sourced foods, this could be through micro-livestock farming and nutrition education.

As development of measures for household food security continues HFIAS and HDDS show promise in their use as tools for measurement. There is need for further research to come up with standardized cut-off points for classification of food groups in the dietary diversity scales.

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APPENDICES

Appendix 1: Questionnaire

ID CODE:.....

CONTACT SHEET:

ID CODE (assigned by interviewer): _____

Name of Respondent: _____

Name of HH head (if not respondent):_____

PLEASE NOTE: ID CODE MUST BE WRITTEN ON THE TOP OF EVERY PAGE

Section A: Interview Details **ID CODE:**

A01. **Interviewer ID** (circle):

01 Name 1

A02. **Sub-cluster**:

01	Bondeni
02	Rhonda & kaptembwa
03	Shabab and racecourse
04	Kivumbini
05	Other (specify)

A03 – 05. **Date of Interview**: ____/____/_____ (DD/MM/YYYY)

A06 – 08. **Time of Interview**: ____:____ AM/PM (eg 10:50 AM)

→ HAVE YOU FILLED OUT THE ID CODE ON ALL PAGES?

A09. Are you the head of this household?

01 Yes → Skip to B1
02 No

A10 - 11. Who is the household head?

01 Husband
02 Mother in law
03 Father in law
04 Brother
05 Sister
07 Other (specify): _____

Section B: Information on HH Head **ID CODE:**

B01a. What is their age?: ____ B01b. Date of birth?: ____/____/_____ (DD/MM/YYYY)	B02. Do they do paid work? 01 Yes 02 No
B03 - 04. What province do they originate from? 01 Nairobi 02 Rift Valley 03 Central 04 Nyanza 05 Western 06 Eastern 07 North-Eastern 08 Coast 88 Don't know 99 Refused	B05 - 06. What is their primary occupation? 01 Farmer 02 Salaried employee 03 Formal business owner 04 Informal business owner 05 Retired with pension 06 Retired without pension 77 Other:_____ 88 Don't know 99 Refused
B07 - 08. Who provides the main source of income for the household? (in relation to HH head): 01 Own earnings 02 Husband 03 Wife 04 Children 05 Other relative 77 Other:_____ 88 Don't know 99 Refused	B09. What is the total number of years HH head has studied?: _____
B10 – B11. What is their highest level of education?: 01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused	B12 – 13. What is their marital status?: 02 Married monogamous 03 Married polygamous 04 Together but unmarried 05 Single 06 Separated 07 Divorced 08 Widowed/Widowered 78 Other: _____ 88 Don't know 99 Refused

Section C: Human Capital

ID CODE:

C01-C08: Please list the members of the household – other than HH head - their age, relation to household head, their occupation and if they are contributing money. Begin with respondent, unless respondent is HH head. Circle child used for anthropometric measurements in Section G.

Name	Sex	Age	Relation to HH Head	What is their primary occupation?	Highest Level of Education?
C01a.-01m. (start with respondent)	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused
C02a.-02m.	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused
C03a-03m.	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused
04a-04m.	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused

Name	Sex	Age	Relation to HH Head	What is their primary occupation?	Contributes Money?	Highest Level of Education?
C05a.-05m. (start with respondent)	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 Yes 02 No	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused
C06a.-0m.	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 Yes 02 No	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused
C07a-07m	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 Yes 02 No	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused
C08a-08m.	01 M 02 F	_____(yr/mo) ___/___/_____ (DD/MM/YYYY)	01 Wife 02 Husband 03 Son 04 Daughter 05 Male relative 06 Female relative 07 No relation 77 Other:_____ 88 Don't know 99 Refused	01 Unemployed 02 Farmer 03 Salaried employee 04 Formal business owner 05 Informal business owner 06 Retired + pension 07 Retired – pension 77 Other:_____ 88 Don't know 99 Refused	01 Yes 02 No	01 No formal schooling 02 Lower primary (1-3) 03 Upper primary (4-8) 04 Ordinary secondary (1-4) 05 Advanced secondary (5-6) 06 Vocational school 07 Tertiary education 77 Other:_____ 88 Don't know 99 Refused

ID CODE:

Section D: Physical, Financial, and Natural Capital

D01-02. Material used for walls in the residential main house 01 Brick/cement 02 Wooden planks 03 Unfinished wooden poles 04 Mud/dirt 77 Other:_____	D03-04. Material used for flooring in the residential main house 01 Brick/cement 02 Wooden planks 03 Tiles/carpet 04 Mud/dirt/dung/sand 77 Other:_____	D05-06. Material used for roofing in the residential main house 01 Brick/cement 02 Wooden planks 03 Unfinished wooden poles 04 Tin cans 05 Corrugated metal (mabati) 06 Straw/grass/makuti 07 Tiles 77 Other:_____
D07. State of the dwelling 01 Completely dilapidated shack 02 Needs major repairs 03 Needs no/minor repairs 04 Being repaired now 05 Under constructions	D08. How many rooms are used for sleeping in the house?:_____	D09. Do you have a latrine? 01 No → **Go to question D11** 02 Yes, in own house/compound 03 Yes, in neighbor's house
D10-11. What type of latrine do you have? 01 Pit latrine 02 VIP latrine 03 Flush toilet 04 Bucket 77 Other:_____	D12-13. During the DRY season, what is your primary source of water? 01 Piped water in house 02 Piped water in neighbours house 03 Open public well 04 Closed public well 05 Open well, compound 06 Closed well, compound 07 Rainwater in tank 08 River/stream 09 Borehole 10 Spring 11 Public tap 77 Other:_____ 88 Don't know 99 Refused	D14-15. During the WET season, what is your primary source of water? 01 Piped water in house 02 Piped water in neighbours house 03 Open public well 04 Closed public well 05 Open well, compound 06 Closed well, compound 07 Rainwater in tank 08 River/stream 09 Borehole 10 Spring 11 Public tap 77 Other:_____ 88 Don't know 99 Refused
D16-17. What is the main source of fuel in the household? 01 Charcoal 02 Firewood 03 Natural Gas 04 Kerosene 05 Electricity 06 Biogas 07 Coal 08 Dung 77 Other:_____ 88 Don't know99 Refused	D18-19. What is the main source of lighting in the household? 01 None 02 Kerosene 03 Electricity 04 Solar power 77 Other:_____ 88 Don't know 99 Refused	

D20-26. For each of the following assets, please record how many the household owns (if any): **ID CODE:**

D20. Radio:___	D21. TV:___	D22. Refrigerator:___	D23. Telephone or mobile:___
D24. Bicycle:___	D25. Motorbike:___	D26. Car/truck:___	

D27-34. For the following assets, indicated both how many the household has access to, and whether they own/share them:

D27a-27b. Manual farming tools (shovel, hoe, etc):_____	01 Own 02 Share
D28a-28b. Farming machinery:_____	01 Own 02 Share
D29a-29b. Cows:_____	01 Own 02 Share
D30a-30b. Goats:_____	01 Own 02 Share
D32a-32b. Pigs:_____	01 Own 02 Share
D33a-33b. Sheep:_____	01 Own 02 Share
D34a-34b. Poultry:_____	01 Own 02 Share

D35-41. Household sources of income

Source of Income	Practiced by Household?	Rank in order of importance (ie 1, 2, etc)
01 Urban Agriculture	01 Yes 02 No	
02 Formal business	01 Yes 02 No	
03 Informal business	01 Yes 02 No	
04 Salaried employment	01 Yes 02 No	
05 Relatives/friends outside HH	01 Yes 02 No	
06 Scavenging/ recycling goods for sale	01 Yes 02 No	
07 Recycling and selling organic waste	01 Yes 02 No	
08 Pension	01 Yes 02 No	

D35-36. Aside from money gained from Urban Agriculture, what was the household's MONTLY income last month?

D35. If exact amount known, enter here: _____

D 36. If not, circle approximate income:
01 <1000 KSH
02 1000 – 5000 KSH
03 5000 – 10000 KSH
04 >10000 KSH
88 Don't know
99 Refused

ID CODE:

G1-G15. Household Dietary Diversity Scale

Did you, or anyone else in your household, eat the following foods yesterday during the day or night?

FOOD GROUP	EXAMPLES	RESPONSE
G1. CEREALS	Bread, biscuits, cookies mage from millet, sorghum, maize, rice, wheat, ugali etc.	01 Yes 02 No
G2. VITAMIN A RICH VEGETABLES AND TUBERS	Pumpkin, carrots, squash, sweet potatoes, other locally available vitamin A rich vegetables.	01 Yes 02 No
G3. WHITE TUBERS AND ROOTS	White potatoes, white yams, cassava, or foods made from roots	01 Yes 02 No
G4. DARK GREEN LEAFY VEGETABLES	Sweet pepper, dark green/leafy vegetables, including wild ones and locally available vitamin A rich leaves such as cassava leaves etc.	01 Yes 02 No
G5. OTHER VEGETABLES	Other vegetables including wild vegetables	01 Yes 02 No
G6. VITAMIN A RICH FRUITS	Ripe mangoes, papayas, other locally available vitamin A rich fruits.	01 Yes 02 No
G7. OTHER FRUITS	Other fruits including wild fruits	01 Yes 02 No
G8, MEAT	Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds, liver, heart or other organ meats or blood-based foods.	01 Yes 02 No
G9. EGGS		01 Yes 02 No
G10. FISH	Fresh or dried fish	01 Yes 02 No
G11. LEGUMES, NUTA AND SEEDS	Beans, peas, lentils, nuts, seeds or foods made from these	01 Yes 02 No
G12. MILK AND MILK PRODUCTS	Milk, yoghurt, mala, cheese or other milk products	01 Yes 02 No
G13. OILS AND ATS	Oil, fats or butter added to food or used for cooking	01 Yes 02 No
G14. SWEETS	Sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies	01 Yes 02 No
G15. SPICES CAFFEINE OR ALCOHOLIC	Spices, coffee, tea, alcoholic beverages or local examples	01 Yes 02 No

G16. 24 Hour Dietary Recall

Please list everything you ate in the last 24 hours including alcohol and sweets.

TIME	FOOD ITEM	AMOUNT	COOKING METHOD	LIST OF INGREDIENTS (MIXED DISHES)

G17. Are the foods listed representative of a normal day? 01 = Yes 02=No

G18. Are you taking any vitamins/mineral supplements? 01 = Yes (Go to G13) 02=No

G19. If yes above please list the supplement and dosage

Supplement	Dosage

G20- G28 Household Food Insecurity Access Scale

.Please answer the following questions: During the last 30 days

G20. Did you worry that your household would not have enough food?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G21. Were you or any household member not able to eat the kinds of foods you preferred because of lack of resources?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G22. Did you or any household member eat just a few kinds of food day after day due to a lack of resources?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G23. Did you or any household member eat food that you preferred not to eat because of a lack of resources to obtain other types of food?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G24. Did you or any household member eat a smaller meal than you felt you needed because there was not enough food?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G25. Did you or any other household member eat fewer meals in a day because there was not enough to eat?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G26. Was there ever no food at all in your household because there were not resources to get more?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G27. Did you or any household member go to sleep at night hungry because there was not enough food?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).
G28. Did you or any household member go a whole day without eating anything because there was not enough food?	01 Never 02 Rarely (1-2 times in the last 30 days) 03 Sometimes (3-10 times in the last 30 days). 04 Often (>10 times in the past 30 days).

G23-G34. Anthropometric Measurements for child aged between 2 to 5 years

NAME OF THE CHILD: .....

AGE (IN MONTHS): .....

SEX: .....

G23. Height 1	
G24. Height 2	
G25. Height 3	
G26. Final height (cm) (average of 1,2,3 readings)	
G27. Weight (kg) 1	
G28. Weight (kg) 2	
G29. Weight (Kg) 3	
G30. Final Weight (kg) (average of 1,2,3)	
G31. Mid Upper arm circumference (MUAC) (cm) 1	
G32. MUAC 2	
G33. MUAC 3	
G34. Final MUAC (average 1,2,3) (cm)	
G35. Skin fold 1	
G36. Skin fold 2	
G37. Skin fold 3	
G38. Final Skin fold (average between 1,2,3)(mm)	

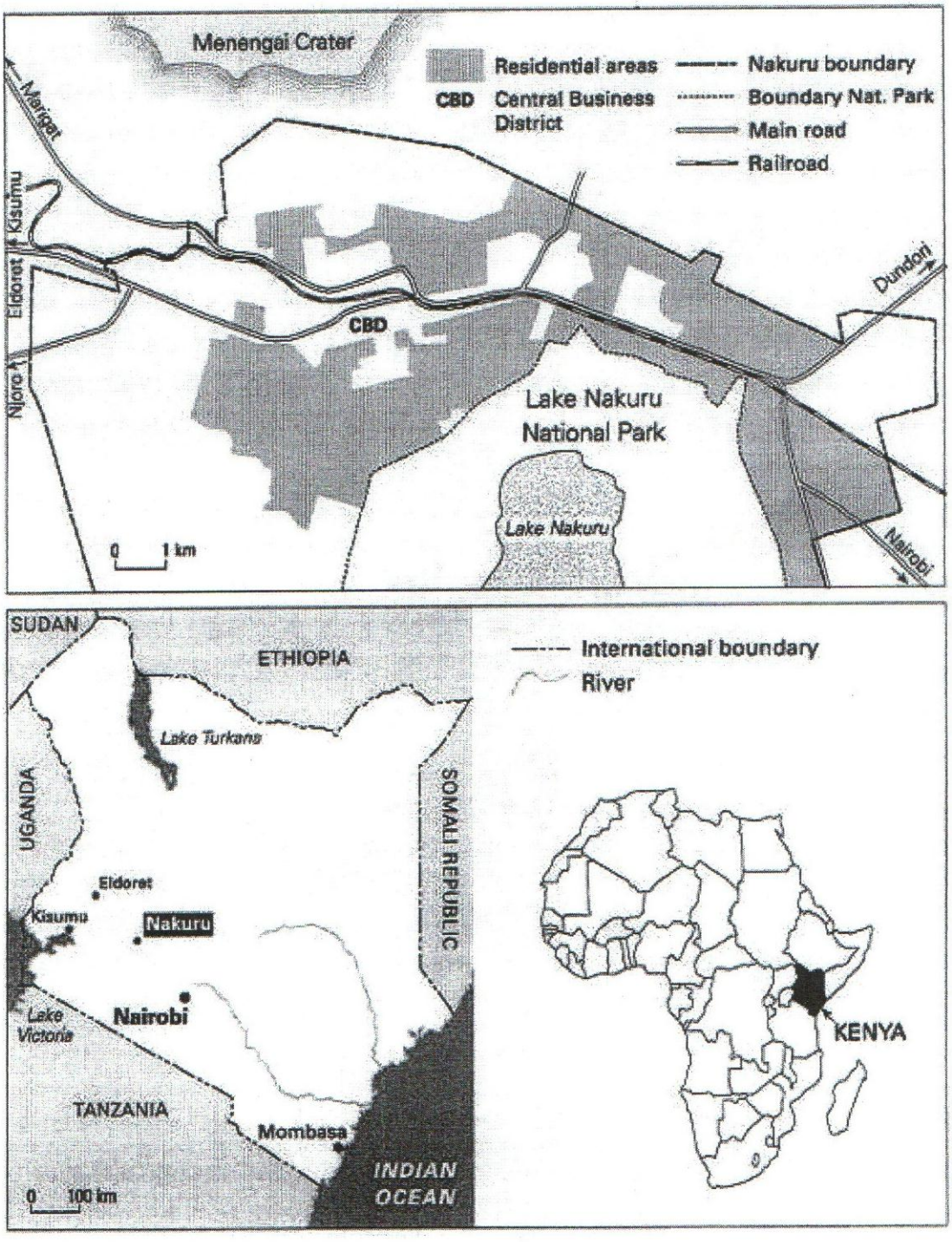
PRINCIPAL INVESTIGATORS COMMENTS: __

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Appendix 2: Map of study area.



Appendix 3: Adaptation and pre-test of HFIAS and HDDS

Adaptation and pre-test of HFIAS report

As part of the preparation work for the survey, adaptation and pre-test of the HFIAS and HDDS was undertaken. The purpose is to adapt the phrases, definitions and examples to the local context and ensure appropriate understanding of the questions (Coates et al, 2005). A review was done using a key informants meeting comprising seven (7) members of the L&H group who constitute the Home Based Care Team comprised of a nurse and social workers. The outcome was then refined using a focus group discussion held with eleven (11) members drawn from L&H client base both male and female. Both activities were undertaken through group discussions and not one to one. The actual pre-test was then done using a different group of HIV and AIDS clients over a three days period from two different locations in the municipality, a total of 14 people were interviewed.

The following is the outcome of the adaptation activities undertaken:

Key informants interview report with L&H staff held on 22nd November 2006

We are in the process of adapting questionnaires used for assessment of food insecurity to suit the local context. We would like to consult with you to ensure that the questions contained in these questionnaires are understandable by respondents in this area and culture.

Therefore I will ask you some questions to help us clarify some of the phrases used in the questionnaire for respondents in this area/culture. Please participate in this discussion freely. You may decline if you wish not to participate in the discussion and you may also choose to leave or not to answer a question at any time.

1. We would like to clarify the way that a "**household**" is described in this culture/area. For instance, in some cultures "household" might be defined as "people who live together and share food from a common pot". Can you tell us how people here would commonly describe a household?

   RESPONSE
   From the discussion the meaning of the household is anyone who lives in the house (eat from the same pot) including children and beneficiaries.

2. We would like to include in the questionnaire examples of different kinds of foods that are considered "preferred foods" in this culture/area. By "preferred foods" we mean foods that people in this area would like to eat if they had adequate resources. What are some examples of such foods in this area?

   RESPONSE
   The question is meant to elicit foods based on different cultural backgrounds according to the L&H Home Based Care (HBC) team key informants, the predominant tribes are Luo

and Kikuyu within their client base. Beans, maize and rice are generally considered preferred foods while amongst the Luo the small fish (omena) and certain types of traditional vegetables popular from there area of origin will be preferred, while amongst the Kikuyu potatoes will be preferred and some traditional vegetables popular among the Kikuyu such as black night shade (managu).

3. We would like to understand how people here describe "lack of resources". By lack of resources, we mean not having money or the ability to grow or trade for food. How do people here usually talk about a "lack of resources"? **(Note for interviewer: Probe to find out how a household that lacks adequate resources is described in the area)**

   RESPONSE
   The client base for L&H is families residing in resource limited settings (mostly from the slums), thus in there words lack of resources implies - Not working, bed-ridden, single parent. Their understanding of lack of resources is lack of a source of livelihood, hence there predominant livelihood is employment and would view lack of resources as having same meaning to any event that deters prospects for employment.

4. We would like to add examples of a diet consisting of "a limited variety of foods" in our questionnaire. When we say "a limited variety of foods", we want to mean a monotonous diet.

   RESPONSE
   To this group limited variety is based on 'lack' of variety hence monotony in consuming Potatoes, kales, Ugali, githeri (mixture maize and beans) though the same foods will feature among preferred foods though they will have them within a variety of other foods and quantity for the same if resources could allow.

5. What types of food are included in a diverse diet in this area as opposed to a monotonous or less varied diet?

   RESPONSE
   The key informants portrayed an understanding of a balanced diet and therefore the response was a varied diet should be balanced (containing protein, vitamins, minerals, carbohydrates and mineral rich foods).

6. We would like to include examples of different kinds of foods that poor, food insecure people may eat that are considered "**less preferred**" in this culture. By "**less preferred'** we mean foods that may be considered "**socially unacceptable**" but may be consumed in this area at times when people have no other choice. Are there examples of such foods that could apply here?

   RESPONSE
   Foods included here are porridge, black tea, indigenous vegetables that grow during the rainy season and are therefore considered less prestigious and lower status and they would prefer not to have them, they include; amaranth, stinging nettle, and among a community such as the Luo pumkin leaves, for the Kikuyus the small fish (omena).

7. We would like to understand what people in this area consider a 'meal' to be. The term "meal" is understood differently in different cultures. By "meal" we mean the major eating occasions (not including snacks). We would like to make sure that the word "meal" is understood this same way. How can we express this same concept of "meal" in "**Swahili**" and in this area/culture?

   RESPONSE
   The major eating occasions are breakfast, lunch and supper. In Swahili the key informants described the Swahili names as being; chai ya asubuhi [though it should not necessarily be tea in the morning], chakula cha mchana, chakula cha jioni.

8. We would like to add a phrase in our questionnaire that clarifies the meaning of "**no food at all.**" By "**no food at all**" we mean that the food was not available in the household and could not be accessed by the household's usual means (e.g. through purchase, from the garden or field, from storage, etc.). What are the terms that best describe the concept of not having food at hand and not being able to access food through the usual means and channels?

   RESPONSE
   The proposed terminologies from the key informant discussion are: 'starving', 'going to sleep hungry'.
   [Note it conflicts with Qn. 7 and 8]

9. What do you understand the following question to mean? 'Did you or any household member go to sleep at night hungry because there was not enough food?'

   RESPONSE
   The response was captured through the proposed statements that could mean the same and the following came up 'a situation where the mother gives children food and goes to sleep hungry herself.' Or 'no food but waiting for a neighbour to provide, implying the neighbour has food and will most likely provide some though not adequate.'

   [Note questions 8 and 9 seem to have been understood as meaning the same]

10. What do you understand the following question to mean? Did you or any household member go a whole day without eating anything because there was not enough food?

    RESPONSE
    The response was understood within the context of livelihoods in that the bread winner came home empty handed. The notion here is that food availability is a daily pursuit depended on what resources were secured for that day, so that if no food was brought home then the household went without any food even through the following day.

Focus group discussion with 11 L&H Group members on 28th November 2006

We are in the process of adapting questionnaires used for assessment of food insecurity to suit the local context. We would like to consult with you to ensure that the questions contained in these questionnaires are understandable by respondents in this culture.

Therefore I will ask you some questions to help clarify some of the phrases used in the questionnaire for respondents in this area/culture. Please participate in this discussion freely. You may decline if you wish not to participate in the discussion and you may also choose to leave or not answer a question at any time.

1. We would like to clarify the way that a **"household"** is described in this culture/area. For instance, in some cultures household might be defined as people who live together and share food from a common pot. Can you tell us how people here would commonly describe a household?

RESPONSE
Most respondents described a household as a family consisting of husband, wife and their children. Others felt that together with the nuclear family, material possessions and daily activities also formed a household. A visiting person or extended family member living in the same house may not be part of the household.

2. We would like to include in the questionnaire examples of different kinds of foods that are considered as 'preferred foods' in this culture/area. By preferred foods we mean foods that people in this area would like to eat if they had adequate resources. What are some examples of such foods in this area?

RESPONSE
Some members felt that preferred foods are having a balanced diet. Majority though agreed that a preferred food must not be balanced and described them as sweet foods. These they said were individual and culture based. Examples given included; chips (French fries) as preferred by women, fish for people from western and githeri (mixture of maize and beans) and indigenous vegetables for people from central Kenya. One member also raised the issue of preferring foods due to their health status dictating taste.

3. We would like to understand how people describe "lack of resources". By lack of resources, we mean not having money or the ability to grow or trade for food. How do people here talk about "lack of resources"? (Note for interviewer: probe to find out how a household that lacks adequate resources is described in this area)

RESPONSE
Members gave different types of resources like; human resources, natural resources and money. They described lack of resources as lack of ability to work so as to feed their families. Some members viewed lack of resources as just lack of money. They argued that you may lack ability to work but have money to buy food.

4. We would like to add examples of a diet consisting of "a limited variety of foods" in our questionnaire. When we say "a limited variety of foods", we want to mean a monotonous diet.

RESPONSE
Members of this group agreed that a monotonous diet is a diet that is not balanced and is repeated over a long period of time. Examples given included having ugali and kales always for several days.

5. What types of food are included in a diverse diet in this area as opposed to a monotonous or less varied diet?

RESPONSE
The responses given were all those that represented a varied diet. They included foods from breads and cereals, vegetables, fruits meats and alternatives and water. Each individual had their own ideal type of a balanced diet.
Examples; one respondent gave the following food combination – ugali, vegetables, fruits such as oranges, avocado, banana and water.
A second respondent gave – githeri mixed with vegetables and carrots alongside a fruit.
A third respondent gave – rice, beans, water and two kinds of fruits.

6. We would like to include examples of different kinds of foods that poor food insecure people may eat that are considered "less preferred in this culture. By less preferred we mean foods that may be considered socially unacceptable but may be consumed in this area when people have no other choice. Are there examples of such foods that could apply here?

RESPONSE
Types of foods given here were individual based and included foods such as; potatoes githeri (maize and beans), omena (small fish) and beans. It was noted that what to some was not preferred was preferable to others. Hence knowing the cultural background of the respondent and through probing one is able to elicit the correct understanding and response.

7. We would like to know what people in this area consider a 'meal' to be. The term "meal" is understood differently in different cultures. We would like to make sure that the word "meal" is understood this same way. How can we express this same concept of "meal" in "Kiswahili" and in this area/culture?

RESPONSE
The respondents felt that the meals described the major eating occasions which some felt included lunch and supper; others thought it included breakfast, lunch and supper. A few especially those on ARVs and anti TB drugs believed that the meal can be any time they feel hungry not necessarily a particular time. In 'Kiswahili' a meal for them is wakati wa kula (eating time).

8. We would like to add a phrase in our questionnaire that clarifies the meaning of "no food at all." By "no food at all" we mean that the food was not available in the household and could not be accessed by the household usual means e.g. through purchase, from the garden or field, from storage etc.] What are the terms that best describe the concept of not having food at hand and not being able to access food through the usual means and channels?

RESPONSE
Most people felt that lack of money or lack of resources to acquire food can be described as having no food at all. Another group felt that one could have the money but still lack food due to inability to access food due to reasons such as illnesses or time

9. What do you understand the following question to mean?' Did you or any household member go to sleep at night hungry because there was not enough food?

RESPONSE
Here the concept of large family in relation to available food arose. Most agreed that sleeping hungry would be as a result of having little food to share and the young are given priority to eat leaving adults to sleep hungry. Others felt that one may sleep hungry because 'we have food but other resources such as charcoal or water may be lacking'.

10. What do you understand the following question to mean? 'Did you or any household member go a whole day without eating any thing because there was not enough food?'

RESPONSE
Here most responses showed that lack of food to eat the whole day meant eating very little e.g. visiting people having to share a meal or taking porridge because a better meal could not be afforded. All these were attributed to lack of enough resources to purchase enough food. Others felt you can stay without food due to lack of appetite. [Note like in the Key Informant discussion, Qn 8 and 9 seem to elicit the same meaning]

Examples of local foods eaten were obtained during both discussions, it was later very helpful to me once I identified the cultural background of the respondent I was able to give a relevant list of foods and examples by probing since I had an idea of say preferred and non-preferable foods.

Pre-Test process
The pre-test took place over a three day period since this were the most appropriate days for us to meet the support groups at the venues where they hold there weekly meetings. The criteria for choosing participants was a woman with a child aged 2 to 5 years who was present on that day (the announcement for those who had a child 2 to 5years to bring them along had been made the previous week), there were anthropometric measures to be done alongside socio-demographic and livelihoods. Consent to participate was sought as they signed acceptance papers.
The ordering of questions for the food and nutrition insecurity part which I personally did was in the order of; HDDS, 24hr dietary recall for the child, HFIAS, and then anthropometric measurements of the child. A general description of the nature of questions from the different tools was outlined before commencing on the specific tools.

HDDS
I used both recall and probing to elicit responses. Clarification on foods prepared at home and consumed or foods brought from outside but consumed at home (note in the poor neighbourhoods even foods such beans are bought cooked as they find it more convenient when considering the costs of fuel and convenience). In my opinion it was easy to administer the questions as the recall period of 24hrs. was easy for respondents to remember.

HFIAS

It was difficult to explain the HFIAS in full to the respondents and so I opted to refer to it as 'the state of food in your household.' The tool was administered using both recall and probing. The recall period used was 4 weeks and actually the respondents would easily go back in time recalling the experiences on two weekly basis and response on the frequency would be easier to state after recalling stepwise.

Comprehension of HFIAS questions

1. Frequencies for anxiety were obtained with relative ease; the respondents would keep quiet for a while and recall events such as receipt of food relief at some time in the month which helped alleviate worries etc.
2. The question was well understood. With an explanation to guide the respondent in recalling, the answer seemed genuine.
3. Eating just a few kinds of foods was easy to remember, the respondents even gave examples without being probed.
4. Having done the adaptation and knowing the background of the respondent in view of food culture and local practices, it made it easy for me to ask the question and explain where necessary. Socially undesirable maybe easy to capture but personally undesirable is quite challenging due to the varied reasons such as sickness, general dislike etc.
5. My understanding of a smaller meal is in the quantities, so as to differentiate it with question 3 on few kinds of foods. The respondents were able to answer.
6. Fewer meals were fairly simple to answer, with respondents giving reasons as to why. For example some felt they could skip lunch so as to have the meal in the evening to avoid going to bed hungry.
7. No food at all in the household; my understanding was the physical presence of food in the house. I took it to mean any reserves of food, as would be expected at any point in time there should be some physical presence of food in the house.
8. With the explanation of having eaten something but not to the point of being filled, the respondents were able to understand the question.

[Seemed common during certain times and I wondered could question 7 be more severe?]

9. With an explanation of the reason being due to lack of resources and covering day and night, the respondents were able to understand the question and give a response.

Appendix 4: HFIAS SPSS Syntax

```
STRING HFIAS_FANTA (A8).

IF (q1< 2 AND q2=0 AND q3=0 AND q4=0 AND  q5=0 AND q6=0 AND q7=0 AND
 q8=0
AND  q9= 0) HFIAS_FANTA = 'Food Secure'.

IF (q1=2 OR q1=3 or q2>0 OR q3=1 OR q4=1 AND  q5=0 AND q6=0 AND q7=0
 AND
q8=0 AND  q9= 0) HFIAS_FANTA = 'Mildly food insecure'.

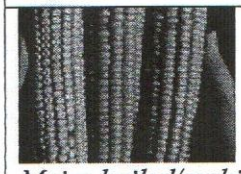
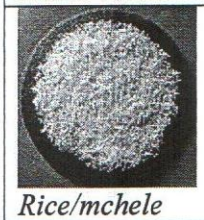
IF ( q3=2 or  q3=3 OR q4=2 or q4=3  or  q5=1 or  q5=2 or  q6=1  or
  q6=2
AND q7=0 AND q8=0 AND  q9= 0) HFIAS_FANTA = 'Moderately food
 insecure'.

IF (q7>0 or q8>0 or q9> 0) HFIAS_FANTA= 'Severely food insecure'.

EXECUTE.
```

Appendix 5: Dietary intake protocols

Sample food Calendar for memory aid

	TICK IF CONSUMED BY CHILD TODAY
 *Maize boiled/mahindi*	
 *Rice/mchele*	
 *mandazi*	
 *Meat/nyama*	
 *pawpaw/paipai*	
 *orange/machungwa*	

Sample Recipes and food quantity estimates for dietary intake

INGREDIENTS	Wt before preparation	wt after preparation	total wt of the mixed dish	wt of a serving	number of servings	**a serving for 2-5 yrs kid**
kale	500	400	600	162.7	5	**60**
tomato		93.5+67.2				
onion	31.5	26.8				
fat		53.9				
salt		10.4				
kale	600	500	400	133.4	5	**72.9**
onion	41.4	37.4				
fat		46.3				
salt		12.8				
kale	700	602	400	103.4	4	**76.2**
fat		47.8				
salt		5.3				
kale	1000	900	500	131	4	**74.4**
tomato		71.8+60.6				
fat		56.9				
salt		8.3				
maize		6600 for both maize+beans	7800	600	13	**219.9**
beans						
tomato		80.8+71+70				
onion	82	78.1				
fat		67.3				
salt		34.7				
royco		19.6				
maize		270	600	600	1	**211.2**

beans		355				
salt		1.3				
maize		5400(for maize+beans	6600	800	11	**250**
beans						
fat		87.8				
onion	66.4	59				
salt		32.3				
rice		800	2900	800	4	**500**
fat		71.3				
onion	81.5	74				
salt		23.9				
water		2000				
rice		800	3000	800	4	**333.3**
fat		46.2				
onion	30.2	28.3				
tomato		88.2+73				
salt		16.7				
royco		10.6				
dhania		3.4				
water		2600				
rice		1000	4600	900	7	**370.3**
potatoes	2000	1500				
fat		70.7				
onion	46.6	40.7				
salt		17.3				
royco		15.6				
dhania		3.8				
water		2600				

rice		800	3900	800	5	**404.3**
potatoes	2000	1500				
fat		52.3				
royco		13.9				
salt		21.1				
water		3000				
rice		1000	4200	800	6	**400**
potato	1500	1400				
fat		64.7				
tomato		72.9+74.3+66.5				
salt		24.6				
royco		16.8				
water		2000				
rice		1000	4400	850	5	**412.3**
potato	2000	1600				
fat		74.1				
tomato		74.1+68.3+67.1+72.7				
onion		40.4				
salt		23.5				
royco		20.9				
water		2200				

Nutrisurvey food entry coding manual

-carrot (item listed): carrot fresh cooked (item name used in Nutri-Survey).
-onion: onions fresh cooked.
-tomato: tomatoes fresh cooked.
-omena: fish, small, whole, dried
-salt: Table Salt, 5g (teaspoon)
-ugali: maize, flour, dry
-if sugar is listed in ingredients, used: Sugar (15g- teaspoon)
-if milk is listed in ingredients, used: Cow's milk boiled (Amount: half of the 'Cup' portion (125g), of which half of is 62.5g or 63g rounded up for the program entry
-milk: Cow's milk boiled
-uji- if millet specified, used: millet, pearl, meal/flour, dr
-if maize specified, used: maize, flour, dry
-if no flour/ ingredient specified or 'mixed flour' (i.e. Row 112), used: maize, flour, dry
-if milk was listed in ingredients: took amount of uji and listed a quarter of the amount as milk, and three-quarters of the amount as flour (millet or maize)
-if sugar listed in ingredients- used: Sugar, 15g (spoon)
-if lemon listed in ingredients- NOT entered in the plan as it is too minimal to include
-porridge- use either the 'maize' or 'millet' (see Uji for item names in Nutrisurvey) flour depending on what is specified; if no ingredient is specified, then 'maize' was assumed to be used
-passion fruit, mango, banana, orange, avocado, pineapple, etc.: entered as one of the options coded "(Z) Additional Foods"- used either just the fruit name (i.e. passion fruit) or the fruit name plus 'ripe' (i.e. banana, ripe) depending on what was available in the NutriSurvey list
-ice cube (i.e. Plan 4)- used 2 spoons sugar (30g and 30g= 60g)
-kunde: leaf, cowpea
-potato- if listed as 'fried' in the Cooking Method, used: Fried Potatos (R); when this entry was used, NO extra entry for fat/oil was entered
-if 'potato' was listed along with any other items (i.e. rice, other vegetables) in the 'Item' and the Cooking Method was 'fried', NO extra entry for tat/ oil was entered
-if listed as ' boiled', used: Boiled potatoes
-sweet potato: sweet potato, cooked
-meat: meat, cooked
-chicken: chicken, cooked
-spinach: spinach leaves cooked
-pumpkins: pumpkin, cooked
-fish: fish filet fried; NO extra oil/ fat was entered
-scone: bread, white (1 slice= 21 g)
-sukuma wiki or kale(s): kale, cooked
-yam: yam, cooked
-cabbage: white cabbage fresh cooked
-cake or queen cake: Cakes (bakery)
-if the Cooking Method is 'fried', but no fat was listed in the Ingredients, 'fat' was added onto the paper copy of the spreadsheet and 'Vegetable fat, kimbo' was entered in the spreadsheet

-when 'nuts' were specified under the Cooking Method as 'fried', NO extra fat listed as used because it is too minimal
-nuts: peanut
-egg- if specified as 'fried' under the Cooking Method, used: Fried egg (R); no extra fat listed when 'Fried egg (R)' is entered (even if fat is listed in the ingredients because 'fried' already takes into account that fat was used)
-biscuit: biscuits
-sweet(s): Sugar-coated sweets
-maize: maize, green, cooked
-beans: bean, kidney, dried, cooked
-tea, tea + milk + sugar, tea + milk: Tea black with milk and sugar (beverage)
-strong tea, tea (strong): Tea black with sugar (beverage)
-sausage: sausage (coded (Z) Additional Foods)
-plum: plum fresh (NOT plums fresh)
-lists of vegetables (i.e. Row 82) such as beans, maize, pots, cabbage, etc. that have no Cooking Method specified, assumed: all vegetables were 'cooked' or 'boiled', NOT 'fried'; also, when different vegetables were listed in 'Ingredients' following an 'Item' that was a list of vegetables, they were assumed to be minimal and were not entered into the plan
-nyama: meat cooked
-liver: Beef liver cooked
-yoghurt: Yoghurt min. 45% fat (dry matter)

Appendix 6: Photographs of selected anthropometric field work exercise.

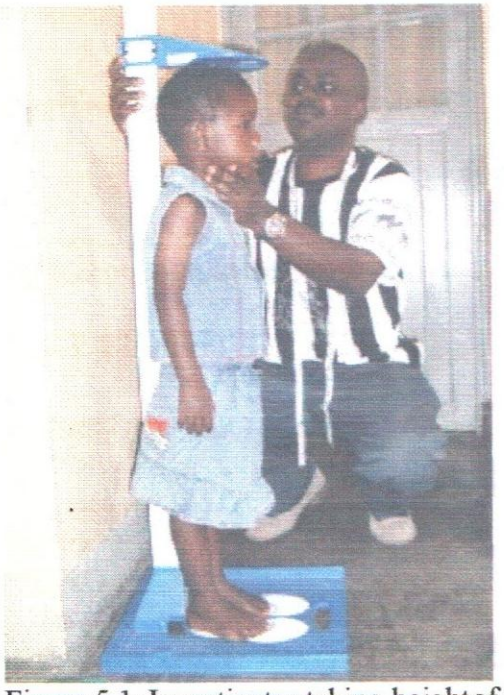


Figure 5.1: Investigator taking heightof index child

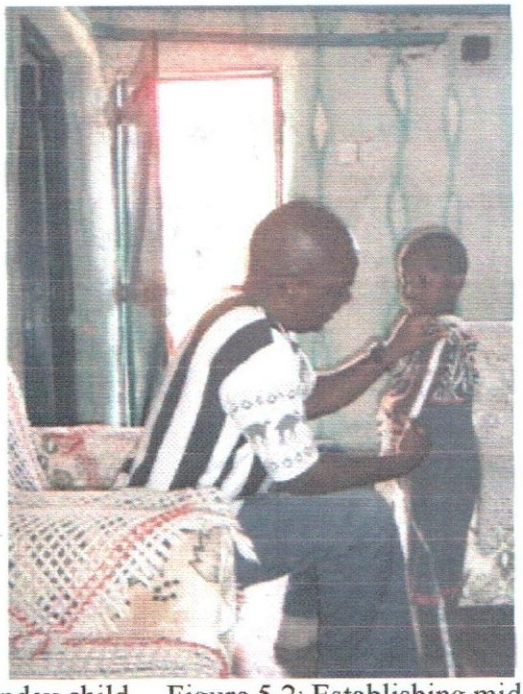
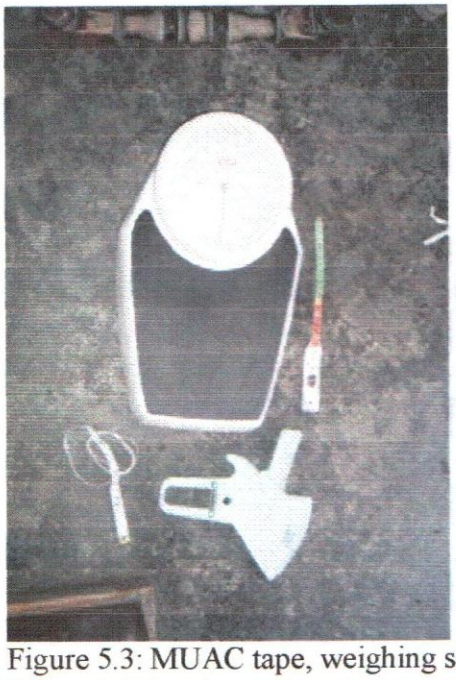


Figure 5.2: Establishing mid-point between shoulder bone and elbow



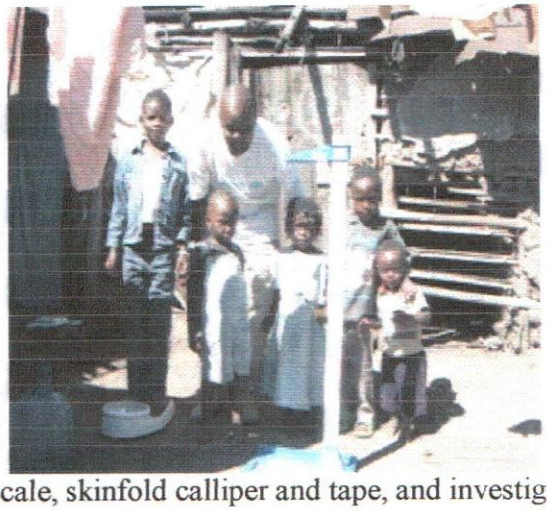


Figure 5.3: MUAC tape, weighing scale, skinfold calliper and tape, and investigator with children in Rhonda estate.

MINISTRY OF SCIENCE & TECHNOLOGY

Telegrams: SCIENCE TEC", Nairobi

Fax No.
Telephone: 318581
When replying please quote

REPUBLIC OF KENYA

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HARAMBEE AVENUE
P. O. Box 9583-00200
NAIROBI
KENYA

MOST 13/001/37C 277/2

24th May 2007

Samuel Mbugua
Egerton University
P.O. Box 536-20115
Egerton
NJORO

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on '***Food and Nutrition Insecurity Status of HI/AIDS affected Households: The Case of Nakuru Municipality' Kenya'***

I am pleased to inform you that you have been authorized to carry out research in Nakuru Municipality for a period ending 30th July 2007.

You are advised to report to the District Commissioner and District Education Officer Nakuru and the Town Clerk Nakuru Municipality before embarking on your research project.

On completion of your research, you are expected to submit two copies of your research report to this office.

M. O. ONDIEKI
FOR: PERMANENT SECRETARY

Copy to:

The District Commissioner
Nakuru District

The District Education Officer
Nakuru District

The Town Clerk
Nakuru Municipality
Nakuru

Appendix 8: Consent Form

Serial No……

Dear Respondent,

RE: CONSENT TO PARTICIPATE IN RESEARCH STUDY

I am a student pursuing a Master of Science degree in Nutritional Sciences at Egerton University. As part of my degree program requirements, I am currently conducting a research study to determine the food and nutrition insecurity status of HIV/AIDS affected households in Nakuru municipality.

To achieve this objective I am requesting you to enrol in this important study and would wish to assure you that the information will be treated with confidentiality.

I hereby request your consent to participate.

Yours faithfully,

Samwel Mbugua

FOR THE RESPONDENT/GUARDIAN

Consent granted: .....

Signature

EGERTON UNIVERSITY LIBRARY