Nutrition Status and associated Morbidity Risk Factors among Children in Orphanages and Non Orphanage Children in selected Primary Schools within Dagoretti Division, Nairobi, Kenya (2009)

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DECLARATION

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

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

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DEDICATION

To my family, my loving husband Mwaniki and our beautiful daughters Melody and Joy.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome.
BMI	Body Mass Index
GAM	Global Acute Malnutrition
GoK	Government of Kenya
HIV	Human Immune Deficiency Virus.
NASCOP	National AIDS and STI Control Programme
NCHS	National Center for Health Statistics
SDs	Standard Deviations.
STDs	Sexually Transmitted Diseases.
STIs	Sexually Transmitted Infections
UNAIDS	United Nations on HIV/AIDS.
UNDPI	United Nations Department of Public Information.
UNICEF	United Nations International Children's Education Fund
USAID	United States Agency for International Development.
USDA	United States Department of Agriculture

DEFINITION OF TERMS

Calorie: A unit of heat measurement used in nutrition to measure the energy value of foods. A calorie is the amount of heat energy needed to raise the temperature of 1 kilogram of water to 1°C.

Malnutrition: Any disorder of nutrition. It may result from an unbalanced, insufficient, or excessive diet or from impaired absorption, assimilation, or use of foods.

Morbidity: The incidence or prevalence of a disease or of all diseases in a population.

Non Orphanage child: A child whose both parents are alive and is under the care of one or both, and is not residing in an orphanage.

Nutritional status: The condition of the body in those respects influenced by the diet; the levels of nutrients in the body and the ability of those levels to maintain normal metabolic rate.

Children in orphanages: Children who are sheltered in the orphanages

Orphanage : An institution that shelters orphans, vulnerable or abandoned children.

Over nutrition: Results from excessive intake of energy and nutrients above the body's requirement.

Ugali: It is the nationally consumed staple food in Kenya which is a stiff porridge made of pure or composite flour from either maize, sorghum, finger millet, pearl millet, cassava or a combination of these.

Uji: A thin cereal porridge usually made from pure or mixed flour from maize, sorghum, finger millet or pearl millet. It can be made from pure or composite flour of the cereals and can either be fermented or unfermented.

Under nutrition: Is a consequence of inadequate intake of essential nutrients and energy or using or excreting them more rapidly than they can be replaced.

Vaccination: The process of administering weakened or dead pathogens to a healthy person, with the intent of conferring immunity against the pathogen.

ABSTRACT

Most of the nutritional surveys that have been carried out in Kenya have concentrated on children aged five years and below who are under the care of their parent(s). On the other hand, HIV/ AIDS, conflicts, natural disasters, endemic diseases such as malaria and tuberculosis, and rising poverty have claimed the health and lives of millions of productive adults, leaving their children orphaned and vulnerable. This has led to the mushrooming of orphanages to take care of these orphans and vulnerable children in Kenya. The main objective of this study therefore was to compare the nutrition status and associated risk factors of primary school children living in orphanages and those not living in orphanages in selected primary schools in Dagoretti Division, Nairobi. In this comparative and descriptive study purposive sampling was used to select the four schools that the children from the three orphanages attended which were within Dagoretti Division. Chi-square was used to compare the frequency of food consumption and hygiene practice among the children. t-Test for proportions was used to compare the differences in proportions of children who were malnourished among non orphanage and children in the orphanages. Pearson product moment was used test the relationships of risk factors and the dependent factors. The children in orphanages had a significantly higher rate of stunting and underweight ($p < 0.05$) than the non-orphanage children. This was an indication that chronic malnutrition was more prevalent among the children in orphanages. However there was no significant difference in wasting among the two groups ($p > 0.05$). The children in orphanages had also a significantly higher rate of morbidity ($p<0.05$) than the non-orphanage children.

Children in orphanages were more likely to be stunted and underweight and this was associated with high levels of diarrhea and colds/cough. There was significantly ($p<0.05$) lower rate of vaccination among the children in orphanages (69%) than among non-orphanage children (92%). There was a significantly ($p<0.05$) higher proportion of non orphanage children who reported washing hands with soap at critical times compared with the children in the orphanages. The total mean energy intake among the non-orphanage children was significantly higher ($p<0.05$) than among the children in orphanages. The non-orphanage children had more diversity of foods than the children in orphanages. In this study, the prevalence of stunting was significantly higher ($p<0.05$) among boys in orphanages in comparison to non-orphanage boys.

Stunting and underweight among the children in orphanages was also associated with longer duration of stay in the orphanage. In conclusion chronic malnutrition and personal hygiene situations were worse among children in orphanages in comparison with non orphanage children. The morbidity state was also higher among the children in orphanages in Dagoretti Division. The results of this study can therefore be used to formulate and/or strengthen strategies that address the needs of children in orphanages in Kenya and other developing countries.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Currently there are over 2.4 million orphans and vulnerable children in Kenya, 47% of these were as a result of HIV/AIDS (UNAIDS/WHO, 2009). The number of orphans and vulnerable children in Kenya has been increasing steadily over the years (Rau, 2005). Children in orphanages may have suffered the loss of their families, depression, increased malnutrition, lack of vaccination or health care, increased demand for labor, lack of schooling, loss of inheritance, forced migration, homelessness, vagrancy, starvation, crime and exposure to HIV infection (Johnstone *et al*., 1999). This outgrowth of the orphans and vulnerable children may create a lost generation, a large cohort of disadvantaged, under - educated and less healthy youths.

While extended families in Kenya had traditionally fostered orphaned and vulnerable children, the high incidence of HIV infection and AIDS and the growing numbers of children left in its wake have already overwhelmed the traditional care structures in most parts of the country. The extended family is struggling to take care of these orphans and vulnerable children (Irungu and Karis, 2006). Where this structure is unable to cope, some Kenyan households are being led by children as young as 10 to 12 years old (USAID/UNICEF, 2002). In other families, the entire structure has fallen apart, leaving orphans and vulnerable children homeless in the streets and ironically, more vulnerable to HIV/AIDS.

Some of these have been taken up in orphanages, most of which are impoverished and lack basic facilities and services for the children. Many orphans and vulnerable children lack basic needs and necessities for survival namely food, shelter, clothing, medical services and school fees among other needs. Most children in orphanages do not therefore have access to basic health services, and many of them are not likely to complete their primary education. As a result the recent achievements in reducing child mortality and illiteracy rates in Kenya are being rapidly reversed (UNICEF, 1996).

The first HIV/AIDS case in Kenya was reported in 1984 (Welch, 2001). According to the Kenya Demographic and Health survey (2009), the average prevalence rate was 6.3% among the adult population 15 to 64 years of age. Studies have shown that women are more likely to be infected (8.0%) than men (4.3%), and young women aged 15-24 years are four times more likely to be infected (6.4%) than young men of the same age group (1.5%) (NASCOP, 2010). Since this is the most economically productive population, illness and death at these ages is a serious economic and social burden for the family and society (UNAIDS, 2002). These deaths have important consequences for children since most people in this age group are raising young children. It was estimated that there were about two million orphan and vulnerable children under the age of 15 years who had lost either one or both parents, in Kenya (Mishra and Bignami, 2008).

1.2 Statement of the problem

The ever-increasing number of orphans and vulnerable children in Kenya will inevitably have a profound impact on societies in which they live. In Kenya it is the high number of orphans and vulnerable children that is potentially the biggest long-term crisis, yet few studies have seriously delved into their plight. The impact of HIV/AIDS compounded with high level of poverty has subjected these children to deplorable conditions, denying them adequate access to basic needs of life necessary for their proper growth and development. These large numbers of orphans and vulnerable children have resulted in mushrooming of orphanages. Some of these orphanages may lack adequate resources to provide adequate basic necessities including food and clothing. There may also be limited awareness about nutritional needs of the children, appropriate childcare and hygiene practice and the consequences of childhood malnutrition among the caretakers in the orphanages.

The importance and lasting impact of nutrition in the crucial months of infancy and sound childhood cannot be overstated. Infants and children who are affected by malnutrition early in life face serious problems in proper growth and development. Further malnutrition also increases the risk of morbidity. The lack of adequate resources to cater for basic hygiene needs in some of these orphanages could also further increase the risk of morbidity. Yet there is very limited data comparing the nutritional and morbidity status of the children living in orphanages with those living with their parents.

1.3 Justification of the study

The vulnerability of children living in orphanages may be exacerbated by limited resources to provide adequate basic needs and lack of appropriate care. Many of the orphanages might be impoverished with little or no outside assistance. The findings of this study will raise awareness about the nutritional status of the children, their morbidity and adequacy of energy intake as compared to children living with their parents.

The comparison of children in orphanages and non-orphanage children will provide evidence as to whether the children in orphanages are at increased risk of malnutrition and illness than the non-orphanage children. The outcome will also help governments, policy-making bodies, Non-Governmental Organizations and donors to formulate and design strategies tailored to address the needs of these children. Health research institutions could also use the findings of this study to institute intervention programs that could improve the living conditions of these children so that they are not left vulnerable to preventable health hazards. Information from this study will serve as baseline data for future nutrition and hygiene intervention programs among children in these primary schools. It will also help the orphanages and the parents/guardians to improve their nutritional care practices. Finally it will enable the nutritionists understand the difficulties faced by children in these primary schools in Dagoretti Division and be able to effectively monitor their nutritional status.

1.4 Research questions

1.4.1 Are there differences in nutritional status between the children in orphanages and the non-orphanage children?

1.4.2 Are there differences in food consumption pattern between children in orphanages and non-orphanage children?

1.4.3 Are there differences in morbidity pattern between children in orphanages and non-orphanage children?

1.4.4 Are there differences in risk factors associated with malnutrition among the children in orphanages and non-orphanage children in the selected schools?

1.5 Null hypothesis

1.5.1 There is no difference between the nutritional status of children in orphanages and non-orphanage children.

1.5.2 There is no difference in the morbidity and food consumption patterns between the children in orphanages and the non-orphanage children.

1.5.3 There is no difference in malnutrition risk factors among children in orphanages and non-orphanage.

1.6 Objectives

1.6.1 General objective

To compare the nutritional status, morbidity pattern and determine factors that contribute to nutritional and morbidity risk among the children in orphanages and non-orphanage children in selected schools within Dagoretti Division, Nairobi County, Kenya.

1.6.2 Specific objectives

1.6.2.1 To assess and compare the nutritional status of children in orphanages and non-orphanage children in the selected schools.

1.6.2.2 To assess the food intake and energy adequacy among the children in orphanages and non-orphanage children in the selected schools.

1.6.2.3 To compare the morbidity patterns between children in orphanages and non-orphanage children in the selected schools.

1.6.2.4 To determine the risk factors associated with malnutrition among the children in orphanages and non-orphanage children in the selected schools.

1.7 Conceptual framework of malnutrition

This study was based on UNICEF's conceptual framework which gives inadequate food intake and disease as the two immediate causes of malnutrition affecting an individual: the underlying causes as the inadequate household food security, the social and parental care and the public health environment (Young and Jaspars, 2006).

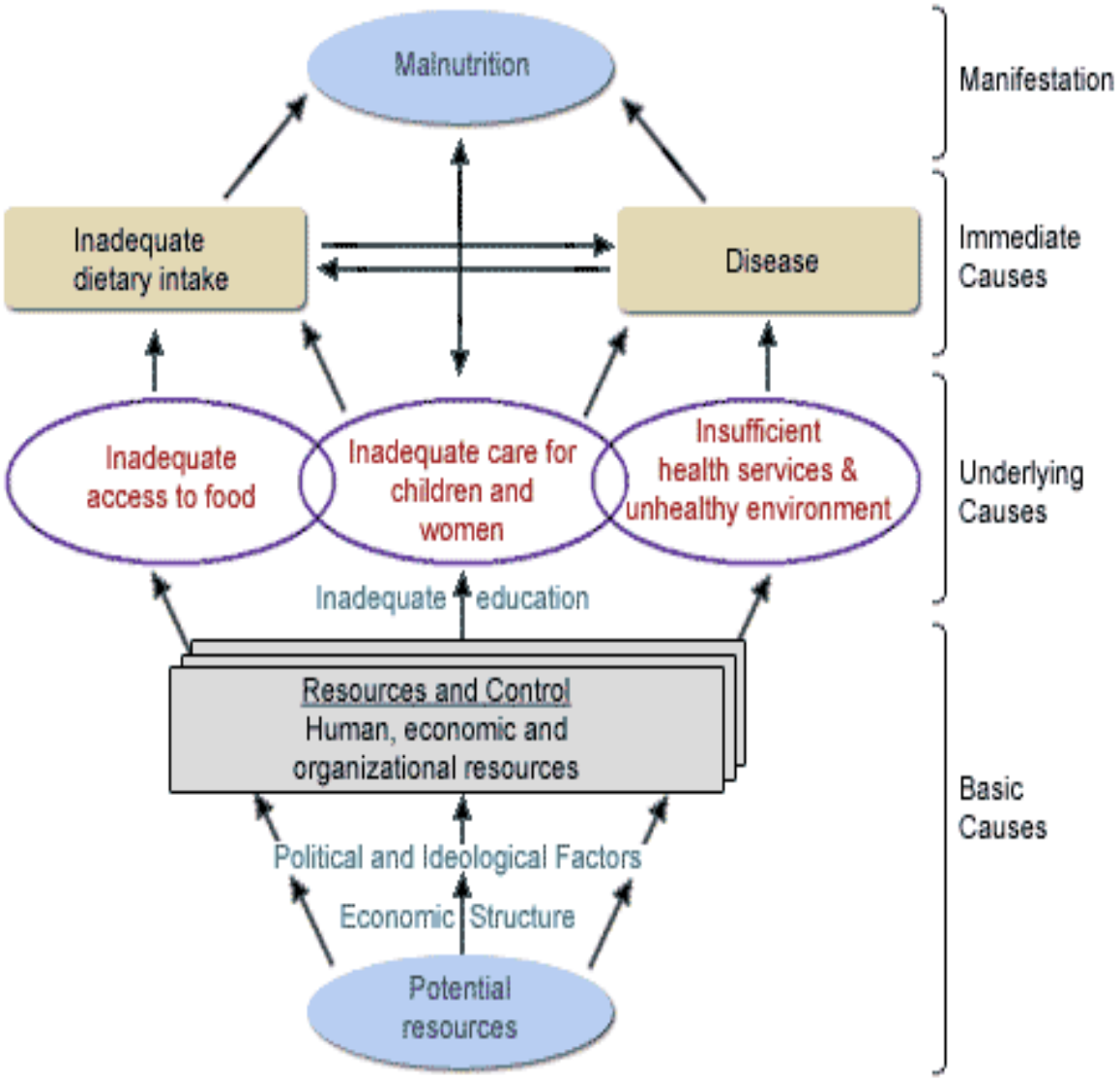

Figure 1.1 Conceptual framework for malnutrition (UNICEF, 1998)

Immediate causes: The interplay between the two most significant immediate causes of malnutrition, inadequate dietary intake and illness, tends to create a vicious circle: A malnourished child, has their resistance to illness compromised. The child therefore falls ill and malnourishment worsens (Black *et al.,* 2008)). Children who enter this malnutrition-infection cycle can quickly fall into a potentially fatal spiral as one condition feeds off the other (Figure 1. 2).

When children don't eat enough, their immune system defenses are lowered, resulting in greater incidence, severity and duration of disease (APHRC, 2008). Disease speeds nutrient loss and suppresses appetite (Lindblade *et al.*, 2003). These, in turn, increase the body's requirements for nutrients, which further affects young children's eating patterns and how they are cared for. Sick children tend not to eat as they should and the cycle continues (UNICEF, 1996).

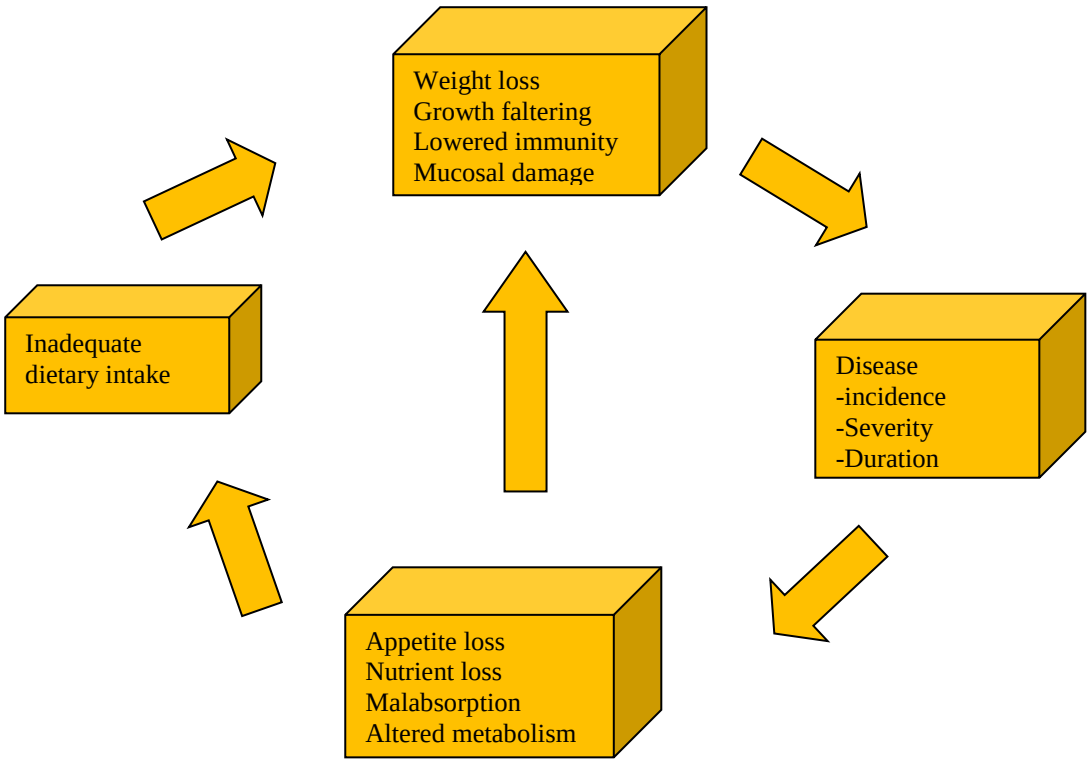

Figure 1. 2 Inadequate dietary intake/disease cycle (UNICEF, 1996)

On an immediate level, malnutrition results from an imbalance between the required amount of nutrients by the body and the actual amount of nutrients introduced or absorbed by the body (Nokuthula, 2009).

Adequacy of food intake relates to: The quantity of food consumed and:

The quality of the overall diet with respect to various macronutrients and micronutrients.

The energy density and palatability of the food consumed

How frequently the food is consumed.

Underlying causes: Three clusters of underlying causes lead to inadequate dietary intake and infectious disease: inadequate access to food in a household; insufficient health services and an unhealthful environment; and inadequate care for children and women (Steyn and Temple, 2008).

Household food security: This is defined as sustainable access to safe food of sufficient quality and quantity - including energy, protein and micronutrients - to ensure adequate intake and a healthy life for all members of the family. In rural areas, household food security may depend on access to land and other agricultural resources to guarantee sufficient domestic production (Semba and Bloem, 2008). In urban areas, where food is largely bought on the market, a range of foods must be available at accessible prices to ensure food security. Other potential sources of food are by exchange, gifts from friends or family and in extreme circumstances food aid provided by humanitarian agencies (UNICEF, 1998). Household food security depends on access to food, financial, physical and social as distinct from its availability. For instance, there may be abundant food available on the market, but poor families that cannot afford it are not food secure (Nematian *et al.,* 2004).

For the poor, therefore, household food security is often extremely precarious. Agricultural production varies with the season and longer-term environmental conditions. Families selling crops may find themselves paid fluctuating prices depending on a variety of factors beyond their control, while those who need to buy food may encounter exorbitant prices (Young and Jaspars, 2006). Families living on the edge of survival have few opportunities to build up sufficient stocks of food, or to develop alternatives that would cushion them in times of hardship. So while poor families may have adequate access to food for one month, what is essential is access that is consistent and sustainable (Druck, 2010).

Women have a special role to play in maintaining household food security. In most societies, they are solely responsible for preparing, cooking, preserving and storing the family's food -- and in many societies they have the primary responsibility of producing and purchasing it. For house hold food security to translate into good nutrition, this often overwhelming burden of work must be redistributed or reduced so that other needs of children, also related to nutrition, can be met (Nokuthula, 2009). Health services, safe water and sanitation: An essential element of good health is access to curative and preventive health services that are affordable and of good quality. Families should have a health centre within a reasonable distance, and the centre's staff should be qualified and equipped to give the advice and care needed (Grantham-McGregor and Cheung, 2007). **S**afe water supplies, adequate sanitation and good housing are preconditions for adequate nutrition.

Social and care environment: The social and care environment within the household and local community also can directly influence malnutrition. Appropriate childcare, which includes infant and young child feeding practices, is an essential element of good nutrition and health. Cultural factors and resources such as income, time and knowledge also influence caring practices as well as attitudes to modern health services, water supplies and sanitation.

While it is true that improving care for young children is vital, the emphasis on behavioural change should be accompanied by an understanding and commitment to addressing the economic constraints placed on caregivers (UNICEF, 2000). The social and care environment may be significantly different in orphanages compared to that in non orphanage households. The conceptual framework for this study envisaged the main underlying preconditions that determine adequate nutrition as insufficient access to food, poor personal hygiene, inadequate sanitation facilities and lack of vaccination: the immediate preconditions as inadequate diet and disease. The degree of an individual's or a household's access to these preconditions affect how well they are nourished.

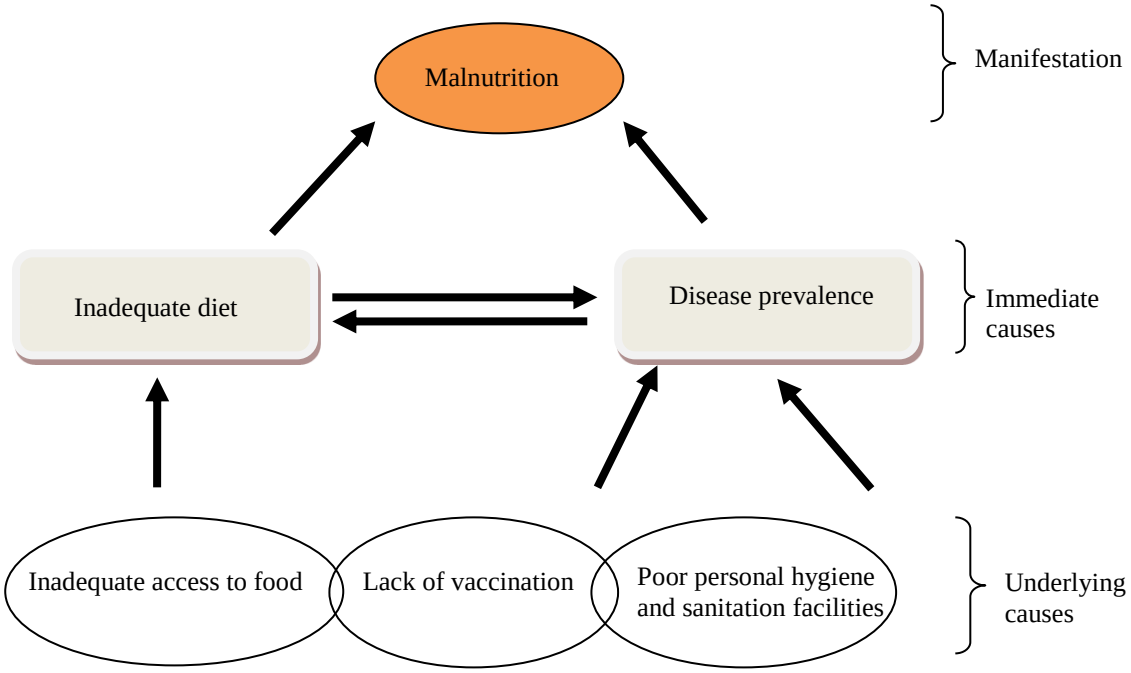

Figure 1.3 Conceptual Framework for this study

In conclusion, the food deficit in Kenya is a major problem, resulting in millions chronically undernourished people. National food policies, while aiming to boost productivity, do not address access to food and quality. Access to safe water and sanitation services have not caught up with the needs of the growing population. Inadequate funding curbs the rehabilitation and expansion of water supply and sanitation facilities and as a result, many diseases claim the lives of poor people every year (Kenya National Bureau of Statistics, 2007).

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Children's vulnerability and orphan hood in the world

In countries severely affected by HIV/AIDS, there has been a growing concern over the number of orphans and vulnerable children. (World Bank, 2000). On the other hand it has been difficult to track this trend because there are few estimates of the number of orphans and vulnerable children and because those estimates that do exist are often not comparable from one country to another (USAID, 1999). However, the needs of these children and their growing numbers necessitates governments, donors, non-governmental organizations, religious bodies and others concerned with the child welfare to take this trend seriously (Foresythe and Rau, 1996).

In sub- Saharan Africa the number of orphans and vulnerable children is predicted to comprise up to 8.9% of the global orphan children under the age of 15 years (UNAIDS, 2010). It is estimated that by 2015 the number of orphans and vulnerable children will still be overwhelmingly high in Sub Saharan Africa. The size of the population at risk of the HIV/AIDS and the increasing spread of the pandemic in Africa means that the problem will continue to worsen. According to Mishra and Bignami (2008) there are 45 million orphan and vulnerable children in the world; 12 million of these are in Sub-Saharan Africa (UNAIDS, 2008).

Currently Kenya has an estimated burden of 2.4 million orphaned and vulnerable children (13% of all children under 18 years of age), Rwanda has 850,000 orphaned children (19% of all children), South Africa has 2.5 million orphaned children (14 % of all children), Sudan has 1.3 million orphaned children (8% of all children), Uganda has 2.1 million orphaned children (13% of all children), Zambia has 1.1 million orphaned children (19% of all children) (UNAIDS, 2008). The high number of orphans and vulnerable children in Kenya is potentially a very big long-term crisis and very few studies have looked seriously into the plight of these children.

These children may lack the proper care and supervision they need at this critical period of their lives. The strain on social systems to cope with such a large number of orphans and vulnerable children will be tremendous (HACI, 2002). The burden will increase on society, both in the community and in the nation, to provide services for these children, including orphanages, food, health - care and school fees. Many children go without adequate health-care and schooling, which will increase the burden on society in future years. The number of urban street children may also increase. These children have the potential and the right not only to survive to adulthood, but also to develop their abilities and play a useful and fulfilling role in society. Instead, they face the prospect of a relentless struggle for physical survival, for basic education, for love and affection, and for protection against exploitation, abuse and discrimination. The problem of meeting the needs of these children represents a major new challenge to governments, organizations and communities (Christian and Glen 1991).

The threat to the prospects of economic growth and development in most seriously affected areas is considerable. Acquired experience with caring for orphan and vulnerable children, as a social problem is limited. Historically, caring for orphan and vulnerable children on a large scale has been a sporadic short-term problem, caused by war, famine and disease. Caring for orphans has been transformed into a long-term chronic problem by HIV/AIDS (Mishra and Bignami, 2008). The serious social and economic dislocation that will result from the large and growing proportion of children who are orphaned and vulnerable will require comprehensive, creative and long term solutions (Ng'wesheni *et al.,* 1997). There is concern that if these orphaned and vulnerable children are not adequately cared for in the orphanages they may run into the streets where they will be exposed to conditions that may make them vulnerable to HIV infections. They may also suffer from malnutrition, which will leave them crippled, chronically vulnerable to illness and intellectually disabled (Mishra and Bignami, 2008).

2.2 The State of orphans and vulnerable children (OVC).

UNICEF/UNAIDS (2004) defines an OVC as a child under 18 years who has lost one or both parents or lives in a household with an adult death in the past 12 months or who lives outside family care. The number of orphans due to all causes is likely to reach a staggering 50 million by 2015 in Africa (USAID/HACI, 2010). HIV/ AIDS, conflict, natural disasters, endemic diseases such as malaria and tuberculosis, and rising poverty has claimed the health and lives of millions of productive adults in Africa, leaving their children orphaned and vulnerable (UNAIDS, 2010).

Traditionally, extended families and community members would care for these children, but the sheer scale and complexity of these problems are eroding traditional support networks, leaving orphans and vulnerable children (OVC) with little, if any, adult care and supervision. Among these OVC, young children below the age of eight represent an extremely vulnerable population (Cox *et al.,* 2006). Recent research has shown that as many as 200 million children worldwide fail to reach their cognitive and socio-emotional potential because of malnutrition, micronutrient deficiency, and lack of stimulation during early childhood (Grantham-McGregor and Cheung, 2007). These findings are especially pertinent for Africa, where 15 percent of all orphans, or about 6.5 million children, are under 5 years of age (Hamadani *et al.,* 2006). Deprivation during these early years results in life long deficiencies and disadvantages. By contrast, adequate care, stimulation, and nutrition in early childhood can lead to positive physical, socio-emotional, and cognitive outcomes measurable well into adulthood.

All stages of human growth are important, with each stage including specific milestones of progress. However, early childhood, which encompasses birth to eight years, is considered to be the most critical foundation stages of growth and development. These early years have a longer lasting impact on the full life course than any other period (Cox *et al.,* 2006). During the first two years of life, a child undergoes rapid physical development, including skeletal, muscular, and organ growth. This is also when a child's immune system establishes itself. The brain and the entire nervous system increase the numbers of neural connections, while nerves gain myelin, leading to increasing gross and fine motor skills (Bundy *et al.,* 2006).

Poor nutrition, as well as lack of affection and stimulation, during this critical period can create permanent deficits in all three of the traditional developmental domains: physical, cognitive, and socio-emotional (UNICEF, 2007). Physical growth after the age of six has been shown to be highly dependent upon hormonal secretions triggered by affection and social interaction. Additionally, research has determined that growth failure in children can be as much the result of emotional neglect as poor diet (Grantham-McGregor and Cheung, 2007).

Although most children live with a caretaker, they face a number of challenges, including finding money for school fees, food, and clothing. Experts contend that effective responses must strengthen the capacity of families and communities to continue providing care, protect the children, and to assist them in meeting their needs. There are thousands of localized efforts, many of them initiated by faith-based groups, to address the needs of children made vulnerable by AIDS (UNAIDS, 2006). Proponents argue that supporting these "grassroots" efforts can be a highly cost-effective response, although additional mechanisms are needed to channel such resources. They further assert that additional resources are needed to expand the limited programs and to support the children who are on the street or in institutional care (Victoria *et al.*, 2008). But it is not only these children who will suffer. Countries struggle to develop when their citizens grow up malnourished, poorly educated or ravaged by disease (WHO, 2010). These factors perpetuate poverty and low productivity and may lead to instability or even spill over into violence and armed conflict.

The healthy development of children not only safeguards their own well-being, it is also the best guarantee of the future peace, prosperity and security that are central ambitions of the Millennium agenda (UNICEF, 2006). In Kenya the Ministry of gender, children and social development (2010) defines an orphan as a child (age 0-18 years) who has lost one or both parents. It also defines a vulnerable child as one whose safety, wellbeing and development are, for various reasons, threatened. This includes children who are emotionally deprived and traumatized. The situation of Orphans and Vulnerable Children (OVC) in Kenya has continued to be of national and international concern. Although no comprehensive survey has been carried out, the Government estimates that there are a total of 2.4 million OVCs in Kenya out of which 1.15 million are as a result of HIV AIDS (UNICEF, 2009).

The Government of Kenya through its Ministry of Gender, Children and Social Development developed a National Plan of Action (2007-2013) on OVC which helps to strengthen the capacity of families to protect and care for OVCs, provide economic, psychosocial and other forms of social support, as well as mobilize and support community based responses to increase OVCs access to essential services such as food and nutrition, education, health care, housing, water and sanitation (UNICEF, 2009). Kenya's Cash Transfer Programme for Orphans and Vulnerable Children (OVC) provides regular cash transfers to poor families living with OVC. This however does not cover the OVC under the institutional care. Even with this government support USAID (2005) indicated that fostered children (6-14years) in Kenya were more likely to be stunted (42% and 37%) and underweight (32% and 23%) than non fostered children of the same age respectively.

It is important therefore to find out the health status of the children under institutional care and compare them to other children who are not living in institutions. These will provide feedback on the effectiveness and relevance of the existing responses in meeting the basic needs of the children under institutional care.

2.3 Vulnerability of school children to malnutrition.

Orphans and vulnerable children are often more prone to malnutrition and infections and less likely to receive health-care than other children (Cox *et al.,* 2006). This is so especially with the very young children who are likely to suffer from lack of care, and die unnecessarily of malnutrition and respiratory infections (Young and Jaspars, 2006). School-age children are particularly vulnerable to under nutrition as the priority in nutrition interventions is often to prevent malnutrition during fetal development and the first years of life – the most critical period for growth and development (Bundy *et al.,* 2006). Malnutrition is usually the result of a combination of inadequate dietary intake and infection. In children, malnutrition is synonymous with growth failure. Malnourished children are shorter and lighter than they should be for their age (UNICEF, 2000). There are 226 million children under the age of five in developing countries who suffer from moderate or severe stunting (Nokuthula, 2009). This is nearly 40 percent of this age group. Stunting and wasting are also wide spread among school-age children in developing countries (Burbano *et al*., 2009). High levels of stunting among children suggest that there will also be a long term deficit in mental and physical development that can leave children ill prepared to take maximum advantage of learning opportunities in schools.

Strong epidemiological evidences suggests a link between maternal and early childhood under nutrition and increased adult risk of various chronic diseases (Allen and Gillespie, 2001). During infancy and early childhood, frequent or prolonged infections and inadequate intake of nutrient particularly energy, iron, protein, vitamin A and zinc may contribute to preschool underweight and stunting (Black *et al.,* 2008). Underlying such immediate causes will be inadequacies in one or more of the three main preconditions for good nutrition: food, care and health (Druck, 2010). A child who is stunted at five years of age is likely to remain stunted throughout life (Semba and Bloem, 2008).

Children stunted at school age are likely to have been exposed to poor nutrition since early childhood and the degree of stunting can tend to increase throughout the school age years (Gillespie and Kadiyata, 2004). However children can exhibit catch up growth if their environment improves. This suggests that interventions for school age children can supplement efforts in the preschool years to reduce levels of stunting (WHO, 2008).

Underweight among school age children can reflect prenatal under nutrition, deficiencies of macro- and micro- nutrient, infection and, possibly inadequate attention by care givers (WFP, 2004). Wasting is not as common as either stunting or underweight in school age children. Nevertheless, wasting rates can change rapidly in situations of acute food crisis, with school age children becoming severely malnourished (Gillespie et al., 1997). On the other hand, stronger children grow into stronger and more productive adults (Neumann *et al.,* 2002).

There is established evidence that (a) good nutrition status helps the body resist infection, (b) that when infection occurs, the good nutrition status relieves its severity and seriousness, and (c) that good nutrition speeds recovery (Anita, 2002). Malnutrition was implicated in more than half of all child deaths worldwide. This proportion was unmatched by any infectious disease since the Black Death (This was a Bubonic plague that killed a quarter of England's population in 1348) although it is not an infectious disease (UNICEF, 1998).

With the high incidence of poverty and HIV/AIDS, it is true that malnutrition prevalence is also high (UNICEF, 2009). Malnutrition needs to be viewed as an indication of inadequate realization of some of the most basic of all human rights, as a reflection of inadequate investment and progress in a range of issues related to human capital development and as significant influence on future economic development of a country (WHO, 2010). In a healthy, well fed population of children, it is expected that only two to three percent of children would fall below two standard deviations from the median of the reference population for each of the three nutrition indices namely wasting, stunting and underweight (UNICEF, 2005). Encompassing more than just hunger, malnutrition can lead to weakened immune systems when vitamin A is lacking and a child is neither hungry nor underweight (Mattimore and plangemann, 2008). Even when it does not cause death, malnutrition can inflict lifelong damage on a child's health and development (UNAIDS, 2006). Malnutrition and infection kill together jointly.

As depicted in Figure 2.1 the overlap between the middle circle and the pie slices is proportion of deaths that are due to the synergism between malnutrition and infection. Malnutrition kills synergistically with infectious disease (UNICEF, 2009).

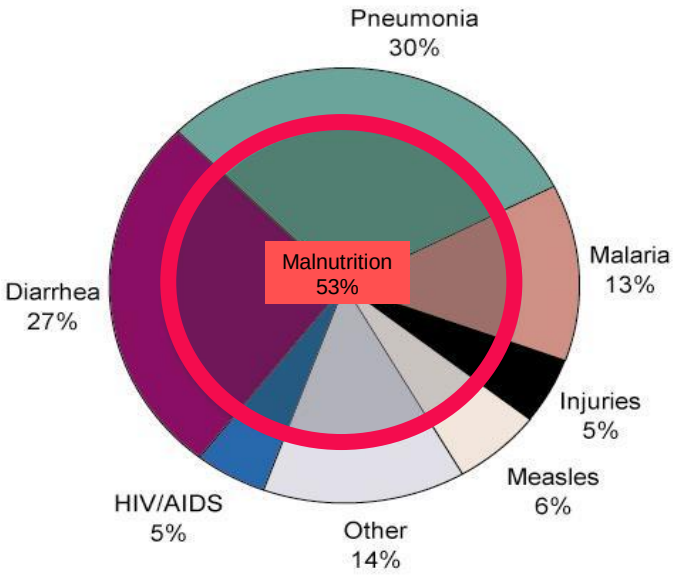

Figure 2.1 Synergy of disease and Malnutrition (APHRC, 2008)

While huge strides have been made worldwide to increase vaccination coverage, there is still room for improvement. Tragically, the poorest children are also at a disadvantage when it comes to immunization. The richest children are more than twice as likely to have received the measles vaccination as the poorest 20 per cent of children in Azerbaijan, the Central African Republic, Chad, the Democratic Republic of the Congo, Niger and northern Sudan (Nokuthula, 2009). A strengthening of disease surveillance as well as the up scaling of vaccination coverage significantly contributed to a reduction of infections among both young and school children (UNICEF, 2009).

A child is considered fully vaccinated if he or she received a Bacillus Calmette Guerin (BCG) vaccination against tuberculosis, three doses of Diphtheria/Pertussis/Tetanus (DPT) vaccine to prevent Diphtheria, Pertussis and Tetanus, at least three doses of Oral Polio Vaccine (OPV) to prevent Poliomyelitis and one dose of measles vaccine. These vaccines should be received within the first year of life (Tumwet *et al.,* 2005). In a study carried out in Kenya, 62.7% of primary school children (6-13 year old) had BCG scars present. Overall, in the same study there was a significant upward trend of 15% in BCG vaccination coverage in the country (Kwamanga *et al.,* 1993). In another study by UNICEF (2009), National immunization coverage in Kenya was at 76 per cent, far below the recommended 85 per cent in 2008.

Poverty and low socio-economic status are important factors of malnutrition (CBS, 1984). Winnikoff *et al*, (1984) and Okeahialam (1975) found that socio-economic status of the family as reflected by the total family income in both urban and rural areas in Kenya to be an important factor contributing to poor nutritional status. Income disparities often translate into disparities in the nutritional status of children (UNAIDS, 2006). UNICEF (1994) found that high levels of female education had negative association with stunting levels in Kenya. Thus mothers with better education had fewer children stunted compared to those with little or no education. Maternal education was related to knowledge of good child-care practices and to household wealth. Children of mothers who had secondary education had lower rates of stunting and wasting than those of mothers who had primary or no education in Kenya (KDHS, 1998).

In Kenya, another study showed a slight decrease in proportion of men and women with no education (19% for women, 13% for men) compared to 2003 (23% for women, 16% for men) and the median number of years of schooling completed was slightly higher for males (6.0 years) than females (5.2 years) (USDA, 2009). In Kenya, another study done by KDHS (2009), mother's education was inversely correlated with stunting levels. A similar inverse relationship was observed between the mean household income and stunting levels in the same study.

Studies carried out in rural Machakos have shown that other than pregnant and lactating mothers, young children are the group most affected by marginal nutrition (Mbithe, 2008). In this study, malnutrition was found to be due to both an inadequate diet and high morbidity rate, and the study associated high morbidity, high population densities and low levels of education with malnutrition among school children. In a study carried out in Zambia among school children, 28.9%, 14.5% and 3.9% were stunted, underweight and wasted respectively (Gillespie and kadiyata, 2004). Another study in Machakos district, Kenya, found that malnutrition levels were high among school going children just as in children below five years. In the same study, girls were at a higher risk of being underweight compared to boys (Mbithe, 2008). A study in Nyambene District, Kenya among pupils between 5-10 years reported that the nutritional status (stunting, underweight and wasting) of girls was better than that of boys, although the difference was not statistically significant (Meme et al., 1998).

The prevalence of malnutrition varies among school boys and girls. Anthropometric status of school children in Ghana, Tanzania, Indonesia, Vietnam and India found that boys in most countries tended to be more stunted than girls (WHO, 2002). Another study in Pemba Island Zanzibar showed prevalence of stunting increased with age for both school girls and boys (Stoltzfus, 2004). In Brazil school age boys were significantly more stunted than girls of the same age (Parraga, 2000). Stunting was also found to increase with age, younger school children were reported to have a prevalence of just 2% stunting while 16% of older school children were stunted in Bangladesh (Ahmed, 2005). Another study in Brazil found that 21% of school-age children were stunted and 13% were underweight. Both indices of nutritional status worsened as the study population got older, particularly for boys (Parraga, 2006). Based on the literature it is important to determine whether school children in Dagoretti Nairobi, Kenya are potentially malnourished.

2.3.1 Malnutrition among children in orphanages.

One of the consequences of the HIV/AIDS epidemic in Sub-Saharan Africa is the increase in the number of children in orphanages resulting from the increase in number of orphans, estimated to have reached 6-10% of the children less than 15 years old in 2000 (UNAIDS, 2006). Children in orphanages may be at increased risk of poor health due to trauma and loss of parental care (UNAIDS, 2005). Children in orphanages nutritional status registered almost 0.3 Standard Deviations lower than non-orphanage children (Lindblade *et al.*, 2003).

A study carried out in Malawi established that the prevalence of malnutrition in children in orphanages (≤ 6 years old) was 55 % compared with 30 % of non-orphanage children (Lindblade *et al.*, 2003). Among the children in orphanages, 64 % were stunted compared with 46 % of the non-orphanage children. The mean (SD) Z-score of Height for Age was significantly lower in the children in orphanages group, -2.75 (1.29) and -1.61 (1.57) in non-orphanage children (p=0.05). Conversely, older children in orphanages (>5 years) were less stunted and wasted than non-orphanage children. Illness of children in the last one month was reported to be higher among the children in orphanages, especially diarrheal disease, which occurred 30% compared with 7 % of non-orphanage children. Girls in orphanages were more likely to be malnourished than boys in orphanages. Children who had been admitted to an orphanage for more than one year were less malnourished (Panpranish *et al.,* 1999). A recent study in Botswana found that children in orphanages were 49% more likely to be underweight than non-orphanage children (Mishra and Bignami, 2008).

In Zimbabwe a strong association was found between living in an orphanage and nutritional and health outcomes such as diarrhea, acute respiratory infection, and underweight status among 5-10 year old children. In the same study children in orphanages were more wasted (9%) compared to non-orphanage group (2%). In both groups there was a negative and significant relationship between child's age and wasting, stunting and underweight. However among the older children, age had a significant and positive relationship with stunting (Young and Jaspars, 2006).

A study in Nicaragua found a direct correlation between the prevalence of underweight among orphanage school children and diarrheal, coughs/colds and length of stay in the orphanage. In the same study younger children were found to be more likely to be wasted than older ones (Morris *et al.,* 2004). In Dar-es-Salam, Tanzania, a study documented adverse potential consequences of orphan hood on children's psychosocial well-being and emotional health as anxiety, sense of failure, pessimism and suicidal tendency (Mishra and Bignami, 2008). Another study in North Western Tanzania found higher stunting levels among children in orphanages and this increased with increase in age of the children (Ainsworth and Semali, 2000). In Uganda much higher levels of anxiety, depression and anger were found among children in orphanages than among non-orphanage children. In rural Zimbabwe, children in orphanages were found to have significantly higher psychosocial distress than non-orphanage children (UNICEF, 2006).

2.4 Food consumption

2.4.1 Food consumption in Sub –Saharan Africa

The term food consumption is used to define the amount of food prepared at the household level or the amount of food eaten by individuals (WFP, 2009; FAO, 2011). It can also be defined as available food which is either acquired through agricultural production or purchased and eaten to impact on the nutritional status of the population (Nokuthula, 2009). The consumption pattern of a population generally depends on the production pattern, which determines what is to be consumed and how much should be consumed (Imbuni, 2007).

Food consumption is to a great extent affected by a nation's agricultural policy because most of the food that is consumed is acquired through agriculture. Agriculture production therefore plays a very important role in meeting the food consumption needs of any household. The nation's agricultural policy provides a link between agriculture production and nutrition status of a population ensuring that nutritionally adequate food is available (Van Lieshout and West, 2004).

Population growth has had a significant impact on food consumption. It brought about the movement of people from rural to urban areas, resulting in a change in their food composition and dietary patterns (Ruel and Levine, 2004). The growth in population world-wide has resulted in higher food demands that need to be met by agricultural production. The Sub-Saharan African region also experienced its fair share of population growth resulting in the shift from traditional foods to processed and convenience foods (Darnto-Hill and Nalubola, 2006). Starchy crops such as roots, tubers and cereals make up an important part of the diet of the people of Kenya. These starchy staples are mostly consumed in rural areas and their consumption depends on the agricultural conditions.

In African countries, millet, sorghum, maize and rice are the main cereal crops consumed in varying proportions (Prinzo and De Benoist, 2002). A food consumption study in South Africa found that maize porridge was most commonly consumed by children aged 1-5 years, with 80% of the children consuming an average of 426g per day. The cereal food group was consumed by 99% of this same child population (Ruel, 2003).

2.4.2 Meal patterns and commonly consumed foods in Kenya

In Kenya, as elsewhere, food habits and dietary patterns are related to the environment in which people live. They are based on traditions of the people in the community (Oniang'o *et al.,* 2003). Three meals are normally served in Kenyan households. These consist of breakfast in the morning, midday meal and supper in the evening. Breakfast may consist of leftovers of Ugali, rice or sweet potatoes from previous night, which is reheated and taken together with some tea or fresh breakfast porridge (uji) (Nokuthula, 2009)). For those families that can afford to have more variety, breakfast may include chapattis (traditional unleavened bread), uji (thin porridge) or bread. Sometimes the mid-day meal is often not served because children are usually away from home at school or herding livestock. The most important meal of the day then becomes supper when all the family members are present to share the food (Imbuni, 2007).

Lunch and supper may consist of a number of foods (Ruel and Levine, 2004). However in Kenya the main food component especially in the rural areas is Ugali which could be served together with any available local vegetable, milk and sometimes fish. In areas nearby Lake Victoria or the coastal area (Nokuthula, 2009). In most cultures in rural Kenya, the members in the household have to share their meals by eating from a communal bowl (Neumann *et al.,* 2002). The national staple food in Kenya is Ugali generally prepared from maize flour. Some communities may prepare Ugali from other indigenous cereals such as sorghum and millets. Ugali and uji may also be made from a combination of different cereals, legumes, roots and sometimes fish.

Other types of Ugali are made from bananas, cassava and roasted or boiled maize mixed together with beans as well as mashed Irish potatoes (Allen, 2003). The food habits in Kenya may also differ by region and ethnic group. For example, the traditional dishes in the southern part of Kenya are maize and beans, often supplemented with vegetables, fat and milk. These are eaten at least twice a day, especially by the poor people. For people that can afford variety in their diet, fat and meat is more common and may be eaten together with large portion of beans, peas or maize (Ruel, 2001). Common foods consumed by different Kenyan communities are as shown in Table 2.1.

Table 2.1 Diet and dishes among different ethnic groups in Kenya (Imbuni, 2007).

Location and ethnic group	**Main dish**
Nyanza province (Luo)	• Ugali (stiff porridge from sorghum flour or finger millet) • Uji (fermented or unfermented soft porridge made from cereal flour) • Githeri (mixture of beans and maize) • Samaki (deep fried fish) • Nyama choma (Roasted meat) • Matumbo (Tripe)
Central province (Kikuyu)	• Irio (Mixture of maize , various kinds of beans and mashed bananas) • Uji (fermented or unfermented soft porridge made from cereal flour) • Githeri (mixture of beans and maize)
Coastal region (Giriama)	• Sima (porridge made from maize) • Porridge made from brown rice, cassava and bananas • Kitoweo (a mixture of red beans *(kunde*) small round green beans (*padzo*),stewed beef or goat, boiled fish or shark, prawns or chicken) • Boiled raw bananas or bananas fried in ghee • Sweet potatoes roasted in ashes or boiled • Samaki (deep fried fish)
Northern Kenya (Samburu)	• Fermented milk • Wild, fruits and vegetable soups • Blood • Oljukoti (mixture of fresh milk and blood) • Imotori (meat soups)
Kenya coastal strip (Digo)	• Mandazi (deep fried wheat bun) • Chapatti (a pan fried unleavened wheat bread) • Mahindi choma (maize on cob grilled on charcoal) • Mchele (boiled rice)

2.4.3 Dietary intake and nutritional status of school children

Nutrition plays a vital role in early childhood development. Physical development during the period between birth and three years of age is critical as this is the time when children are most vulnerable to the permanent effects of stunting and negative cognitive outcomes attributable to malnutrition (Bundy *et al.,* 2006).

Because a child's brain undergoes tremendous growth between the ages of 0-11 years, caloric and protein intake impact a child's future mental abilities (Cox *et al.*, 2006). Micronutrients also play an important role. Iodine and iron deficiencies have been cited as two of the leading reasons for poor developmental outcomes for young children in developing countries (USAID/HACI, 2010). It is common knowledge that nutrition contributes to physical growth and play contributes to socio-emotional development. However, research has shown that the developmental domains of early childhood are highly interdependent. A recent study found that socio-emotional stimulation was equally as important for aspects of physical development as good nutrition.

During the first six months of life, children born from healthy mothers hardly experiences any nutrition related illnesses until when they reach the weaning stage where they have to take complementary foods. It is believed that the nutritional status of the children gets affected when they start taking complementary foods which are often bulky cereal based diets that are low in essential nutrients and high in antinutrient factors (UNICEF, 1998). A proper diet is therefore essential in providing the proper quantity of the food for energy and quality of the food to provide the essential micro- and macro-nutrients for proper human growth and development especially from early childhood (Neumann *et al.*, 2002).

The nutrients that are essential for proper growth and development and are often of major concern in developing countries are carbohydrates, proteins iron, zinc, iodine, calcium, vitamin B12 and vitamin A, which are acquired from a number of foods that make up the diet. These nutrients are also of low bioavailability and poor quality especially in cereal based diets. Increasing the consumption of animal products improves the amount and bioavailability of micronutrients (Bentley *et al.,* 2000). Animal products are high in most micronutrients, and many minerals and vitamins are better absorbed from milk, meat and eggs than they are from plant derived foods. Most animal based foods contain more fat than plant based foods. This makes them more energy dense, as well as being a good source of fat soluble vitamins and essential fatty acids (Armtrong *et al.,* 1997). Staple and cereal intake reduces underweight while milk and dairy products reduce wasting and underweight (Tomkins, 2000). Children who consume a variety of foods foster better health (Oniang'o, 2003).

The consumption of a varied diet is associated with increased intake of energy (Gibson and Holtz, 2001). A study carried out in Pakistan found that 6.5% of children in orphanages consumed four or more food groups compared to 42.5% of the non children in orphanages. The foods groups used to calculate the minimum food diversity were grains, legumes, dairy products, meat/fish, eggs and vegetables and fruits. In the same study the children in orphanages consumed 9.7%, 34.6% and 54.7% of daily energy intake for breakfast, lunch and supper respectively. The non-orphanage group consumed 9.3%, 46.3% and 44.4% of the daily energy intake for breakfast, lunch and supper respectively (UNICEF, 2009).

In another study in Western Kenya, 63.7% of school children met their daily energy intake (WFP, 2010). All the children in this study consumed four or more food groups. However the cereals contributed a high proportion (45.1%) of the total daily energy intake but this was in line with the food based dietary guidelines which recommend 55% of the daily energy intake from the cereal group (Maunder *et al.,* 2001). The risk of inadequate diet often arises when the percentage of the population meeting the required daily allowances is less than 97% (Neumann *et al.,* 2002). The average child up to 11 years of age need to eat every 4-6 hours to maintain a blood glucose level sufficient to adequately support the activity of the brain. Morning nutrition is especially important for children because of their greater energy requirements and relatively reduced energy stores. The liver of the child which is much smaller than that of an adult has a glycogen store that lasts only about 4 hours (Pivik and Dykman, 2007).

A study carried out in Kenya showed that diets were monotonous, cereal-based and unevenly distributed within the household. Energy intake was low and contributed mainly by carbohydrate in the form of maize (78% of their Recommended Daily Allowance), with plant proteins contributing 12% of the total energy. Only 6% of energy coming from animal source foods (Nimrod and Charlotte, 2003). The phytate and fiber content of these diets was extremely high rendering the energy nutrient bio unavailable (Van Lieshout and West, 2004). Recent studies have related higher levels of physical activity in children who walk to school daily regardless of the distance to increased energy requirement (Cooper *et al.,* 2003).

2.4.4 Nutrition intervention strategies

The fight to reduce malnutrition has been focused on using strategies that pay particular attention to increasing the amount of food consumed, leading to an increase in the energy intake, and also to increasing the consumption of protein and micronutrient rich foods to improve the quality of nutrition. Strategies that aim at eliminating malnutrition focus on two approaches, increasing the efficacious supply of nutrients through the use of food or tablets; and reducing situations where high nutrient intake is required such as in illness. (Van Lieshout and West, 2004). The most popular strategies used are supplementation, fortification and dietary diversification (Ruel and Levine, 2004). The success of each strategy depends on the availability of the following; Policy support, safety regulations, multiple sectorial involvement, economic and marketing incentives, constant monitoring of the nutrient level, food regulatory systems, sustainability, education, communication and continued investments (Darnton-Hill and Nalubola, 2006).

Fortification: Is defined as the practice of deliberately increasing the content of essential micronutrients – that is vitamins and minerals (including trace elements) – in a food so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health (WFP, 2010). This term is also used to refer to the addition of one or more nutrients in small amounts to a food to improve the nutrient in the population that it is intended for (Van Lieshout and West, 2004). Fortification has been used by a number of countries to improve nutritional deficiencies such Vitamin A, iodine and iron declared as national problem (Darnton-Hill and Nalubola, 2006).

The most popular fortification practice employed by a number of countries is vitamin A fortification of white sugar. Other fortification vehicles that have been successfully used also include salt, sugar and flour (WFP, 2009). The following measures need to be adhered to in order for fortification to be successful: the population at risk must be regular consumers of the potential fortification vehicle in large amounts, day to day variations in consumption must be minimal, the price of the product to be fortified should not be too high when compared to the unfortified version of the product; the physical characteristics such as the taste and colours must not be altered by the fortification process and the fortified food must be produced by a limited number of manufacturers so that it is easy to monitor the fortification process (FAO, 2004). The most limiting factor in using fortification mainly in developing countries is the implementation of the regulations that are satisfactorily enforced (WFP, 2010).

Supplementation: This is a short term approach used to alleviate nutrient deficiencies over a specific period of time (WFP, 2009). Supplements are usually administered in capsule form to have a rapid impact and supplementation is often administered as a complementary strategy if fortification is not able to reach the population in time. Due to its immediate effectiveness, supplementation could be used for a specific deficiency where other strategies could be too slow and then the long term sustainable strategy implemented afterwards. Since supplementation programmes are usually difficult to administer in large populations, it is usually easier to administer supplementation to women and /or children attending ante natal or post natal clinics (Prinzo and De Benoist, 2002).

Just like fortification, supplementation is more likely to succeed if the cost for administering the capsules is affordable and also if the transportation and storage system to deliver the capsules to the target population is reliable (Allen, 2003).

In addition to these factors, supplementation needs to be closely monitored and supervised; hence it must go together with education (Nokuthula, 2009). Supplementation is an expensive short term strategy mainly for developing countries. Supplementation requires reliable supply, distribution, and delivery of the supplementation to the targeted group which may fail when there is poor commitment. One such failure due to lack of full compliance on the full iron supplementation provided for children was reported in Bangladesh (Ruel, 2001).

Dietary diversification: dietary diversity is defined as the number of individual food items or food groups consumed over a given period of time (WFP, 2010). It can be measured at the household or individual level through use of a questionnaire. Most often it is measured by counting the number of food groups rather than food items consumed. The type and number of food groups included in the questionnaire and subsequent analysis may vary, depending on the intended purpose and level of measurement. At the household level, dietary diversity is usually considered as a measure of access to food, (e.g. of households' capacity to access costly food groups), while at individual level it reflects dietary quality, mainly micronutrient adequacy of the diet. The reference period can vary, but is most often the previous day or week (FAO, 2011; WFP, 2009).

Dietary diversification is a food-based strategy whose main aim is to increase the availability, access, production, bioavailability and consumption of foods that are rich source of the essential nutrients (Ruel and Levine, 2004). With both supplementation and fortification having to depend on good government, market and health infrastructure, which are not always available in rural areas, food based strategies such as this one have the potential to reach the targeted population (Harvest plus, 2006). Dietary diversification is often promoted by advocating for the growing of kitchen gardens, indigenous food utilization, and proper food preparation, preservation, processing and storage methods (Tumwet *et al.,* 2005).

Dietary diversification is a long term sustainable strategy that involves changes in food production, selection and preparation practices of locally available indigenous foods (Gibson and Hotz, 2001). An acceptable description of dietary diversification is defining it as having variety between and within food groups (Ruel, 2003). An effective dietary diversity intervention strategy can be implemented through the following practices; promote the use of improved cereal varieties, include foods that enhance the absorption of minerals, modified milling practices, promote soaking, fermentation and germination of cereals to reduce phytic acid activity. In Kenya, the use of Animal Source Foods (ASF) which are foods mainly of animal origin has been implemented to improve their micronutrient intake (Whaley et al., 2003). The fight against malnutrition should focus on food security at the household level economic growth, poverty alleviation, social development and education.

The diets of chronically hungry people lack 100-400 kilocalories per day (FAO, 2003). Most of these people are not dying of starvation. Often they are thin but not emaciated (Nokuthula, 2009). The presence of chronic hunger is not always apparent because the body compensates for an inadequate diet by slowing down physical activity and, in the case of children, growth. In addition to increasing susceptibility to disease, chronic hunger means that children may be restless and unable to concentrate in school, mothers may give birth to underweight babies and adults may lack the energy to fulfill their potential. When dietary intake is adequate, the variety of foods is generally greater, providing more energy and better nutrition (FAO, 2002). A diet constituting of 55% starchy staples and 45% of a variety of other nutritious food stuffs fosters optimum nourishment. However, a diet that constitutes of 75% starchy staples and 25% of a variety other nutritious food stuffs fosters inadequate nourishment (UNICEF, 2009).

2.5 Nutritional anthropometric measurements.

The influence of nutrition on the health of an individual is measured through assessment of nutritional status. Anthropometry, which is a measure of growth and development, is an important examination especially of infants, children and adolescents and pregnant women. It deals with comparative measurements of the body that permit estimations of body fat, muscle tissue and bone. They include height, weight, head circumference, arm circumference and chest circumference, skinfold and bone widths (Clifford *et al*., 2004). Physical measurements reflect the total nutritional status over a lifetime.

The use of anthropometric measurements is justified in that, a large body of evidence exists showing that nutrition influences the physical dimensions of the body particularly in early childhood, characterized by rapid growth (Ritz, 1990). Anthropometric measures yield indices, which are then compared using a normal distribution curve representing an international reference population defined by the United States Centre for Health Statistics (NCHS). This in turn has been recommended by the World Health Organization (WHO) and the Centre for Disease Control (CDC) (Clifford *et al*., 2004). The following are some of the indices: (a) Wasting which is determined by Weight-for-Height. This is weight of a child compared to median weight of reference (healthy) children of the same height (UNICEF, 2009). A child with low weight-for height is wasted or too thin (Bhuiya, 1986). Wasting is a result of serious underfeeding and /or illness (FAO, 1993).

(b) Stunting which is determined by Height-for-Age. This is the height (length) of a child compared to the median height of a reference (healthy) child of the same age. A child with a low height-for-age is stunted. Stunting is as a result of poor growth over a period of several months and is usually caused by chronic underfeeding and ill health (Lopez-Quintero *et al.,* 2009). Stunting becomes more common as children get older because there has been a longer period for slow height growth to occur (Ritz, 1990). (c) Underweight which is determined by weight-for-age. Weight-for-age is the weight of a child compared to the median weight of reference (healthy) children of the same age. A child with a low weight- for-age is underweight. An underweight child may be wasted, stunted, or both (FAO, 2004). Measurements of head, mid-arm and abdominal circumference are also useful.

Measurement of head circumference provides information about brain growth, midarm circumference about muscle mass and abdominal circumference about water retention (Darnton-Hill and Nalubola, 2006). Skinfold thickness measurements provide information about fatness and leanness. The width of the fat layer that lies directly beneath the skin is measured in various places on the body to obtain the skinfold thickness (Marian, 1984). Height and head circumference represents past nutrition or chronic nutritional status (Clifford *et al*., 2004). Weight and skinfold thickness reflect present nutritional status and are used to assess energy reserves both as fat and as protein (FAO, 2004). Weight in children is a sensitive measure of growth which gives immediate nutritional history and can be an early clue to growth problems and nutritional inadequacy (Nokuthula, 2009).

2.6 Hygiene practices and health

2.6.1 Hand washing

Over 30,000 people in Kenya lose their lives annually due to diarrhea related illnesses and children account for 16 per cent (MoPHS/UNICEF/WHO, 2010). These deaths can be reduced by half if the public adopts hand washing techniques. In addition 30 per cent of the infections are transmitted through shaking hands, eating, playing together and many others (Lopez-Quintero *et al.*, 2009). The importance of washing hands with soap cannot be overemphasized since most of the related diseases have no available vaccine hence the need to adopt proper hygiene practices. This can be achieved by sensitizing school going children on the importance of washing hands with soap.

Hand washing is effective in minimizing cholera and diarrhoea which are killer diseases among children (Department of health, Republic of the Philippines, 2009). Despite this lifesaving potential, hand washing with soap is seldom practiced and difficult to promote. Washing hands with soap before eating and after using the toilet could save more lives than any single vaccine or medical intervention, cutting deaths from diarrhoea and acute respiratory infections by almost half and one quarter respectively (UNICEF, 2009). Hand washing with soap can be transformed from an abstract good idea into an automatic behaviour performed in homes, schools and communities worldwide. Approximately 80% of the hospital attendance in Kenya is due to preventable diseases out of which 50% are water, sanitation and hygiene related (MoPHS/UNICEF/WHO, 2010). In 1999 about 2,500 Kenyans died from diarrhoea and gastroenteritis diseases compared to a reported mortality of 2,787 from HIV/AIDS related diseases (Government of Kenya, 2007). During the same period, diarrhoea and gastroenteritis diseases were the highest causes of infant hospitalization.

Thousands of children suffer nutritional, educational and economic loss as a result of diarrhea and worm infections. Besides the burden of sickness and death, inadequate sanitation threatens to contaminate Kenya's water resources and undermine human dignity. Poor disposal of human excreta is responsible for the spread of cholera, typhoid, schistosomiasis and other infections that result in the hospitalization or death of thousands of Kenyans, with corresponding economic costs in health care and morbidity (World Bank, 2005).

Studies have shown that:

First, more than 5,000 children die every day or 1.7 million children die every year from diarrhoeal diseases before the age of five (Lopez-Quintero *et al.,* 2009). Second, diarrhoea is the second most common cause of death in children accounting for 18 per cent of all under five deaths (Curtis *et al.,* 2009). Third, hand washing at critical times - including before eating or preparing food and after using the toilet; can reduce morbidity due to diarrhoea in children under 5 years by almost 50 per cent (MoPHS/UNICEF/WHO, 2010). Fourth, hand washing with soap can reduce the incidence of pneumonia by up to 50 percent. Pneumonia was the number one cause of mortality among children under five years old, taking the life of an estimated 1.8 million children per year (APHRC, 2008)). Fifth, diarrhoea and pneumonia, together accounted for almost 3.5 million child deaths annually (UNICEF, 2009).

Rates of hand washing around the world are low (Nokuthula, 2009). Observed rates of hand washing with soap at critical moments range from zero per cent to 34 per cent (Nematian *et al.,* 2004). In Kenya this rate stood at 5 percent (MoPH/UNICEF/WHO, 2010). Hand washing with soap is the single most cost-effective intervention for prevention of diarrhoeal related deaths and disease (World Bank, 2005). A study conducted among Colombian school children reported that only 7% of students reported having clean water and soap regularly available at school (Lopez-Quintero *et al.,* 2009). Those that had water and soap were three times more likely to wash their hands before eating or after using the toilet (Curtis *et al.,* 2009).

Even if knowledge of hygiene exists, lack of appropriate resources may negatively affect proper hand washing practices. A UNICEF (2009) study conducted in Ethiopia found that less than one-third of schools had water points and only 5% had hand washing facilities, none of which had soap. Another reason that can influence hygiene practice among school children is the low level of parental literacy (Rukunga and Mutethia, 2006). In this study, the mother's literacy rate was lower than the father (39.7% and 67.5%, respectively) in Kenya. A study in Ethiopia found 36.2% of school children washed hands with soap, 14.8% reported washing hands after visiting the toilet/latrine (Neumann *et al.*, 2002). In Colombia and Philippines, 75.9% and 46.9% of school children reported washing hands before meals (Lopez-Quintero, 2009). Another study in Philippines and Turkey found 37.7% and 42.4% rates of washing hands with soap among school children respectively (Lopez-Quintero, 2009).

In Colombia and India 82.5% and 86.4% of school children washed hands after using the toilet respectively (UNICEF, 2009). The burden of disease has been shown to be high among school children who have poor hand washing hygiene. Hand washing has been shown to reduce diarrhoea. In Bangladesh, episodes of diarrhoea reduced among school age children who washed hands more than four times a day (Torres, 2000). A multicountry analysis study showed 35% reduction of diarrhoea from hand washing with soap (Esrey, 2004). A study in Tanzania found 53% lower incidence of diarrhoea among children under 15 years old in households that washed hands with soap (Luby *et al.*, 2005).

2.6.2 Sanitation facilities

The ministry of education has set the minimum standards for provision of toilets as part of the school sanitation facilities. The minimum number of toilets/latrines in a school is 4 for the first 30 pupils, there after a ratio of 25:1 and 30:1 applies for girls and boys respectively (Government of Kenya, 2000). World Bank (2005) has shown that safe disposal of excreta; personal hygiene, quantity and quality of water are most strongly related to the reduction in cases of deaths from diarrhea among children. Inadequate quality of drinking water exposes pupils to the threat of diarrhea. A day school should have at least five litres of water for one child in a day and a water point for every 50 students (Kenya National Bureau of Statistics, 2007)). Of all the excreta disposal facilities in Kenya 72% are simple pit latrines providing varied degrees of safety, hygiene and privacy (MoPHS/UNICEF/WHO, 2010).

Accessibility to water and sanitation facilities in schools in Kenya is rated under three categories by the Ministry of Education Science and Technology (MOEST) and according to WHO recommendations. When less than 40 children share one latrine, the accessibility is considered fair, forty to one hundred children using one latrine is classified as bad and over 100 pupils sharing a single latrine is dangerous (UNICEF, 2009). A household is classified as having an improved toilet if the toilet is used only by members of one household (i.e., it is not shared) and if the facility used by the household separates the waste from human contact (World Bank, 2005). Less than one-quarter of households in Kenya used an improved toilet facility that was not shared with other households (KDHS, 2009).

Urban households were only slightly more likely than rural households to have an improved toilet facility (30 percent and 20 percent, respectively) (UNICEF, 2009). The most common type of toilet facility in rural areas was an open pit latrine or one without a slab (47 percent of rural households), while in urban areas toilet facilities were mainly shared with other households (52 percent) (KDHS, 2009). According to the Ministry of Education (MoE) survey in 2006, a paltry 29% of all schools in Kenya, at both primary and secondary levels, have access to clean drinking water and appropriate sanitation facilities (Rukunga and Mutethia, 2006). Where these facilities are in place, the quality is often awful. A safe environment in schools influences children's health and wellbeing.

Water and sanitation facilities are increasingly recognized as fundamental for promoting appropriate hygiene behaviour and children's wellbeing. However, many schools experience unsanitary conditions that vary from inappropriate and inadequate sanitary facilities to the outright lack of latrines (African Institute for Health Development, 2004). In the context of school health, by 2015 the target is to educate 80% of primary school children on hygiene, to equip all schools with facilities for sanitation and hand washing and educate all children about hygiene. The mere provision of facilities does not make them sustainable or ensure the desired health impact. It is the use of the facilities and change in the related hygiene behaviours among the beneficiaries that provides health benefits (Kirimi and Mwaniki, 2004). A study by GOK (MOEST) (2003) shows that the majority of public primary schools in Kenya are in the 'dangerous' category.

2.6.3 Bathing

A bath cleanses, energizes, freshens, and relaxes the body and also relaxes the mind. After a nice bath, a person does greater amount of work and if it is taken at night, one is able to sleep more deeply and calmly with a relaxed mind. Water used for bathing can be warm or cold, which depends on the climatic conditions and the personal preferences. For some, cold water is a relaxant while for others, warm water is a must for bathing. Generally in cold weather conditions, warm to hot water is used for bathing and in hot and humid weather conditions, a cold water bath may be appropriate (Nematian *et al.,* 2004).

Basics of bathing are the same for all the people all over the world (Juan, 2007). A bath can be taken once or twice daily according to the climatic conditions of the place, skin type and the kind of work a person is doing. Bathing includes cleansing of all parts of body like cleaning hair, eyes, nose, hands and legs. The skin has pores as its vital part. Pores accumulate dirt, grease and sweat and these pores get clogged (Lopez-Quintero *et al.,* 2009). A daily bath routine is necessary for the skin to breathe and excrete body waste. Lack of bathing can contribute to skin diseases and allergies (Rukunga and Mutethia, 2006). According to basics of bath, one must rinse the body with clean water after applying some soap or bathing gel to degrease the body and to remove dirt (Juan, 2007). A study carried out in Philippines found that 37.7% and 47.4% of children reported good and adequate bathing hygiene respectively with only a small proportion having poor bathing hygiene (bathed daily, 4-6 times a week and <4 times a week) (UNICEF, 2009).

In another study conducted in the Philippines 35% of students reported poor bathing hygiene (Department of Health, Republic of the Philippines, 2009).

2.6.4 Brushing of teeth

Brushing teeth with toothpaste is essential to good oral health (Lopez-Quintero *et al.,* 2009). Not only does brushing teeth help prevent tooth decay, it also helps prevent gum disease, which is one of the leading causes of tooth loss. Removing tooth stains and avoiding bad breath are added benefits of brushing teeth (Juan, 2007). The foods that are eaten contain sugars and starches. When plaque, the sticky substance that forms on the teeth, combines with these sugars and starches, an acid is produced that attacks tooth enamel, which causes tooth decay. Plaque can also irritate the gums and lead to gum disease.

Irritated gums can become red, swollen, tender, and bleed, easily causing gingivitis, the beginning stage of gum disease. Gingivitis can be treated and reversed if it is diagnosed in the early stages (Kenneth, 2008). If plaque is not removed, the gums can eventually start to pull away from the teeth. When this happens, bacteria and pus-filled pockets can form and the bone that supports the teeth can be destroyed. Once the bone is destroyed, the teeth will loosen or have to be removed. Brushing teeth properly removes plaque from the surfaces of the teeth and flossing removes plaque from in between the teeth (Curtis *et al.,* 2009). The American Dental Association recommends teeth to be brushed at least twice a day for about two minutes, preferably after eating.

In order to maintain good oral hygiene, it's important to brush at least twice a day, floss daily, eat a well-balanced diet and visit a dentist for regular checkups (Nematian *et al.*, 2004). However where resources are inadequate, brushing teeth at least once daily, 4-6 times a week and <4 times a week is considered as good, adequate and poor hygiene respectively (WHO, 2008). A study carried out in Colombia found that 89.2%, 7.2% and 4.4% of children had good, adequate and poor hygiene rated against the frequency of brushing teeth, respectively (Department of health, Republic of the Philippines, 2009). The greatest challenge in improving the personal hygiene and sanitation among primary school children is therefore identified as access to safe and adequate water and sanitation facilities as well as availability of soap and other hygiene materials. It is important to find out the availability and adequacy of the sanitation facilities and materials, the hygiene levels of the school children in this sample and the relationship with their nutrition status.

2.7 Care of orphans and vulnerable children.

2.7.1 Community based care and support/resources

Care refers to the behaviour and practices of caregivers (mothers, siblings, fathers and child care providers) who provide the food, health care, psychological stimulation and emotional support necessary for the health, growth and development of children (Engle, 1999). These practices and the ways in which they are performed (with affection and with responsiveness to children) are critical to survival, growth, and development of children. However, it is impossible for caregivers to provide this care without sufficient resources, such as time, energy and money (Armstrong *et al.*, 1997).

With the ever increasing numbers of orphans and vulnerable children needing care, families and communities have responded in various ways. Assessments done on orphans and vulnerable children and support in Kenya indicate that there are various forms of care for orphans and vulnerable children, these include: Community based care and support and institutional care (GOK/UNICEF, 2001; HACI, 2002; WCRP/UNICEF, 2002). Community based care and support include informal fostering, formal fostering, communal fostering, extended family and community care.

Informal fostering is a form of care whereby orphans and vulnerable children are taken in to live with neighbours or other families. It is an informal arrangement at a community level and it may come to an end at any time and, in such a case another foster parent may be sought. Such informal arrangements destabilize the children as they keep moving from one caregiver to another. The foster family lives with the children and is responsible for their provisions. They sometimes receive support from other well-wishers (Bentley *et al.,* 2000).

Formal fostering and adoption: fostering or adoption is done by families and is arranged through social and welfare services. Through such arrangements, the children are adopted legally and stay with the foster family, which cares for the child and provides for all their needs (UNICEF, 2002).

Communal fostering: This entails orphans and vulnerable children family groups living in a community or communal setting with foster mother or house parents. In such a case, a certain number of children are accommodated together under the care of a suitable foster mother. The foster mother with the support from the community manages the home as a family unit and is responsible for the children entrusted to her (Engle, 1999).

In extended family, the orphan live with grandparents, uncles or other relatives. The extended family network is singled out as the most ideal informal care structure for children orphaned by HIV/AIDS (GOK/MOH, 1997; Saoke *et al.,* 1994). The government policy is that community should be persuaded to care for these orphans and vulnerable children to avoid their stigmatization, exploitation and alienation (GOK/MOH, 1997). In addition, the extended family provides orphans with opportunities for social and cultural continuity as they adjust to the challenges of orphan hood.

However, with increased economic and social pressure, which is rapidly transforming most of the communities, care must be taken since the extended family network is already showing signs that it can no longer adequately take care of orphans and vulnerable children. Saoke *et al,* (1994) found that grandmothers cared for 41.8% of orphans and vulnerable children. Orphans and vulnerable children in such households are likely to have no access to basic needs such as adequate food, health, education and shelter (Mattimore and Plangemann, 2008).

Further, grand- parents often find themselves unable to control and discipline adolescents under their care (Topouzis and Hemrich, 1995). As pressure on the extended family mounts, orphans and vulnerable children are increasingly forced to take care of their younger siblings thus heading their families. Child headed families constitute 5% of all family types in Kenya (GOK, 1999; GOK/MoH, 1999). The extent to which orphans and vulnerable children's needs are met in these households and impact of increased household responsibilities on children are issues that need to be addressed in programmes designed to benefit the orphans and vulnerable children (Sanou *et al* ., 2009).

There are indications that the growing population of orphans and vulnerable children and the difficult economic situation in the country has stretched household resources, rendering the extended family network largely incapable of adequately meeting the needs of orphans and vulnerable children (Saoke *et al.,* 1994). Studies indicate that although orphans and vulnerable children are absorbed within the extended family, they are discriminated against in the distribution of household resources such as food and education. They are also allocated heavier workloads than the biological children in the same household (Action Aid- Kenya, 1995; Barnett and Blaike, 1992; Saoke *et al*., 1994).

Community care is where various forms of community based care systems have been developed at the community level to assist orphans and vulnerable children. The Government of Kenya and both local and international organizations such as Non-Governmental Organizations, Faith based organizations and community based organizations have initiated these programmes. The programmes are often organized and managed by the organizations responsible with assistance from community members. As the number of orphans and vulnerable children increases, communities are creating volunteer structures to offer assistance to those families caring for orphans and vulnerable children (Ennew, 2005).

Skovdal *et al.*, (2009) established that groups of community members had organized themselves to identify vulnerable children, developed resources through local fundraisings and set up day care centres supporting the children. Other Non-Governmental Organizations, both local and International, have also initiated progammes at community level to assist orphans and vulnerable children in provision of their needs. The children get support in form of food, clothing, shelter, support for education and medical care from the community programmes (HACI, 2010). In some programmes, the orphaned children and their families are registered and visit the centre for the provisions such as food, clothing and support in education. Most of these programmes rely on volunteers from community to undertake their activities. The programmes face severe limitation of resources and are overwhelmed by the children in need (Ennew, 2005).

A report on orphan and vulnerable children programming (GOK/UNICEF, 2001) indicates that, so far programmes have reached only a tiny fraction of the most vulnerable children indicating a need for these intervention programmes to be bought to national scale. In the light of the growing population of orphans, support for the community programmes and empowering them remains the most cost effective option of handling the orphan and vulnerable children crisis.

Institutional care: this entails keeping orphans and vulnerable children in institutions such as orphanages and children's homes. The children live in the institution and are provided with their basic needs such as food, clothing and shelter, while some institutions offer education. The traditional welfare provision for orphans and vulnerable children outside families and the kinship system has been containment in institutions, largely financed through charitable donations (Ennew, 2005). The level and quality of care provided in institutions differs from one institution to another, depending on the type of internal organization (family-based or conventional dormitories), the size of the family or other internal unit, internal equipment, the number of qualified staff, the working hours of care-givers and the type of relationship they have with the children, management style, the overall atmosphere within the institution and financial resources (Cahajic *et al.,* 2003). Although institutions are considered to be the last resort for the care of parentless children, they have a role to play in short-term, emergency placements for sibling groups (Sanou *et al.,* 2009) and for children who may be too traumatized to be able to fit easily into a substitute family (Ansell and Young, 2004).

In addition, although professionals argue that children would rather live in families and home-like environments, the adoption of older children may be difficult, which limits the alternatives available for providing more children with family care. In most of the institutions, the children are kept until the age of 18 years (GOK/HACI, 2010), while a few others keep them until 21 years of age, after which they are reintegrated back into society. It is hoped that at this age, they have some form of training, are mature and are able to settle on their own (HACI, 2002). Critics of institutionalization of children argue that this is not the best option of caring for children (GOK/MOH, 1997). Such homes have been found to separate orphaned children from their social environments and family members, particularly their siblings.

When these children are put in institutions, there is likelihood of losing their identity. Further, they may not be able to safe guard their inheritance. As such, when they are eventually reintegrated into the society, they may find difficulties in fitting in the society, knowing and adjusting to their relatives and following up on their inheritance, which may have been taken by their relatives (Skovdal *et al.,* 2009). Furthermore, as indicated in a study by WCRP/UNICEF (2002), institutionalizing children focuses on assisting the child and not the family unit, which may further create dependency. Another study of institutional care of orphans and vulnerable children in Bosnia and Herzegovina (Cahajic *et al.*, 2003) reveals that the children's developmental and emotional needs are not met, that institutions limit the children's potential and that there is almost no provision for the time when children become 'too old' for institutional care.

Children may not adjust to the change in their lives, to the extent that they deny the reality of their loss of family life, and their emotional needs fail to be met (Abebe and Aaes, 2007). Moreover, institutionalization is less likely to be holistic in meeting the economic needs of children. Besides, assisting the orphan in the family calls for partnership with caregivers, while in some instances, support offered through income generating activities enables them to care for the orphans and vulnerable children (Skovdal *et al.,* 2009). The proliferation of property-grabbing has led some to call for an increase in orphanages. Supporters of increasing the use of orphanages argue that many communities are overwhelmed and can no longer effectively care for children and vulnerable children. Children who live in orphanages have access to education, food, shelter, and nurturing, which they may not be able to secure on their own, advocates of orphanages say (Ansell and Young 2004).

Some, including USAID, argue that orphanages do have their place in society, but that they should be used only in cases of last resort. Those who express caution about increasing the use of orphanages to respond to the growing orphan and vulnerable children population argue that poverty will be the primary reason that parents place their children in institutions. Due to the high level of poverty in many areas, many parents send their children to orphanages simply because they are unable to support them. Research has shown that only 25% of African children in institutional care do not have any known relatives (UNAIDS, 2006).

Supporters of community-based care argue that children who are raised in orphanages have a hard time being self-sufficient as adults because they do not learn life skills, do not have community connections (a critical part of networking and job seeking), have difficulty adapting to life outside the orphanages, and develop a mentality that they will always be cared for. Some caution that orphanages can undermine community efforts to support orphans and vulnerable children and separate them from their families (UNICEF, 2002).

In this view, community-based support can both enable the children to stay within their communities, and enable donors to support more children, as the cost of supporting a child in an orphanage is substantially more than supporting a child within its own community (UNAIDS, 2009). Despite the consensus that institutionalized care is not the optimal support system for orphans, the increasing number of orphans and vulnerable children who are abandoned by extended family have left them with no choice but to turn to institutions for support (WRCP/UNICEF, 2002).

2.7.2 Historical perspective of institutional /orphanage care.

Orphanage is the name used to describe a residential institution devoted to the care of orphans and vulnerable children whose parents are deceased or otherwise unable to care for them (HACI, 2002). Parents, and sometimes grandparents, are legally responsible for supporting children, but in the absence of these or other relatives willing to care for the children, they become destitute, and orphanages are a way of providing for their care and housing.

Children are educated within or outside of the orphanage. Orphanages provide an alternative to foster care or adoption by giving orphans and vulnerable children a community-based setting in which they live and learn. In the worst cases, orphanages can be dangerous and unregulated places where children are subject to abuse and neglect. Other alternative names are group home, children's home, rehabilitation center and youth treatment center (HACI, 2010).

In Kenya, the origin of the Department of Children's Services now in the Ministry of Gender, Children and Social Development can be traced back to the Colonial era, when it existed as a Juvenile Correctional Institution. Its earliest correctional and rehabilitation institution, the then Kabete Approved School (now Kabete Rehabilitation School) was built between 1910 and 1912, in the lower Kabete area (Government of Kenya, 2010). The school was founded to cater for youth who had been imprisoned for failing to register themselves or their inability to carry the identity card (Kipande). With the reorganization and prior to the attainment of independence, the Approved Schools were up-graded into a fully-fledged department under the repealed Children and Young Persons Act Cap 141. Initially, the department was known as the department of Approved Schools but after independence it became Children's Department, hereby referred to as the Department of Children's Services (Government of Kenya, 2007). It is worth noting that the struggle for independence in the country has greatly influenced the development of the Department. As the struggle between the colonial administrators and the Mau Mau intensified, many small children and infants were orphaned, homeless and without support.

This in part explains the reason why the majority of the statutory children's institutions run by the Department are in Central Kenya (HACI, 2010). In Kenya, a 1999 survey of 35,000 orphans and vulnerable children found that there were 64 registered and 164 unregistered institutions that cared for orphans and vulnerable children (WRCP/UNICEF, 2002). Over the years these number has increased to 830 Charitable Children's Institutions (CCIs) in Kenya (GOK/HACI, 2010). Charitable Children's Institutions regulations were gazetted in 2005 which required the institutions to register with the Children's Welfare Services Department. However, due to constrained personnel and other resources in the field officers, only 347 Charitable Children's Institutions have been registered (Government of Kenya, 2010).

2.7.3 Appropriate intervention for orphans

Naturally, a child should grow up in a family setting. However, due to death of one or both parents; this has not always been the case. Traditionally, death has been associated with old age. Children have been robbed of their parents through illness, war, famine and natural calamities among others (Engle, 1999). According to African traditions, such unfortunate children were taken care of by their relatives and the community as a whole. With the breakup of the traditional coping mechanisms due to changing socio-economic factors most of the orphans and vulnerable children are left on their own. This has led to orphans and vulnerable children finding their way in the streets seeking means to fend for themselves. Such means include harmful vices such as prostitution, petty crime, and drug trafficking among others.

These are harmful to their growth and the nation as a whole considering that they are the resource people that a country depends on for future prosperity (Mattimore and Plangemann, 2008). Some relatives are willing to take care of orphans; this has not been always possible due to the changing socio-economic dynamics (Mishra and Bignami, 2008). This is illustrated by the fact that more than half of Kenyan population lives below the poverty line and the situation is expected to worsen owing to the current global economic crisis.

It is necessary to strengthen governments, families and community capacities to ensure a supportive environment for orphans and vulnerable children by providing appropriate counseling and psychosocial assistance, ensuring they are educated and have access to shelter, good services; nutrition and health and social services on an equal footing with other children; provide orphans and vulnerable children protection against all forms of ill treatment, violence, exploitation, discrimination, trafficking and loss of inheritance (GOK/HACI, 2010).

Responding to the needs of orphans and vulnerable children the scope of the problem can be envisaged as:

> Neither words nor statistics can adequately capture the tragedy of children grieving for dying or dead parents, stigmatized by society through association with HIV/AIDS, plunged into economic crisis and insecurity by their parents' death and struggling without services or support systems in impoverished communities (HACI, 2010).

Children are being orphaned at a rate that family structures cannot cope with Barely any family is left untouched.

Extended families are overstretched, communities are robed of a generation of adults in their most productive years.

Children are either living with relatives, left on their own in households headed by children or living in the streets (Mattimore and Plangemann, 2008).

Illness or death of one or both parents exposes an orphaned child to multiple sociological, economic and psychological effects.

Malnutrition, illness, abuse and sexual exploitation,

Lack of education,

Discrimination,

HIV/AIDS is destroying a future of a generation of African Children (WRCP/UNICEF, 2002).

Caretakers are vulnerable and live in vulnerable communities,

Situation worsens when orphans themselves develop HIV Symptoms,

Increase in under five mortality in African countries, Kenya included eroding years of hard-won progress in child survival.

Children affected by HIV/AIDS live in a state of powerlessness and despair, lack parental guidance and love, economic security and education (Skovdal *et al.,* 2009).

In the light of all these challenges there appears to be no single "best practice" option applicable to all countries and or regions. Program choice as much as the choice of the right targeting instrument, depends very much on country circumstances and the nature and intensity of the problem.

The number of orphans and other vulnerable children are so large already as to threaten the traditional coping mechanisms, strengthening the case for public intervention (Mishra and Bignami, 2008). However , interventions need to be carefully chosen to (a) address the specific risks faced by orphans in given country environment, and (b) strengthen the existing community coping strategies, rather than supplant them (Mattimore and Plangemann, 2008). "Fostering" of orphans by relatives is more attuned to the African social cultural milieu than most other options. This is also the option widely prevalent across much of Africa. Orphans are being looked after by the extended family or friends and relatives known to orphans. However, care needs to be taken that fostering does not lead to child abuse.

In Sub-Saharan Africa, mistreatment appears to be confined largely to stigmatization and in some instances discrimination in food allocation, education, and workload (Bourdillion, 2004). Wherever fostering is promoted, community or Non-Governmental Organization oversight may be necessary (UNICEF, 2001).

To promote fostering both direct subsidies (cash) and indirect subsidies (such as education sponsorship and food supplements) have a role to play. In Kenya a number of well-wishers have been offering assistance to the orphans and vulnerable children through various interventions. The most common intervention has been institutionalization of children in charitable homes (GOK/HACI, 2010). Though this has alleviated the suffering of some orphans and vulnerable children, it should be considered as the last resort.

To regulate registration and management of such institutions, the Department of Children's Services has developed Charitable Children's Institutions Regulations which the institutions must conform to before registration (Mishra and Bignami, 2008). The Department is represented in the provinces and districts by Children's Officers at the respective provincial and district administrative headquarters. The children officers are crucial in the response to children issues in their provinces and districts. The officer's deal with all cases of children including those in need of care and protection, and those in conflict with the law. Records show that child neglect is the most reported category of child abuse (WRCP/UNICEF, 2002).

Children issues are many and diverse in nature hence requires a wider approach in addressing them. The children's officers' co-ordinate this approaches through the Area Advisory Councils at the district levels. The composition of these councils is representative of all key stakeholders from Government departments, Non-Governmental Organizations, Civil, Religious Organizations and Private Sector (GOK/HACI, 2010). Children including orphans are best brought up within their families and communities. This has not been possible due to the difficult economic times and other negative western influences such as individualism (Mattimore and Plangemann, 2008). The capacity of households to cater for orphans and vulnerable children especially from the extended families has been seriously eroded. The advent of the HIV/AIDS scourge has aggravated the situation. Kenya as a signatory to various instruments on the child rights such the United Nations Convention on the Child (UNCRC) and the African Charter on the Rights and Welfare of the Child (ACRWC) has taken deliberate steps to address the situation (HACI, 2010).

In Kenya, as in other countries of sub-Saharan Africa heavily burdened by HIV/AIDS, orphans and vulnerable children (OVC) face poverty and despair. There is an urgent need to provide a comprehensive response that supports families and communities in their efforts to care for children and safeguard their rights. In the year 2004, the Government of Kenya through the Department of Children's Services in collaboration with other partners started the Cash Transfer programme for Orphans and Vulnerable Children to build the capacity of families' taking care of orphans and vulnerable children (Mishra and Bignami, 2008). This started on a pilot basis with 500 households in 13 districts benefiting from Ksh 500 per month. The pilot was scaled up to 50,000 children in 47 districts (Skovdal *et al.,* 2009) in Phase three and to 100,000 children in Phase Four. The overall target population of the program is 300,000 orphans and vulnerable children in 74 districts, which is at the national scale, to be achieved in the years 2009 to 2015 (HACI, 2010). Indirect subsidies are preferable largely because they benefit the children in orphanages.

Orphanages are expensive and should be the last resort, although evidence from Eritrea and Uganda does point to their effectiveness in providing care for orphans and vulnerable children. Therefore they cannot be ruled out especially in urban settings. The challenge is to provide a nurturing and stable environment that avoids the potential stigma of an institutional upbringing (Mattimore and Plangemann, 2008). Orphanages have their place in the care of the orphans and vulnerable children in the society. This study therefore seeks to determine the adequacy of the care given to these children and the extent to which it is able to foster good nutritional status and hygiene.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study design

This was a comparative study and descriptive study that compared nutritional status and associated risk factors among children sheltered in orphanages and those not sheltered in orphanages but attending the same schools. It also sought to determine factors influencing the nutritional status of children sheltered in the orphanages and those not sheltered in the orphanage in the selected schools. These primary school students were recruited from primary schools located near orphanages in Dagoretti, Nairobi County between 15thNov 2009 and February 2010.

3.2 Study area /site

The study was conducted in Dagoretti Division which is within Nairobi Province, approximately 20 km from Nairobi City centre (Figure 3.1). Dagoretti Division lies in the extreme Western Division of the City of Nairobi. It consists of several unplanned settlements – Dagoretti Corner, Congo, Wanyee, Githembe, Ngando, Lenana, Waithaka and Gachui Village. It is estimated that 30% of the total population are long-term residents, while 70% have moved into the community from other areas. The area's demographics are characterized, amongst others, by a rapid population growth above the norm for Kenya, which has exerted increasing pressure upon the basic resources of land, housing, water and electricity supply (GOK, 2010). This, in turn, has generated under-nutrition, poor sanitation and low levels of environmental health. This study was carried out in Waithaka, Dagoretti corner and Gachui schools.

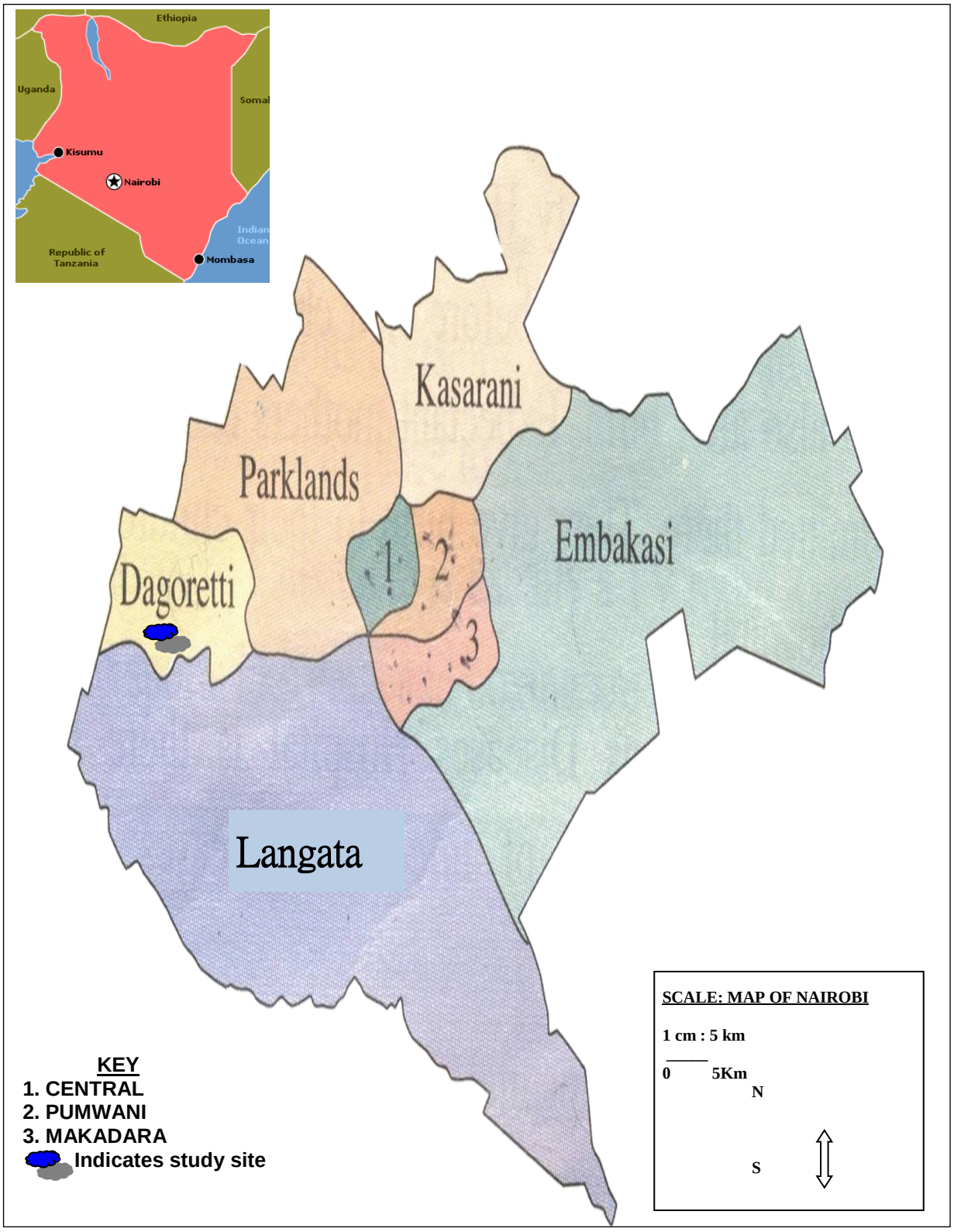

Figure 3.1 Map of Nairobi showing the location of the study sites (inset map of Kenya showing the position of Nairobi).

3.3 Study population

3.3.1 Orphanages

For the purpose of the study, children in orphanages were those who were 11 years old and below and were full time residents in the orphanages. The children were selected from the schools neighbouring the orphanages within the study area. Dagoretti Division had a total of six registered orphanages with the Ministry of Gender, children and social development. Three orphanages were selected for the study. These were Grace, Cheryl's and Rafiki in Waithaka, Dagoretti corner and Gachui. These orphanages had been established for a long time, had relatively large number of children, and were the only ones that allowed research activities. The children attended Grace, Waithaka, Jamhuri and Rafiki Primary schools.

3.3.2 Inclusion criteria

Children in Orphanages

- Children who attended primary school in the selected area
- Children in orphanages who were 11 years and below.
- Children in orphanages who were full time residents at the orphanage.
- Children in orphanages who had resided at the orphanage for at least three months.
- Children in orphanages who did not have chronic illness.
- Children in orphanages for whom consent was obtained.
- Children in orphanages who were physically present in school during the study period.

Non-Orphanage children

- Children who attended primary school in the selected area
- Children who were11 years and below.
- Children who attended the same primary school as the children in orphanages.
- Children who were living with both parents.
- Children for whom consent was obtained from parents.
- Children who were physically present in school during the study period.

3.3.3 Exclusion criteria

Children in orphanages

- Children who were not attending primary school in the selected area
- Children residing in the orphanages for whom consent to the study was not provided.
- Children who were not full time residents including those who were in boarding schools.
- Children who were absent from school during the study period.
- Children with chronic illness

Non-Orphanage children

- Children who lived with both parents but were not attending the same primary school as the children in orphanages.
- Children for whom consent was not given.
- Children who were absent from school during the study period.

- Children with chronic illness

3.4 Sampling and sample size

3.4.1 Sample Size

Sample size was determined using the following formula. This formula is used to determine the minimum sample size for estimating the difference between two proportions with absolute precision (WHO, 1986).

$$n \geq \frac{Z^2}{} \frac{(1-\alpha/2)\{P_1(1-P_1)+P_2(1-P_2)\}}{d^2}$$

This formula was used to determine the sample size to be selected in each of two groups in order to estimate a risk difference to within 5 percentage points of the true difference with 95% confidence. The proportion of children in orphanages and non orphanage group estimated to be malnourished was 55% and 30% respectively. These estimates of the proportions were obtained from a similar study in Malawi (Lindblade *et al.*, 2003).

Where n= desired sample size of children in orphanages.

Z= standard deviate usually 1.96 which corresponds to 95% confidence level.

P_1 = the proportion in the orphanage population estimated to be malnourished =0.55

P_2= the proportion in the non orphanage population estimated to be malnourished =0.30

α = the level of significance = 0.05

d = Absolute precision (in percentage points) required on either side of true value of the difference.

$$n \geq \frac{(1.96^2 \times 0.975\{0.55(0.45)+0.30(0.70)\}}{0.10^2} = 171.35 \approx 172$$

The final sample size was 208 children in orphanages.

This was about 20% (20.9%) of the orphanage sample to allow for stratification and missing or incomplete questionnaires. The total number of eligible children in orphanages who attended the four primary schools was 432. Probability proportional to size was used to determine the sample size from each primary school:

Grace 108/432 × 208 = 52, Jamhuri 106/432 × 208 = 51, Rafiki 106/432 × 208 = 51 and Waithaka 112/432 × 208 = 54. The children were then stratified by sex and age. Each child in the orphanage was matched, by sex and age, with one non-orphanage child from the same primary school to give a total of 208 children in orphanages and 208 non-orphanage children. The sample from each school was selected by use of random number tables. The final sample was such that each sex was equally represented as well as each age set from 4-11 years in the study.

3.4.2 Sampling

Children in orphanages

Purposive sampling was used to identify the three orphanages for the study. Dagoretti Division has six registered orphanages. The three orphanages were selected among the six that are registered. These orphanages have been established for a long time, have relatively large number of children and allow research activities. The children living in orphanages were the target group. Information from the orphanages' records were used to stratify children by age and sex then simple random sampling was applied to get the required number of orphanage group and their caretakers from each stratum. The sample only included children in orphanages who had lived in the orphanage for at least three months.

This was because the study aimed at establishing whether the food consumption pattern of the children in orphanages among other factors foster good nutrition.

Those children in orphanages who had less than three months stay in the orphanage would be reflecting nutritional status (in wasting and underweight) not fostered by orphanages' food consumption. Sampling of children in orphanages was done in the primary schools. These primary schools were also purposively selected. The children in orphanages attended together with other children who did not live in orphanages. Children were stratified to ensure equal number of sex and age among the orphanage group between 4 to 7 years and 8 to 11 years old. There were no children below 4 years of age in the orphanages. The management of the sampled children in orphanages was included in the study.

Non-Orphanage children

Information on the schools which the children in orphanages attended was sought from the three orphanages. These schools were selected and included in the sample. Information from the schools' registers was used to match each child in the orphanage living in the selected orphanages for age, sex and class with one non-orphanage child from the same primary school. Random number tables were used to select the non orphanage children from each stratum.

3.5 Data collection

Data collection was done using structured questionnaires (Appendix 2, 3 and 4). Demographic data was collected which included, age, sex and educational level of the caretakers of the children in orphanages and parents of the non orphanage group.

Data on period of stay in the orphanage, morbidity occurrence, health seeking behaviour and 24 hour recall to obtain the common types of foods taken was also collected from caretakers of children in orphanages and parents of non-orphanage children. The information about children's morbidity was sought from the orphanages' residential nurse at Cheryl's orphanage and from the caretakers of the children from the other orphanages and from the parents of non orphanage children. Morbidity of children in the three orphanages and non orphanage children was assessed as having presented the following symptoms: colds/flu, diarrhea, vomiting, fever and skin conditions in the previous seven days prior to the study.

Child's growth and health monitoring cards were used to extract information on vaccination and from mothers or caretakers' verbal history of the child. In the absence of growth monitoring card, the nurse in charge of the orphanage assisted by verifying the scaration from the BCG vaccination. For this study evidence of a minimum of one vaccination against any one childhood immunizable diseases was accepted as vaccination. This was because some children who were taken to the orphanage when they were more than 5 years of age had no immunization records.

Personal hygiene was assessed by collecting information on whether hands were washed the day prior to the interview, materials used for washing hands, frequency of brushing teeth, frequency of bathing, availability of latrines or toilets and bathrooms or bath shelter. Children below six years of age were excluded to improve reliability of the self-reported hygiene practices.

Children who reported taking a bath daily were rated as having good bathing hygiene while those who took a bath four to six times a week and less than four times a week were rated as having adequate and poor bathing hygiene respectively (UNICEF, 2009). Similarly children who reported brushing their teeth daily were rated as having good oral hygiene while those who brushed their teeth four to six times a week and less than four times a week were rated as having adequate and poor oral hygiene respectively (WHO, 2008). The number of children sharing one toilet/latrine was computed. The ratio of < 40 children per toilet/latrine was considered as fair accessibility, 40-100 bad and > 100 as dangerous accessibility (UNICEF, 2009).

Information on the history of the orphanage, when and why it was started, the proprietors, sources of support, source of food, type of support offered to children in orphanages and challenges encountered was obtained from the orphanages' management. The types of foods consumed for breakfast, lunch and supper were assessed. The 24 hour recall was used to obtain the foods consumed for breakfast, lunch and supper for both groups. Amounts of foods/ meals served were approximated using standard cups, plates and measuring jug. The foods consumed were classified into relevant food groups such as cereals, legumes, vegetables, meat, dairy, fruits, root and tuber crops and plantains (UNICEF, 2009). The selected non orphanage children were visited in their homes so that the researcher could administer the questionnaire to their mothers and obtain and record the 24-hour dietary recall information, verify the number of latrines/toilets available, obtain fathers and mothers' age and educational background.

All the ingredients in the meals and their weights were recorded. The ingredients of the packed school lunch were also recorded. Participants were asked to estimate the child's intake of a specified food using standard cups and plates and measuring jug. The utensil used to serve the child was displayed and the extent to which it fills was explained before the approximations were made. The ingredients of the foods consumed and their volumes or quantities were used to generate energy in Calories using the Nutrisurvey programme. The combined caloric contributions of breakfast and supper (two meals consumed at home or in the orphanage by all children) were also computed using the Nutri-Survey programme. The adequacy of caloric intake was expressed as the proportion of the total daily caloric intake. Food tables were used to estimate the adequacy of the energy food consumption by both the children in orphanages and the non orphanage group.

Anthropometric data, which included, height, weight and age was collected from both children in orphanages and non-orphanage children. These three variables were developed into indices of nutritional status. The indices obtained were weight-for-age, height-for-age, and weight-for-height, as indicators of underweight, stunting, and wasting, respectively. The children were considered to be malnourished when the respective Z scores were below -2 SD from the median for WHO (2006) reference children. Children with Z scores between -2.99 and -2.00 were considered to have moderate malnutrition, while those with -3.00 and below were severely malnourished (WHO, 2006). These instruments were attached to the interview schedule.

The interviewer filled in the anthropometric data of children after weighing and measuring their height as well as verifying their ages by filling in date of birth from the orphanages' records or from information given by the parents. A bathroom weighing Salter scale was used to take the weight of the children. Weight was taken as the average of two measurements in kilograms. A stadiometre was used to take the height of the children. The children were taken the measurements with no shoes, standing straight and with no heavy clothing. Height was taken as the average of two consecutive measurements for accuracy in centimetres. Sex of child was also indicated. Pre-testing of the research instruments was carried out to enhance the validity of the instruments. This was done in Kikuyu Division, Central Province, Kenya and specifically, Faith Children's Home to improve the data collection and clarity of the questions**.** Data was collected from 15 volunteers during the pretesting.

3.6 Data analysis

Data were entered and Z-scores generated using EPI INFO (Version 3.3.2). Statistical analysis was done using Statistical Package for Social Sciences, SPSS (Version 14.0). Nutri Survey programme was used to calculate the caloric contribution of each meal to the children's daily caloric intake. Frequency tables were used to quantify the occurrence of hygiene practices. Anthropometry was used to determine the nutritional status of the children. Z-scores were generated and used to assess the nutritional status of children. The children were classified into categories of nutritional status using the National Centre for Health Statistics (NCHS/WHO) as a reference data (WHO, 2006).

The t-test for proportions was used to test the differences in prevalence of malnutrition indices (stunting, wasting, and underweight) and morbidity among the children in orphanages and non-orphanage children and the differences in proportion of children washing hands at critical times between children in orphanages and non orphanage children. The t-test for proportions was also used to test the differences in morbidity among vaccinated children in orphanages and non orphanage children. It was also used to test the differences in malnutrition indices by sex and age. The t-test for independent samples was used to test differences between means of food consumption. Chi-square was used to test the differences in the frequency of foods consumed by the children in orphanages and non orphanage groups and also to test the differences in frequency of malnutrition among children in orphanages with duration of stay in the orphanage.

Chi-square was also used to test the differences in the frequency of bathing and brushing of teeth among the children in orphanages. Pearson product moment was used to assess the relationship between nutritional status and associated risk factors such as personal hygiene, vaccination, morbidity among children in orphanages and non-orphanage children. Significant differences among variables were set at $p < 0.05$. The dependent variables were stunting, wasting and underweight. The independent variables were variety of foods consumed, energy intake , disease prevalence, vaccination rates, hygiene practices and mothers' and fathers' education and duration of stay in the orphanage.

3.7 Ethical consideration

The objectives of the study were communicated to the school children and participation was completely voluntary. Study participants provided written consent prior to participation. Informed consent forms were signed by the parents of the non-orphanage children and the care-takers and the management of the children in orphanages before commencing the study and there was a 100% participation rate. The information obtained from the participants was not divulged and was held in confidence. Permission was sought from all the relevant authorities: Ministry of Education Science and Technology, the proprietors of the Orphanages namely Grace, Cheryl's and Rafiki and from Kenya Medical Research Institute Ethical and Review Board.

3.8 Assumptions and limitations

Conditions in all the three orphanages were assumed to be similar.

Study was conducted in only three orphanages in one division of Nairobi.

Study was only conducted in registered orphanages that gave consent.

CHAPTER FOUR

4.0 RESULTS

4.1 Demographic characteristics of the children

The sample consisted of children who were equally (50%) distributed between age 4 -7 years and 8-11 years, children in orphanages and non-orphanage children. The ratio of boys to girls was 1:1. The study was carried out in four schools namely Grace, Rafiki, Jamhuri and Waithaka primary schools. The total number of children was 416 as shown in Table 4.1.

Table 4.1 Distribution of children by age, sex and school

		Children in orphanages (n=208)		Non orphanage (n=208)	
		n	%	n	%
Primary Schools	Jamhuri	51	24.6	51	24.6
	Rafiki	51	24.6	51	24.6
	Waithaka	54	25.8	54	25.8
	Grace	52	25	52	25
Age in years	4-7	104	25	104	25
	8-11	104	25	104	25
Sex	Boys	104	25	104	25
	Girls	104	25	104	25

4.2 Demographic characteristics of non-orphanage children parents.

4.2.1 Age and sex distribution of non-orphanage children parents.

The distribution by age and sex of the non-orphanage children's parents were as shown in Table 4.2.

A higher proportion (64%) of females were 30 years of age and below. A higher proportion (53%) of males were between 31 to 40 years old. A few males (3%) and females (1.4%) were over 50 years old.

Table 4.2 Distribution of children's parents by age and sex.

Age (years)		**Males**		**Females**	
		n	**%**	**n**	**%**
	≤30	84	40	133	64
	31-40	110	53	67	32
	41-50	8	4	5	2.4
	>50	6	3	3	1.4
	Total	208	100	208	100

4.2.2 Occupation and education of non-orphanage children's parents.

The mean duration of the mothers' school education was 6.94 years, and 2.4% of the mothers were illiterate and had not been enrolled in school as shown in Table 4.3. The participants were mainly casual workers (Fathers 45% and Mothers 39%).

Table 4.3 Occupation and Education of non-orphanage children's parents

Highest Educational level	**Father (n=188) n (%)**	**Mother (n = 202) n (%)**
Years of school attendance (Mean 7.75 ± 3.61)	8.63± 3.95	6.94± 3.05
No formal education	3 (1.5%)	5 (2.4%)
Primary school (1-8 years)	122 (65%)	131 (64.9%)
Post primary (1-2 years)	9 (5%)	28 (13.9%)
Secondary school (1-4 years)	39 (21%)	32 (15.8%)
Tertiary (2-4)	15 (8%)	6 (2.9%)
Mean number of years of schooling completed	6.8	6.3
Occupation		
Family business	39 (21%)	29 (14.4%)
House wife / No paid work	8 (4%)	47 (23.3%)
Casual	84 (45%)	79 (39%)
Formal	57 (30%)	47 (23.3%)

4.3 Demographic characteristics of caretakers in the orphanages.

4.3.1 Distribution of caretakers by age and sex in the orphanages.

There were 46% females and 54% males among the caretakers who were aged between 25- 55 years (Table 4.4). A higher proportion (51.5%) of the caretakers had attained post primary education.

Table 4.4 Distribution of the caretakers of children in orphanages by age, sex and education.

Age (years)		**n**	**%**
	25-35	9	27
	36-45	16	48
	46-55	8	25
Sex	Males	18	54
	Females	15	46
Education	No formal education	2 (1 males, 1females)	6.1
	Primary school (1-8 years)	6 (3 males, 3 females)	18.1
	Post primary (1-2 years)	17 (6 males, 11 females)	51.5
	Secondary (1-4 years)	3 (males)	9.1
	Tertiary (2-4 years)	5 (males)	15.2
Mean number of years of schooling completed		9.8 years (males), 7.8 years (females)	

4.4 History and resources in the orphanages

4.4.1 History of the orphanages

The three orphanages had started eight, twelve and fourteen years previously to rescue the orphaned and vulnerable children whose relatives were not able to take them into their families. One was started by a church and was built and run by the church. The other two were started by individuals who have since been soliciting for support from well-wishers.

4.4.2 Resources for the orphanages

Individuals donated land where two of the orphanages are located. The homes have neither a permanent donor nor an official sponsor but rely on individual's contribution on adhoc basis. They do not have subsistence self-supporting activities.

The Homes have experienced inadequate donations of foodstuff and clothing through individual contribution over the years. The trend, according to the home managers is very erratic and not dependable. The home managers also work closely with the Ministry of Home Affairs through the children's department, and when funds are available, the Provincial Commissioner Nairobi assists in relief foods and material.

A religious group donated land where one of the orphanages is located. This orphanage received support in form of clothes and food from the religious group and well-wishers. However, these donations were also erratic and therefore not dependable. In addition due to the increased number of children in the home, this support was not adequate. They also received support to meet the school fees for the high school children from UNDPI for five years from 2004-2008. They also got voluntary counseling services from social workers mainly, from Global Volunteer Network.

4.4.3 Challenges in the orphanages

The main challenges faced by the orphanages were:

Lack of permanent income base.

An inadequate amount of land to accommodate such a large number of children.

Lack of funds to offset school fees levies, textbooks, clothing, salaries, medical and utilities expenses.

The orphanages were approximately between two and three Kilometers from the primary schools attended by the children. There was lack of utility transport for children to and from school to help and to support various administrative activities of the home. However the non-orphanage children were approximately one Kilometer away from their respective schools.

Inadequate financial support

The solution to these problems was viewed as more involvement of the community by supporting the running of the orphanages. Participatory support would help in maintaining good discipline of the children and material support would ensure that their basic needs which includes their nutritional needs are well taken care off.

4.4.4 Staff in th eorphanages

The orphanages had a variety of employees however those who directly influenced the nutritional status and personal hygiene of the children were as shown in Table 4.5. These employees were on full time employment. The older girls in orphanages also participated in supervising and assisting the younger girls in the orphanage to bathe and to do their laundry on Sundays. This is the only time they were not attending school. Soap was only provided during the weekend to facilitate laundry and bathing.

Table 4.5 Staff in the orphanages

Staff in orphanage	Orphanage			
	A	B	C	Total
Cooks	2	2	1	5
House mothers	3	2	1	6
Matron	1	0	1	2

4.5 Food Consumption

4.5.1 Feeding frequency

The children in orphanages who attended school away from the orphanage had two meals (Breakfast and Supper) in a day during school days and three meals (Breakfast, Lunch and Supper) during the weekend. These comprised 50% of all the children in orphanages. The non-orphanage children took three meals per day throughout the week.

4.5.2 Food intake by the children in orphanages and non-orphanage children.

To determine the contribution made by each food consumed by the children, children's total food intake by weight was calculated. The foods were classified into 12 different food groups. The food groups found in the children's diet and their contribution by weight to the total diet intake are as shown in Table 4.6. In the non orphanage group, tea/cocoa contributed the highest amount by weight (480.6g) and its proportion of the total dietary intake by weight was 21.1%. The cereals food group contributed the highest amount by weight (497.3g) and proportion (34.2%) to the total diet for the children in orphanages. Fruits 0.7% (10.1g) and spread 0.1% (1.7g) made a small contribution to the children in orphanages dietary intake.

Plantain and eggs were completely lacking in the orphanages' diet. The children in orphanages took significantly higher ($p<0.05$) amounts of cereal based foods (Ugali, Githeri and Rice) than the non-orphanage group. On the other hand, non-orphanage children took significantly ($p<0.05$) higher amounts of meat and fruits than the children in orphanages.

Table 4.6 Foods consumed by children in orphanages and non-orphanage children

Food groups	**Amount consumed from each food group (g) (Percentage contribution to the total diet)**		**p-value**
	Non orphanage group	**Children in orphanages**	
Cereal based grains (Ugali, maize and beans, Rice, Chapattis, bread, porridge)	357.7 (18.4%)	497.3 (34.2%)	**0.000**
Vegetables (cabbage, Kales, spinach)	248.2 (12.8%)	227.1(15.6%)	**0.333**
Legume grains (Beans, Green grams, Lentils)	292.8 (15.1%)	232.1 (16%)	**0.208**
Dairy (Fresh or fermented milk)	188.2 (9.7%)	147.7 (10.2%)	**0.097**
Eggs	18.2 (0.9%)	0 (0%)	**0.000**
Meat (chicken, fish, beef)	166 (8.5%)	66 (4.5%)	**0.000**
Fruits	60.7 (3.1%)	10.1 (0.7%)	**0.000**
Spread (margarine, butter, fruit jam)	3.8 (0.2%)	1.7 (0.1%)	**0.371**
Sugar	47.9 (2.5%)	29.7 (2%)	**0.080**
Tea/Cocoa	408.6 (21.1%)	231.3 (16%)	**0.039**
Plantain	92.1 (4.7%)	0 (0%)	**0.000**
Tubers and Roots (Irish potatoes, Sweet potatoes, Carrots)	56.4 (2.9%)	11.0 (0.8%)	**0.000**
Total	1940.6 (100%)	1454 (100%)	**0.000**

4.5.3 Diversity of foods consumed by children in orphanages and non-orphanage children

A total of 63 and 37 food items were consumed by the non-orphanage and children in orphanages respectively. Only 7.2% of children in orphanages consumed more than four food groups compared to 45.2% of non-orphanage children as shown in Table 4.7 These differences were significant ($p<0.05$).

Table 4.7 Diversity of foods consumed by the children in orphanages and non-orphanage children

	Children in orphanages n (%)	**Non orphanage children n (%)**	**p-value**
< 4 food groups	193 (92.9%)	114 (54.8%)	**0.000**
≥ 4 food groups	15 (7.2%)	94 (45.2%)	**0.000**
p- value	0.000	0.000	

4.5.4 Mean meal energy intake (kcal) for children in orphanages and non-orphanage children

The total mean energy intake among the non-orphanage children was 1890 Kcl per day and was significantly higher ($p<0.05$) than that of the children in orphanages (Table 4.8). Further, the intake of energy by children in orphanages who took lunch was 1547Kcl and was significantly lower ($p<0.05$) compared to the energy intake of non-orphanage children who also took the three meals of the day. The mean energy intake of children in orphanages who did not take lunch was less than half of that of the non orphanage children. Breakfast contributed the lowest mean energy intake for the day among both the children in orphanages (11.2%) and non orphanage (10.2%) children.

Table 4.8 Mean energy intake among children in orphanages and non-orphanage children

Meal	Mean energy intake (Kcal)				**p-value**
	Non Orphanage children (n=208)	Percent contribution %	Children in orphanages	Percent contribution %	
Breakfast	193 (±15.3)	10.2	173 (±2.3) (n=208)	11.2	**0.296**
Lunch	841 (±59.6)	44.5	679 (±35) (n=104)	43.9	**0.000**
Supper	856 (±111.2)	45.3	695 (±31.4) (n=208)	44.9	**0.000**
Total	1890 (±64.3)	100 (with lunch	1547 (±24.9) (n=208)	100	**0.000**
		(without lunch)	868 (±1.00) (n=104)		**0.000**

4.5.5 Adequacy of energy intake by sex among children in orphanages and non-orphanage children.

The total nutrient intake was computed and compared to the recommended daily allowance for each age set and by sex of children (FAO, 2004) these were 1352 and 1698 Kcl for 4-6 and 7-9 year age groups, whereas for the 10-11 year group, they were 2326 Kcl for girls and 2824 Kcl for boys. Overall the children who took adequate energy calories were significantly ($p<0.05$) more among the non-orphanage group (82.7%) compared to children in orphanages (37.1%) (Table 4.9). The proportion of all non orphanage children aged 10-11 years who had adequate energy intake was significantly ($p<0.05$) higher than that of children in orphanages.

Table 4.9 Adequacy of calorie intake among the children.

Age (years)	Sex	Children in orphanages	Non orphanage	p-value
4-6	Boy	31 (14.9%)	33 (15.9%)	**0.382**
	Girl	28 (13.5%)	31 (14.9%)	**0.320**
7-9	Boy	7 (3.4%)	35 (16.8%)	**0.000**
	Girl	11 (5.3%)	28 (13.5%)	**0.001**
10-11	Boy	0	24 (11.5%)	**0.000**
	Girl	0	21 (10.1%)	**0.000**
Total		77 (37.1%)	172 (82.7%)	**0.000**

4.6 Nutrition status of the children

4.6.1 Prevalence of malnutrition among the children in orphanages and non-orphanage children

Children in orphanages had a significantly higher rate ($p < 0.05$) of stunting and underweight than non-orphanage children (Table 4.10). However, there was no significant difference ($p > 0.05$) in the prevalence of wasting among the two groups.

Boys in orphanages had a significantly ($p < 0.05$) higher rate of stunting and underweight compared with non-orphanage boys' rate of stunting and underweight. They also had a higher rate of wasting compared with non-orphanage boys. Similarly, girls in orphanages had a significantly ($p < 0.05$) higher rate of stunting and underweight compared with the non-orphanage girls' rate of stunting and underweight. There was no significant difference ($p > 0.05$) in the prevalence of wasting among children in orphanages and non-orphanage boys and girls.

Table 4.10 Prevalence of malnutrition among children in orphanages and non-orphanage children and by sex

Overall malnutrition (Z score ≤-2.00)	children in orphanages (n=208)		Non orphanage children (n=208)		Total (N=416)		**p-value (t-test)**
	n	%	n	%	n	%	
Stunting	98	47.2	51	24.5	149	35.8	**0.000**
Underweight	69	33.2	31	14.9	100	24.0	**0.000**
Wasting	19	9.2	20	9.7	39	9.4	**0.866**
Nutritional status by sex (Z score ≤-2.00)	Sex		children in orphanages		Non orphanage		
			n	%	n	%	
Stunting	Male (n=104)		54	26.0	28	13.5	**0.0002**
	Female (n=104)		44	21.2	23	11.1	**0.0016**
Underweight	Male (n=104)		33	15.9	16	7.7	**0.0052**
	Female (n=104)		36	17.3	15	7.2	**0.0006**
Wasting	Male (n=104)		10	4.8	8	3.8	**0.6222**
	Female (n=104)		9	4.3	12	5.8	**0.491**

4.6.2 Overall nutrition status of children by sex

Boys had a higher prevalence of stunting (39.4%) than girls' rate of stunting (32.2%). On the other hand girls had a higher rate of underweight (24.5%) than boys (23.6%). Wasting rate was higher among girls (10.1%) than boys (8.7%). However these differences were not significant ($p>0.05$) for stunting, underweight and wasting.

4.6.3 Severity of wasting, stunting and underweight among the children.

Prevalence of severe and moderate stunting was (33.4%) and (2.4%), respectively (Figure 4.1). Prevalence of severe and moderate underweight was 24% and 0%, respectively. Global acute malnutrition was 9.4% in the whole group.

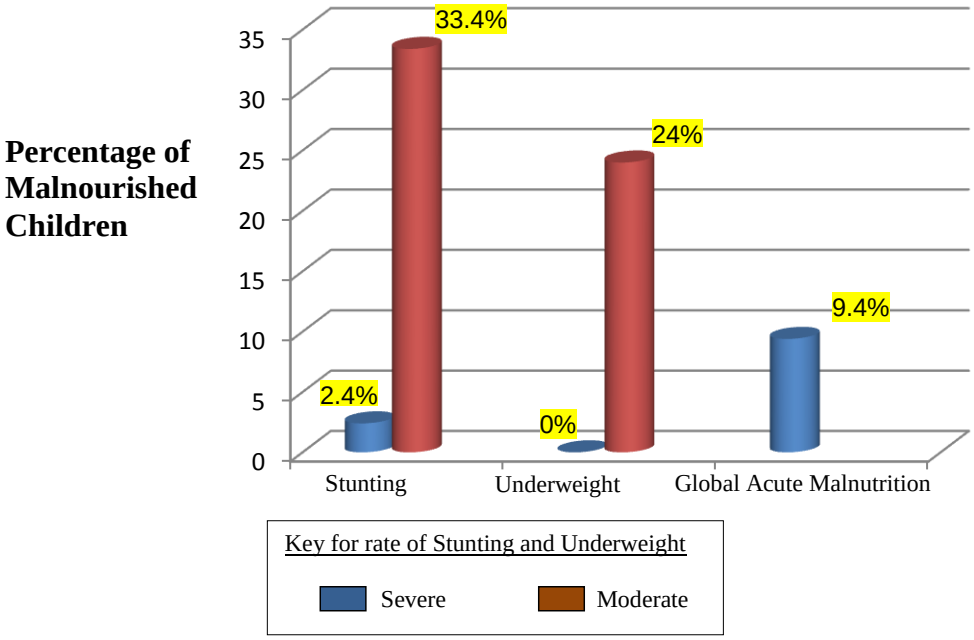

Figure 4.1 Overall severity of malnutrition among children.

4.6.4 Nutritional status of children in orphanages and non-orphanage children by age and sex

Boys in orphanages aged 4-7 years old had significantly higher ($p<0.05$) rates of stunting and underweight compared to non-orphanage boys' rates of stunting and underweight in the same age category (Table 4.11). Girls in orphanages aged 4-7 years had a significantly higher rate of stunting compared to the non-orphanage girls but this difference was not significant for underweight. Girls in orphanages aged 8-11 years had significantly higher ($p<0.05$) rates of stunting and underweight compared to non-orphanage rates of stunting and underweight within the same age category. Similarly older (8-11 years) boys in orphanages had higher rates of stunting and underweight compared with the non orphanage boy's rates of stunting and underweight in the same age category.

These differences were, however, not significant ($p > 0.05$). The differences in the rates of wasting between girls and boys aged 8-11 years were not significant ($p > 0.05$).

Table 4.11 Prevalence of malnutrition among the children by age and sex

Age category	**Malnutrition Z score≤-2.00**	**Sex**	**Children in orphanages**		**Non Orphanage children**		**p-value**
4-7 years (Male, n=52) (Female, n=52)			n	%	n	%	
	Stunting	Boys	27	52	17	33	**0.045**
		Girls	19	36	9	17	**0.026**
	Underweight	Boys	14	27	5	10	**0.022**
		Girls	13	25	9	17	**0.337**
	Wasting	Boys	5	10	7	13	**0.540**
		Girls	6	12	11	21	**0.185**
8-11 years (Male, n=52) (Female, n=52)	Stunting	Boys	27	52	20	38	**0.167**
		Girls	25	48	14	27	**0.025**
	Underweight	Boys	19	36	11	21	**0.081**
		Girls	23	44	6	12	**0.000**
	Wasting	Boys	6	12	1	2	**0.183**
		Girls	2	4	1	2	

4.6.5 Malnutrition among children by school.

Stunting rates ranged from 30.4% in Jamhuri primary to 39.2% in Rafiki primary school (Table 4.12). The prevalence of underweight ranged from 21.2% in Grace to 26.9 % in Waithaka primary school. Wasting ranged from 6.9% in Jamhuri to 12.0% in Waithaka primary schools. These differences were however not significant ($p>0.05$). Therefore, generally the schools had similar malnutrition rates.

Table 4.12 Prevalence of malnutrition among children in different schools

Type of malnutrition (Z scores ≤-2.00)	School	n	%	P-value
Stunting	Grace (n=104)	38	36.5	0.689
	Jamhuri (n=102)	31	30.4	
	Rafiki (n=102)	40	39.2	
	Waithaka (n=108)	40	37.0	
Underweight	Grace	22	21.2	0.678
	Jamhuri	22	26.6	
	Rafiki	27	26.5	
	Waithaka	29	26.9	
Wasting	Grace	9	8.7	0.589
	Jamhuri	7	6.9	
	Rafiki	10	9.8	
	Waithaka	13	12.0	
Global acute malnutrition		39	9.4	

4.5.6 Prevalence of malnutrition among the children in orphanages in relation to duration of stay in the orphanage.

Prevalence of malnutrition seemed to increase significantly in proportion with increase in length of stay in the orphanage (Figure 4.2). These differences were significant ($p<0.05$) for stunting and underweight but not significant ($p>0.05$) for wasting.

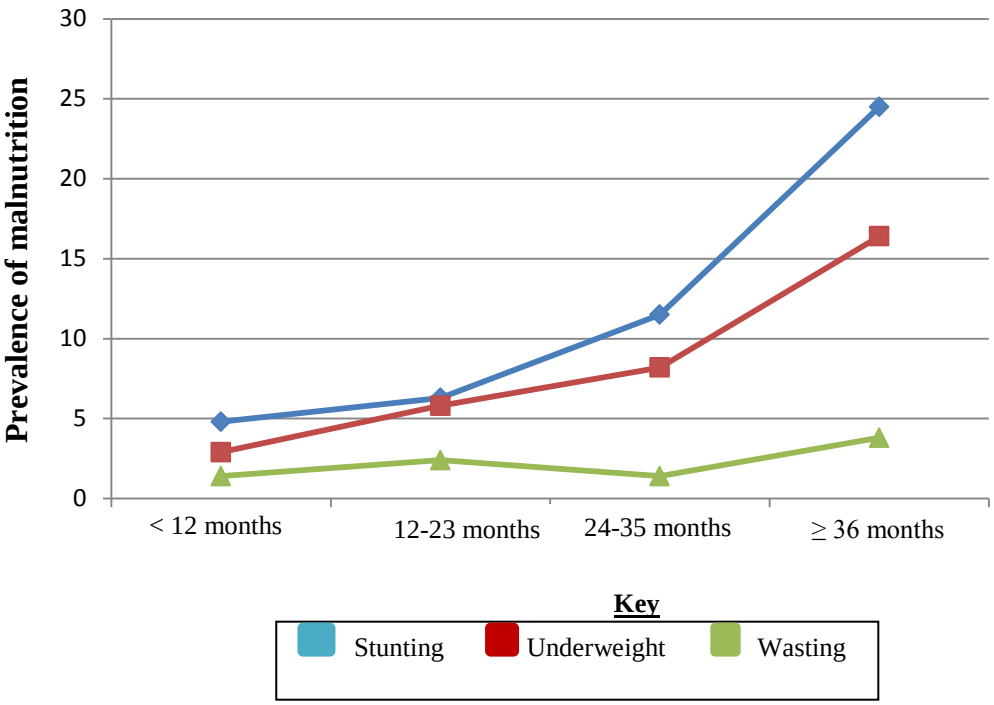

Figure 4.2 Prevalence of malnutrition among children in orphanages with duration of stay (Z scores ≤ -2.00)

4.8 Children's morbidity

4.8.1 Prevalence of morbidity

The children in the three orphanages and non-orphanage suffered from various infections whose symptoms included colds/flu, diarrhea, vomiting, fever and skin rashes. The morbidity rate was much higher among children in orphanages than non-orphanage children (Table 4.13). The children who had been sick in the previous seven days comprised 33 % of the total number of children in orphanages whereas the non-orphanage children who had been sick within the same period of time comprised only 7% of the total number of non-orphanage children. The children in orphanages had significantly ($p<0.05$) higher prevalence of diarrhea, cold/cough and vomiting compared to the non-orphanage children.

It was reported that each case of the sick child who had suffered from fever, diarrhea and vomiting had been taken to a dispensary for treatment. It was expected that children suffering from diarrhea and vomiting would be given more fluids. For all the children in orphanages it was reported that the sick children were given the same food as those who were not sick. The children in orphanages had a significantly higher rate ($p<0.05$) of morbidity than the non-orphanage children. The results were based on the number of children who had suffered from any of the sicknesses in the previous seven days before and within the time of the study.

Table 4.13 Prevalence of morbidity among children in orphanages and non-orphanage children

Morbidity symptoms	Children in orphanages (n=208) n (%)	Non orphanage children (n=208) n (%)	**p-value**
Diarrhea	24 (11.5%)	5 (2.4%)	**0.015**
Cough / colds	26 (12.5%)	6 (2.9%)	**0.014**
Fever	3 (1.4%)	2 (0.5%)	**0.800**
Vomiting	11 (5.3%)	1 (0.5%)	**0.046**
Skin rashes	5 (2.4%)	1 (0.5%)	**0.260**
Total	69 (33%)	15 (7%)	**0.000**

4.8.2 Prevalence of morbidity among children in orphanages and non-orphanage children by age, sex and comorbidities

Morbidity among boys in orphanages and girls ages 4-7 and 8-11 years was significantly ($p<0.05$) higher compared to the non-orphanage boys and girls of the same age (Table 4.14).

Morbidity rates were also significantly ($p<0.05$) higher among boys compared to girls for both children in orphanages and non orphanage children aged 4-7 and 8-11 years. Children in orphanages had a slightly higher (1.4%) prevalence of comorbidities than the non orphanage children but the difference was not significant.

Table 4.14 Prevalence of morbidity by age and sex and comorbidities among children

Age	Sex	children in orphanages		Non orphanage children		**p-value**
		n	%	n	%	
4-7 years	Girls	14	13.5	2	1.9	**0.0016**
	Boys	29	27.9	7	6.7	**0.000**
	p-value	0.023		0.041		
8-11 years	Girls	7	6.7	1	1.0	**0.000**
	Boys	19	18.3	5	4.8	**0.0022**
	p-value	0.013		0.018		
Comorbidities		3	1.4	2	0.5	**0.800**

4.9 Personal hygiene and primary prevention of disease.

4.9.1 Vaccination

Among the non-orphanage children 192 (92%) were vaccinated compared to 144 (69%) of the children in orphanages (Table 4.15). Girls age 4-7 years and 8-11 years had the lowest (8.3% and 13.9%) proportion of the vaccinated children in orphanages. There was a significantly lower rate ($p <0.05$) of vaccination among girls in orphanages aged 4-7 years compared to the non-orphanage girls of the same age.

Table 4.15 Vaccination among children in orphanages and non-orphanage children

	Sex	children in orphanages (n=144)		Non orphanage children (n=192)		**p-value**
		n	%	n	%	
4-7 years	Boys	61	42.4	71	37.0	**0.3194**
	Girls	12	8.3	22	11.5	**0.0004**
8-11 years	Boys	51	35.4	69	35.9	**0.9216**
	Girls	20	13.9	30	15.6	**0.656**

4.9.2 Malnutrition among vaccinated children.

Girls in orphanages aged 4-7 and 8-11 years who were vaccinated had a higher prevalence of stunting compared to the non-orphanage children and these differences were significant at ($p<0.05$) for age 4-7 years as shown in Table 4.16.

The boys in orphanages aged 4-7 years had higher prevalence of stunting compared to non-orphanage boys of the same age but these differences were not significant ($p>0.05$). Non orphanage boys of 8-11 years had a higher rate of underweight compared to the boys in orphanages but this was not significant ($p>0.05$).

Table 4.16 Prevalence of malnutrition among vaccinated children

Age	**Malnutrition**	**Sex**	**Children in orphanages (n=144)**		**Non orphanage children (n=192)**		**p-value**
4-7 years			n	%	n	%	
	Stunting	Boys	19	13.2	17	8.9	**0.424**
		Girls	12	8.3	3	1.6	**0.033**
	Underweight	Boys	2	1.4	5	2.6	**0.549**
		Girls	12	8.3	6	3.2	**0.0652**
	Wasting	Boys	1	0.7	2	1.0	**0.818**
		Girls	7	4.9	8	4.2	**0.8166**
8-11 years	Stunting	Boys	23	16.0	13	6.8	**0.0542**
		Girls	13	9.0	8	4.2	**0.1866**
	underweight	Boys	4	2.8	5	2.6	**0.9314**
		Girls	12	8.3	6	3.2	**0.2462**
	Wasting	Boys	3	2.1	2	1.0	**0.8374**
		Girls	4	2.8	2	1.0	**0.3558**

4.9.3 Personal Hygiene

4.9.3.1 Personal hygiene items

Personal hygiene items including soaps, hair and body oils were not in orphanages' budget but depended on donations which were intermittent. Tooth pastes were rarely available for children in orphanages. Non orphanage children, however, had constant supply of personal hygiene items, though some were shared by all the members of the family. These factors could have contributed to the following results.

4.9.3.2 Bathing

Fewer (6.3%) of the non-orphanage children compared to 32.2% of the children in orphanages reported poor bathing hygiene (Table 4.17). Among of the children in orphanages 59% reported adequate bathing hygiene, however, 63% of the non-orphanage children reported good bathing hygiene. The non-orphanage children had significantly ($p<0.05$) better bathing hygiene compared to the children in orphanages.

Table 4.17 Frequency of bathing among children in orphanages and non orphanage children

Frequency of bathing	Children in Orphanages n (%)	Non orphanage n (%)	**p value**
Daily	14 (8.7%)	98 (63%)	**0.000**
4-6 Times a week	92 (59%)	48 (30.8%)	
< 4 times a week	50 (32.2%)	10 (6.4%)	
Total	156 (100%)	156 (100%)	

4.9.3.3 Brushing of teeth

A significantly ($p<0.05$) higher (47.1%) proportion of children in orphanages reported poor hygiene in brushing of teeth compared to 10.3% of the non-orphanage as shown in Table 4.18. However, 63.5% of the non-orphanage compared to 33.3% children in orphanages reported good hygiene in brushing of teeth. The non orphanage children had significantly higher frequency of brushing teeth compared with children in orphanages.

Table 4.18 Frequency of brushing teeth among children in orphanages and non-orphanage children

Frequency of brushing teeth	children in orphanages	Non orphanage children	**p value**
Daily	52 (33.3%)	99 (63.5%)	**0.000**
4-6 times a week	31 (19.9%)	41 (26.3%)	
< 4 times a week	73 (47.1%)	16 (10.3%)	
Total	156 (100%)	156 (100%)	

4.9.3.4 Washing hands

Of the children in orphanages, 48% reported washing hands after visiting the toilet the day before the interview compared to 78.2% of the non-orphanage children (Table 4.19). There was a significantly ($p<0.05$) higher proportion of non-orphanage children who reported washing hands with soap during the critical times compared with the children in orphanages.

Table 4.19 Washing hands at critical times among children in orphanages and non-orphanage children

Characteristic	Children in orphanages	Non orphanage children	**p- value**
	N=156 n (%)	N=156 n (%)	
Washing hands after visiting the toilet	75 (48%)	122 (78.2%)	**0.0076**
Before meals	77 (49.4%)	122 (78.2%)	**0.0102**
Washing hands with soap	20 (12.8%)	119 (76.3%)	**0.0002**

4.9.3.4.1 Hand washing at critical times among children in orphanages and non orphanage children and by sex

Hand washing rates at critical times were significantly ($p< 0.05$) higher among non orphanage girls and boys compared to girls and boys in orphanages (Figure 4.3).

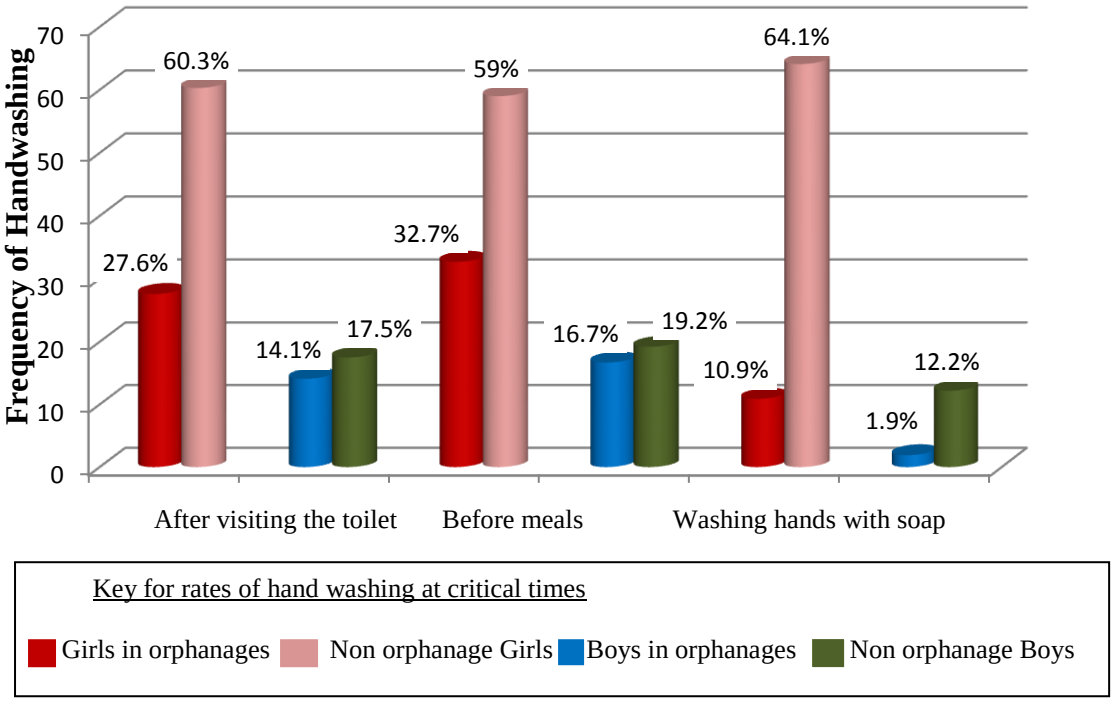

Figure 4.3 Hand washing rates among children in orphanages and non orphanage children and by sex

4.9.3.5 Washroom facilities

Of girls in the orphanages, 68 (65.3%) had fair accessibility and 36 (34.6%) had bad accessibility compared to all non-orphanage girls who had fair accessibility. All 104 (100%) of the children in orphanages boys had bad accessibility to latrines/toilets compared to all 104 (100%) non orphanage boys who had fair accessibility. However none of the children in orphanages and non-orphanage girls and boys had dangerous accessibility to latrines/toilets.

4.11 Relationship between associated factors and prevalence of malnutrition in the non-orphanage children.

The factors that showed significant difference were correlated to the malnutrition indices of stunting, underweight and wasting (Table 4.21). The proportion of stunted children was inversely and significantly ($p<0.05$) correlated with mothers' education, children's energy intake, variety of foods, vaccination rate for both girls and boys, bathing and washing hands with soap. Diarrhoea and colds/cough and the age of children were positively and significantly correlated to the proportion of stunted children.

The prevalence of underweight children was inversely and significantly ($p<0.05$) correlated with mothers' and fathers' education, children's energy intake, variety of foods, vaccination for both girls and boys, and washing hands with soap. Diarrhoea and colds/cough were positively and significantly correlated to the prevalence of underweight children. Wasting was inversely correlated with energy intake for boys 8-11years. This relationship was also significant. There was no significant relationship between wasting and diarrhoea and cough/colds.

Table 4.21 Correlation coefficient between associated factors and malnutrition among non orphanage children

Variable			Malnutrition		
			Stunting	**Underweight**	**Wasting**
			r	r	r
Age of child in years			0.33*	0.01	0.07
Education of mother			-0.26*	-0.22*	0.04
Education of father			-0.06	-0.09	0.02
Energy intake	**4-7years**		-0.79***	-0.23*	0.08
	8-11 years	Boys	-0.31*	-0.47**	-0.45**
		Girls	-0.28*	-0.29*	-0.09
Variety of foods			-0.90***	-0.96***	0.07
Vaccination	**Girls**		-0.36*	-0.01	-0.01
	Boys		-0.76***	-0.03	-0.08
Morbidity	**Diarrhea**		0.82***	0.90***	0.03
	Cough/colds		0.36*	0.29*	0.03
Hygiene practice	**Bathing**		-0.40*	-0.02	0.07
	Brushing teeth		-0.02	-0.01	0.00
	Washing hands (with soap)		-0.91***	-0.39*	-0.09

KEY: p<0.05*: p<0.01: p<0.001*****

4.11.2 Correlation coefficient between various factors and prevalence of malnutrition in the children in orphanages.

The factors that showed significant difference were correlated to the malnutrition indices of stunting, underweight and wasting (Table 4.22). The proportion of stunted children was inversely and significantly ($p<0.05$) correlated with children's energy intake, variety of foods, vaccination for both girls and boys, bathing and washing hands with soap. Diarrhoea and colds/cough, duration of stay in the orphanage and age of child, were positively and significantly correlated to the prevalence of stunted children. The proportion of underweight children was inversely and significantly ($p<0.05$) correlated with children's energy intake, variety of foods, vaccination for both girls and boys, bathing and washing hands with soap.

Diarrhoea and colds/cough and duration of stay in the orphanage were positively and significantly correlated to the prevalence of underweight children in orphanages. Wasting was inversely and significantly correlated with energy intake, variety of food, vaccination and washing hands with soap. Diarrhoea and cough/colds and duration of stay in the orphanage were positively and significantly correlated with wasting.

Table 4.22 Correlation coefficient between various factors and malnutrition among children in orphanages

Variable			**Malnutrition**		
			Stunting	**Underweight**	**Wasting**
			r	r	r
Age of child			0.23*	0.03	0.07
Education of caretakers			0.07	0.02	0.00
Energy intake	**4-7years**		-0.37*	-0.40*	-0.29*
	8-11 years	Boys	-0.92***	-0.58**	-0.53**
		Girls	-0.49**	-0.45**	-0.36*
Variety of foods			-0.93***	-0.88***	-0.71***
Vaccination	**Girls**		-0.49**	-0.64**	-0.34*
	Boys		-0.72***	-0.69**	-0.38*
Morbidity	**Diarrhea**		0.88***	0.90***	0.53**
	Cough/colds		0.39*	0.50**	0.45**
Duration of stay in the orphanage			0.52**	0.63**	0.29*
Hygiene practice	**Bathing**		-0.66**	-0.49**	0.00
	Brushing teeth		-0.06	-0.05	0.00
	Washing hands(with soap)		-0.92***	-0.58**	-0.51**

KEY: p<0.05*: p<0.01: p<0.001*****

CHAPTER FIVE

5.0 DISCUSSION

5.1 Demography

The sample consisted of children who were equally distributed between age 4 and 11 years. These age categories of children still need care and supervision, particularly in matters of personal hygiene. The children were also distributed equally among boys and girls. Boys especially those above nine years of age require higher energy intake than girls of the same age. The study was carried out in four schools namely Grace, Rafiki, Jamhuri and Waithaka primary schools.

Overall there were thirty three caretakers with one orphanage having eleven, the second ten and the third twelve caretakers. These were employed on full time basis to take care of the children in the orphanages. The majority (51%) of the caretakers had attained post primary education. The mean number of years of schooling completed for males was higher (9.8) than for the females (7.8). These means were also higher than for the non-orphanage group.

More women (23.3%) were economically inactive during the study as compared with men (4%) among the parents of the non-orphanage group. This is characteristic of many communities in developing countries. The findings on parental level of education (mean number of years of schooling completed, fathers 6.8 and mothers 6.3) are similar to those of KDHS (2009) which show that the mean number of years of schooling for males was slightly higher than for females. The higher literacy rate of adult males compared with females was expected.

However, the overall educational status of the community (based on the number of years spent in school) showed that majority (65% fathers, 64.9% mothers) completed only 8 years of schooling. This explains the higher proportion of those employed as casual workers (45% fathers and 39% mothers) as a source of family income in the group of non-orphanage parents.

5.2 Types and variety of meals

5.2.1 Dietary intakes

The mean energy intake for the children in orphanages was significantly lower ($p<0.05$) compared to the non-orphanage children. Among the children in orphanages, the cereal based foods mainly Ugali, Porridge and Maize and Beans contributed the highest proportion (34.2%) by weight of food energy whereas the non orphanage diet had only 18.4% of cereal based grains. However for the non-orphanage children tea/cocoa had the highest (21.1%) proportion by weight. Fruits (3.1% for non-orphanage and 0.7% for children in orphanages) and spread (0.2% for non-orphanage and 0.1% for children in orphanages) contributed the lowest proportion by weight of food for both children in orphanages and non-orphanage children. The starchy foods should form the main part of the meal and the rest of the meal can be planned around the starchy component (Vorster and Nell, 2002). The findings for the children in orphanages are similar to Western Kenya study where cereals contributed the highest proportion of food energy (45.1%) for school children (Nokuthula, 2009). However for both children in orphanages and non orphanage children, the contribution of the cereal fell far below the recommendation of food based dietary guidelines of 55% (WFP, 2010; Maunder *et al.*, 2001).

This study also concurs with 1999 micronutrient survey, which reported a relatively low consumption of fruits in Kenya (MoH/UNICEF, 2001). Similarity among the children in orphanages and non-orphanage groups' low cereal consumption and its highest contribution to the proportion of the total mean weight of foods consumed was not unexpected, since the community agricultural activities had declined due to urbanization. Both groups therefore to a large extent depended on purchased food rather than on home-produced food.

The calories (less than 12% of the daily energy intake) derived from breakfast, equivalent to four slices of bread for both groups, were too low to enable the children to perform adequately until lunch. This suggests that the children were hungry for a great part of the morning. Supper was a more (45.3%) important source of energy than lunch (44.5%) for the non-orphanage children. For the children in orphanages group, supper was also a more important source of energy (44.9%) compared to lunch (43.9%). The low energy intake observed in both groups is of concern. For the children in orphanages group even for the children who took lunch, the overall energy intake did not improve much, as indicated by the study data: with lunch 1547 Kcl, without lunch 869 Kcl. These findings are similar to the Pakistan study which observed that children in orphanages and non-orphanage children had lower intakes of calories for breakfast (less than 10%) (UNICEF, 2009). Similarly, in this study supper was a more (54.7%) important source of energy compared to lunch (34.6%) for children in orphanages group and lunch contributed a higher proportion (46.3%) of calories compared to supper (44.4%) for the non-orphanage children.

The proportionately high contribution of lunch and supper to daily energy intake implies that more emphasis was placed on these two meals than on breakfast. However the mean energy intake for individuals for both children in orphanages and non-orphanage children didn't meet the energy requirements for all children. Among the children in orphanages, 37% met their energy requirements compared to 82.7% of the non-orphanage children. This proportion of children was lower for the children in orphanages and higher for the non-orphanage children compared to the Western Kenya findings where 63.7% of school children met the recommended daily energy allowance (Nokuthula, 2009).

Foods that provide the body with adequate nutrients to support all the functions are associated with good health (Krause and Mahan, 1984). The non-orphanage children whose energy intake fell below the recommended intake was an indication that even though the diet was varied, for some children the diet was still inadequate. It could therefore be suggested that for those children whose energy intake fell below the recommended, they were at risk of suffering from nutritional deficiencies. The children who did not meet the energy requirements possibly were given small amount of food. They could also have been the children who only took two out of the possible three main meals of the day. In this study non orphanage children had significantly ($p<0.05$) higher diversity of foods served than the orphanage. Data from the study showed that diet for the children in orphanages consisted of 37 different foods compared to the non-orphanage diet which consisted of 63 different foods. The diet of children in orphanages was dominated by basic staple foods supplemented by complimentary foods usually, in form of stews.

Staples such as maize and rice were observed as sources of energy among the children in orphanages. It was further observed that there was a tendency towards exclusive reliance on starches and legumes. Food eaten by children in the orphanages mainly depended on donations. Majority (92.9%) of the children in orphanages were served meals with less than four food groups compared to 54.8% of the non-orphanage children. Only a small (7.2%) proportion of the children in orphanages were served meals with four or more food groups compared with the non-orphanage (45.2%) group. This results are similar to a Pakistan study which found 6.5% of children in orphanages and 42.2% of non-orphanage children consumed four or more food groups (UNICEF, 2009) respectively. Conversely, another study in Western Kenya found that all the children in the study consumed four or more food groups (Nokuthula, 2009). The consumption of a varied diet is associated with increased intake of energy and better health (Gibson and Holtz, 2001). Children may be served with large servings of starchy cereals because they are bulky thus giving satiety value.

5.2.2 Feeding frequency.

The results showed that many of the children had three meals per day. Breakfast, lunch and supper were the main meals of the day. However, it was found out that disparities existed in the frequency of meals per day. The children in orphanages attended school away from the orphanage had two meals (mainly breakfast and supper) in a day during school days and three meals during the weekend.

Some children in orphanages who were in pre-school in the orphanage had three meals in a day.

Approximately 50% of children in orphanages took two meals in a day during the week. This was explained by the long distance between the orphanages and the schools they attended (two to three kilometers away from school). No effort was made to pack food or snacks for the midday meal. However the non-orphanage children were served with three meals in a day throughout the week. The number of meals served to a child is important in promoting growth. Foods given in adequate portions and frequently foster better health and growth in children than bulky and rare servings (Anita, 2002). However the quality and quantity of food given to a child is very important. The average child up to 11 years of age needs to eat every 4-6 hours to maintain a blood glucose level sufficient to adequately support physical and mental activities (Pivik and Dykman, 2007). This implies that the children in orphanages who took two meals in a day were hungry most of the day.

5.3 Malnutrition

The prevalence of stunting and underweight was significantly higher ($p<0.05$) among the children in orphanages than non-orphanage children. These findings are similar to those of USAID (2005) which also indicated that fostered children (6-14years) in Kenya were more likely to be stunted (42% and 37%) and underweight (32% and 23%) than non fostered children of the same age respectively. A multiplicity of factors interacts to influence children's nutritional status. Malnutrition has its causes emanating from a number of complex factors for which specific interventions could be developed (Maunder *et al.,* 2001).

Some of the factors that were associated with the decline in child nutritional status in this study included lack of variety in types of foods served, inadequate energy intake, father's, mother's education, child's age as well as disease prevalence.

However at the macro levels, studies show that decline in Kenya's economic growth in the 1990's, the rise in inflation, increased poverty levels and HIV/AIDS pandemic are the major contributors to children's nutritional status (UNICEF, 2000). This study found that malnutrition levels were high among school going children just as in children below five years. The overall prevalence of stunting stood at 35.8%. There was significantly ($p<0.05$) higher prevalence of stunting among the children in orphanages compared to non-orphanage children. The school children in this sample had a higher prevalence of stunting than in the study carried out in Zambia among school children where 28.9% were stunted (Gillespie and kadiyata, 2004). These findings also concur with the study carried out in Malawi which found the prevalence of stunting in children in orphanages to be higher (64 %) compared with the non-orphanage children (46%) (Panpranish *et al.*, 1999).

Children with low height for age are stunted. This condition is usually associated with long term chronic malnutrition and long term factors such as frequent infection and poor feeding practices (UNICEF, 2000). Children stunted at school age are likely to have been exposed to poor nutrition since early childhood (WFP, 2004). Non-orphanage children were less likely to be stunted and this was associated with higher levels of mother's educational, energy intake and variety of foods, vaccination rates for both girls and boys, bathing and washing hands with soap rates. These relationships were significant ($p<0.05$).

The lower stunting rate among non orphanage children was also associated with lower prevalence of diarrhoea and colds/cough. These relationships were also significant ($p<0.05$). Children in orphanages were more likely to be stunted and this was associated with lower levels of, energy intake, variety of foods, vaccination for girls and boys, bathing and washing hands with soap rates. The higher stunting rate among the children in orphanages was also associated with longer duration of stay in the orphanage, higher prevalence of diarrhoea and colds/cough and older children. These relationships were significant ($p<0.05$).

These findings concur with the study in Zimbabwe where stunting rates of children in orphanages were directly correlated to length of stay in the orphanages (C-SAFE/WFP, 2004). Another study in North Western Tanzania found higher stunting levels among children in orphanages and this increased with increase in age of the children (Ainsworth and Semali, 2000).

The factors that could have contributed to high prevalence of stunting among the children in orphanages included limited varieties and diversity of foods served to the children in orphanages, the few meals taken in a day, inadequate energy intake, the over dependence on cereals which have low bioavailability and provide poor quality nutrients, and the significantly high prevalence rate ($p<0.05$) of disease among the children in orphanages.

The high levels of stunting could imply that children received inadequate care from the caregivers (fathers, mothers or childhood caregivers) which include food, healthcare and emotional support necessary for the healthy growth and development of children. The caregivers possibly had in sufficient resources such as time, energy and money. Children stunted at school age are likely to have been exposed to poor nutrition since early childhood and the degree of stunting can tend to increase through the school age years (Gillespie and Kadiyata, 2004). However children can exhibit catch up growth if the environment improves (WHO, 2008). This could imply that the orphanage did not offer a conducive environment that could improve the children's' nutritional status thus the longer the length of stay in the orphanage the more likely it was for the child to be stunted.

The prevalence of underweight among the children in orphanages was significantly higher than non-orphanage children ($p< 0.05$). Underweight had an overall prevalence of 24%. The children in orphanages (33.2%) were more likely to be underweight than their counterpart non-orphanage children (14.9%). These findings concur with the study in Botswana which found that children in orphanages were (49%) more likely to be underweight than non-orphanage children (Mishra and Bignami, 2008). Another study carried out in Zambia among school children found out that 14.5% were underweight (Gillespie and kadiyata, 2004). Non orphanage children were less likely to be underweight and this was associated with higher, mother's education level, energy intake, variety of foods, vaccination for both girls and boys rates, and washing hands with soap rates.

Lower underweight rates among the non orphanage children were also associated with lower prevalence of diarrhoea and colds/cough rates. This relationships were significant ($p<0.05$). Children in orphanages were more likely to be underweight and this was associated with lower energy intake, variety of foods, vaccination for both girls and boys, bathing and washing hands with soap rates. Higher underweight rate among the children in orphanages was also associated with longer duration of stay in the orphanage and higher prevalence of diarrhoea and colds/cough. These relationships were also significant ($p<0.05$). These finding are similar to the Zimbabwe study which found a negative correlation between age of children and prevalence of underweight (Young and Jaspars, 2006). Another study in Nicaragua found a direct relationship between prevalence of underweight among school children in orphanages and diarrheal, coughs/colds and length of stay in the orphanage (Morris *et al.*, 2004).

Deteriorating standards of living, disease prevalence and increase in food prices could have contributed to the high prevalence of under nutrition. A child's Weight-for-Age measure reflects both previous growth and present nutritional conditions. Hence the high rate of underweight reflects the presence of both long term chronic malnutrition and recent food insecurity or illness. Underweight among school children can reflect prenatal under nutrition, infection and possibly inadequate attention by care givers (WFP, 2010). This could imply that children in the orphanage were more disadvantaged in terms of care and may have had inadequate intake of energy nutrients in the recent past.

The high dependence on cereals and legume grains could have resulted in extremely high phytate and fiber content of these diets thus rendering the energy nutrient bio unavailable (Van Lieshout and West, 2004). The children in orphanages walked to and from school daily and this may have enhanced their physical activity thus increasing their energy requirement (Cooper et al., 2003). They may also have suffered episodes of disease. The prevalence of wasting was also relatively high among the children. In this study, 9.4% of the children overall were wasted. Prevalence of wasting was not significantly different between the children in orphanages (9.2%) and the non-orphanage children (9.7%) ($p>0.05$). This prevalence of wasting was however high in both groups. The findings are different from the study carried out in Zambia among school children which found that 3.9% were wasted (Gillespie and kadiyata, 2004). Another study in Nicaragua found that 5% of school children were wasted (Morris *et al.*, 2004).

Non orphanage children 8-11 years were less likely to be wasted and this was associated with higher levels of energy intake for boys 8-11 years. This relationship was significant ($p<0.05$). However there was no significant relationship between wasting and diarrhoea and cough/colds among the non-orphanage children. Children in orphanages were more likely to be wasted and this was associated with lower levels of energy intake, variety of food, vaccination and washing hands with soap rates. Children in orphanages were also more likely to be wasted and this was associated with higher levels of diarrhoea and cough/colds rates. These relationships were significant ($p<0.05$)

Conversely for both children in orphanages and non-orphanage children the relationship between wasting and age of children was not significant. These findings differ from the Zimbabwe study where in both children in orphanages and non-orphanage children wasting was negatively and significantly correlated to child's age (Young and Jaspars, 2006). Another study in Nicaragua also found that younger children were more likely to be wasted than older ones (Morris *et al.*, 2004).

Food is required for fuel, physiological functions as well as growth. Any imbalance is taken from, creating inadequacy, or added, in case of abundance to the body stores of energy in form of fat, protein (in muscles) and for short-term use as carbohydrates (in the liver and muscle (Engle, 1999). These energy stores can be measured as weight and are therefore labeled weight-for-height. Leanness or fatness as weight for height measures body energy stress and indicate the energy intake or expenditure balance (Marian, 1984). Negative balance in children means that their development is affected (Bentley et al., 2000). A child's weight-for-height measure is an indicator of nutritional wasting and primarily reflects severe short term deprivation of food in his/her immediate nutritional history, for example during episodes of disease such as diarrhea or in times of food shortage (Armstrong et al., 1997). Adequate dietary intake is essential for good nutrition. It may, however, not be sufficient, because the presence of disease can result in reduced bioavailability, increased needs, nutrient losses or loss of appetite and can thus be an immediate cause of malnutrition (Stratton *et al.*, 2003). The prevalence of wasting in this sample could have resulted from the high prevalence of diarrheal and cough/colds resulting in reduced appetite for food.

Possibly, some children suffered from more than one infectious disease thus culminating in this high rate of nutritional wasting. They could also have suffered acute food crisis thus becoming severely malnourished. Boys in orphanages of 4-7 years old had significantly higher ($p<0.05$) rate of stunting compared to non-orphanage boys of the same age. Similarly girls in orphanages aged 4-7 and 8-11 years had significantly higher ($p<0.05$) rates of stunting compared to non-orphanage girls of the same age.

Boys in orphanages of 4-7 years old had significantly higher ($p<0.05$) rate of underweight compared with non-orphanage boys of the same age. Similarly girls in orphanages aged 8-11 years had significantly higher ($p<0.05$) rate of underweight compared with non-orphanage girls of the same age. Boys had a higher prevalence rate of stunting than girls. On the other hand girls had a higher rate of underweight and wasting than boys. However these rates were not significantly different ($p>0.05$) among girls and boys for stunting, underweight and wasting. The findings were similar to the Machakos study where school girls were at a higher risk of being underweight compared to school boys of the same age (Mbithe, 2008). A study in Nyambene District, Kenya also found that the nutritional status (stunting, underweight and wasting) of girls was better than that of boys, although the difference was not statistically significant (Meme *et al.,* 1998). In Brazil school age boys were significantly more stunted than girls of the same age (Parraga, 2000). The high levels of stunting among boys could have been contributed by high prevalence of disease among boys which could also be associated to the low rates of hand washing at critical times.

It could also have resulted from the low vaccination rates among the children in orphanages. Inadequate energy intake among the children in orphanages could have contributed to the high stunting levels among boys than girls mainly because boys (above 10 years of age) require more food than girls of the same age (FAO, 2004). It could also be explained by the fact that more girls than boys were involved in food preparation and therefore likely to consume more food than boys overtime. Further, since stunting increases with age, it is likely that more boys than girls were stunted in their childhood.

The children in orphanages who had been admitted to the orphanages for a longer period were more likely to be stunted and underweight ($p<0.05$) than those who had been recently admitted. However prevalence of stunting, underweight and wasting was not significantly different ($p>0.05$) between all the four schools. These findings differ from those of the study in Malawi where children who had been admitted to an orphanage for more than one year were less malnourished (Panpranish *et al.*, 1999) than those who had been admitted for a shorter time. It could also imply that nutritional care in the orphanage is less than optimal, resulting in chronic long term malnutrition. Stunting was found to significantly increase with age for both children in orphanages and non orphanage. These findings were similar to those of the study in Brazil which found stunting worsened as the study population got older (Parraga, 2006). This could reflect longer exposure to chronic malnutrition.

5.4 Morbidity

Prevalence of morbidity was significantly ($p<0.05$) higher among the children in orphanages compared to non-orphanage children. Increased morbidity most likely contributed to the significantly ($p<0.05$) higher rate of stunting among the children in orphanages. These findings are similar to the findings of UNICEF (2009) which found synergy between malnutrition and disease prevalence. The signs of infections which afflicted both the children in orphanages and the non-orphanage children were colds, fever, diarrhea, vomiting and skin rashes.

The findings of this study are similar to those of a study carried in rural Machakos which associated the nutritional status of children with morbidity (Mbithe, 2008). Diarrhea and vomiting in children are strongly associated with malnutrition and may cause death by triggering off dehydration and electrolyte imbalance (Nematian *et al.,* 2004). In Bangladesh, episodes of diarrhoea reduced among school age children who washed hands more than four times a day (Torres, 2000). A multicountry analysis study showed 35% reduction of diarrhoea from hand washing with soap (Esrey, 2004). Nutritional deficiencies increase the risk of the child suffering from infectious diseases such as diarrhea, fever and malaria and these illnesses in turn contribute to worsened nutritional status through loss of appetite or nutrient loss during the course of illness (Lindblade *et al.,* 2003). Under nutrition tends to weaken a child's resistance to disease and this interactions are especially evidenced in diarrheal disease. Morbidity breeds malnutrition and in turn, malnutrition increases morbidity, thus establishing a vicious cycle (Nematian *et al.,* 2004).

Repeated bouts of diarrhea have far reaching consequences leading to growth failure and malnutrition. Diarrhea in children results mainly from unsafe water and neglect of personal hygiene. High prevalence of disease among the children in orphanages could be due to inadequate sanitation facilities in the orphanage. It could also have resulted from the low rates of hand washing with soap.

5.5 Personal hygiene and primary prevention of disease.

Among the children in orphanages 69% were vaccinated compared to 92% among the non-orphanage children. There was a significantly lower rate ($p<0.05$) of vaccination among children in orphanages compared to the non-orphanage children. There was a higher prevalence of malnutrition among the vaccinated children in orphanages compared to vaccinated non orphanage children for stunting but these differences were only significant ($p<0.05$) for girls 4-7years. For the children in orphanages, vaccination rate was similar to that of a study carried out in Kenya, where 62.7% of primary school children (6-13 year old) had BCG scars present (Kwamanga *et al.,* 1993). These findings for children in orphanages are also consistent with those by UNICEF (2009), National immunization coverage where only 76 per cent of primary school children were vaccinated, far below the recommended 85 per cent in 2008. Ignorance and or negative attitudes among caregivers may have led to lack of adherence of some children to immunization schedule exposing the children to infections. Hand washing at critical times was poor among the children in orphanages and worse among the boys in orphanages compared to non orphanage children.

Only 48% of the children in orphanages compared to 78% of non-orphanage children washed hands after visiting the toilet the day prior to the interview. The non-orphanage rates are similar to those of studies conducted in Colombia and India which reported that 82.5% and 86.4% of students, respectively, washed their hands after using the toilet (UNICEF, 2009). The findings for both children in orphanages and non orphanage were different from those of the study in Ethiopia which reported that only few (14.8%) of the school children washed hands after visiting the toilet (Neumann *et al.*, 2002). Of the children in orphanages 49% compared to 78% of the non-orphanage children reported washing hands before meals. The children in orphanages rate is consistent with the findings of a study in Colombia which reported 46.9% of school children washed hands before meals.

The non-orphanage rate was similar to 75.9% rate reported among school children in the Philippines study (Lopez-Quintero, 2009). Only 13% of the children in orphanages compared to 76.4% of the non-orphanage children washed hands with soap. These rates are different from the Ethiopian study which reported 36.2% rate (Neumann *et al.*,2002) and the Philippines and Turkey studies where an average of 37.7% and 42.4% of children, respectively, washed their hands with soap (Lope-Quintero, 2009). Observed rates of hand washing with soap at critical moments range from zero per cent to 34 per cent (MoPHS, 2010). Children in orphanages rates are similar to rates in Kenya which stand at 5 percent (MoPHS, 2010).

Hand washing at critical times - including before eating or preparing food and after using the toilet can reduce morbidity due to diarrhoea in children by almost 50 per cent (MoPHS, 2010). Low personal hygiene is associated with increased morbidity, which in turn is associated with decreased nutritional status (Nematian *et al.*, 2004). Absence of taps positioned strategically, for example, near the orphanages' dining area, which could serve as a reminder to the children in orphanages to wash their hands before meals coupled with rationing of water could have contributed to these results among the children in orphanages. Hand washing with soap is the single most cost- effective intervention for prevention of diarrhoeal related deaths and disease (World Bank, 2005).

Although the children may have known that washing hands after using the toilet is important, they may have been negatively influenced by factors such as laziness, the rush to play with friends, or even the lack of hand washing facilities close to the latrines. The low frequencies of hand washing among the children in orphanages with soap may be attributed to the lack of soap in school and at the orphanage. Of the children in orphanages 32.2% reported poor bathing practices compared to 6.3% of the non-orphanage children. The children in orphanages findings are in concurrence with a study conducted in the Philippines which found that 35% of students reported poor bathing practices (Department of Health, Republic of the Philippines, 2009). The proportion of children in orphanages with good, adequate and poor dental hygiene (brushing teeth) was 33.2%, 19.7% and 47.1% respectively. The non-orphanage rates were 63.9%, 26% and 10.1% for good, adequate and poor dental hygiene respectively.

A significantly ($p<0.05$) higher proportion of children in orphanages practiced poor dental hygiene compared with the non-orphanage children. The non-orphanage rates concur with those of a study in Colombia where school children reported low (4.4%) rates of poor and high rates (89.2%) of good dental hygiene in brushing teeth (Department of Health, Republic of the Philippines, 2009). Brushing of teeth twice or more in a day lowers the microbial load in the mouth thus ensuring healthy teeth and gums which are important for proper feeding. Due to intermittent availability of tooth paste, the children in orphanages brushed their teeth with only water. However the non-orphanage children brushed their teeth with water and tooth paste.

More (65.3%) girls in orphanages had fair accessibility while 34.6% had bad accessibility to latrines. All boys in orphanages had bad accessibility to latrines. All non-orphanage boys and girls had fair accessibility to latrines/toilets. None of the children had dangerous accessibility to latrines/toilets. The latrines were also used as bathrooms by the children in orphanages. The non-orphanage children shared toilets and bathrooms with their family members and in some cases with their neighbours. The older girls in orphanages supervised and assisted the younger children in orphanages to bathe. This was only possible on Sundays when they were not attending school. Soap was also given during the weekend to facilitate laundry and bathing. These factors could have contributed to the poor hygiene practices among the children in orphanages.

5.5 Conclusions and Recommendations

5.5.1 Conclusions

Prevalence of stunting, underweight and wasting was high. Stunting and underweight was worse among children in orphanages than among non-orphanage children. However rates of wasting were slightly lower among children in orphanages than among non-orphanage children. Stunting and underweight was worse among younger (4-7 years) boys in orphanages than non orphanage boys of the same age. Stunting and underweight was also worse among older (8-11 years) girls in orphanages than non orphanage girls of the same age. Stunting was worse among younger (4-7 years) girls in orphanages than among non orphanage girls of the same age. The children in orphanages who had been admitted to the orphanages for a longer period were more likely to be stunted and underweight ($p<0.05$) than those who had been recently admitted.

The non-orphanage children had access to a wider variety and diversity of meals than the children in orphanages. Frequency of food consumption was lower among children in orphanages who mostly consumed only two meals than among non-orphanage children who mostly consumed three meals in a day. The daily energy intake derived from breakfast for both children in orphanages and non orphanage children was too low leaving the children hungry for a greater part of the morning. The daily energy intake for both children in orphanages and non orphanage children was far below the WFP (2010) dietary guidelines recommendation of 55% of the daily energy intake from the cereal group.

A significantly higher ($p<0.05$) proportion of non-orphanage children had adequate energy intake than the children in orphanages. The children in orphanages who did not take lunch were hungry most of the day.

Morbidity rate was also significantly higher ($p<0.05$) among children in orphanages. Personal hygiene practices including washing of hands with soap, brushing of teeth and bathing was poor among children in orphanages and worse among children in orphanages boys in comparison with non-orphanage children.

Vaccination rates for non orphanage children were within the recommended UNICEF (2009) rates while those for children in orphanages were below. There was a significantly higher ($p<0.05$) rate of vaccination among non-orphanage children than among the children in orphanages. However stunting levels were higher among vaccinated younger (4-7 years) girls in orphanages than among vaccinated younger non orphanage girls.

The main factors associated with the higher rate of malnutrition among children in orphanages were: high morbidity rate, inadequate amounts and diversity of foods served to the children in orphanages, long duration of stay in the orphanage, low rates of vaccination and basic hygiene.

5.5.2 Recommendations.

There is need for orphanages' management to ensure diet diversification and include more animal source foods and Fruits in the orphanages' diet to improve the nutritional status of the children.

Efforts should also be directed towards increasing energy intake in the diets of children in orphanages. This could be through increasing frequency of meal intake per day specifically introduction of school breakfast and lunch programs to impact positively on the nutritional status of school children in the study area.

There's need for the government to set up support and enforce minimum hygiene standards for the orphanages.

There's need for the management of the orphanages to maintain good personal hygiene practices among the children in orphanages.

Child vaccination campaigns should also specifically target children in the orphanages and the girl child.

Hand washing campaigns should also be targeted to children in orphanages and the boys in primary schools.

The government should ensure that the registered orphanages have adequate resources to adequately take care of the children.

Awareness building activities that incorporate better nutritional practices, hygiene, childhood illnesses and immunization to address childhood needs.

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APPENDIX ONE

CONSENT FORM. PART A

1. **My name is Elizabeth Mwaniki. I am a PhD student of Public Health at the Jomo Kenyatta University of Agriculture and Technology. I am collecting data for a thesis. I kindly request you to participate in this study. Before filling the required information please read the information provided below.**

3. **Purpose of the study**

   To compare the nutrition status and associated risk factors of children in orphanages and non-orphanage children. This will be done by assessing the nutritional status, morbidity and food consumption of children in orphanages and non-orphanage children in the selected schools. The outcome of the study will be used to write a thesis that is a requirement for the Doctorate degree that i am pursuing.

4. **Procedures to be followed:**

   The exercise involves weighing and taking the height of the children. Information on their health and details of food taken will also be required.

5. **Risks:** This procedure is neither painful nor uncomfortable.

6. **Benefits:** The recommendations at the end of the study may be of benefit to the children if implemented by the policy makers and Non-governmental Organization.

7. **Confidentiality of the records**

   Your records that are related to this study will be maintained in confidentiality.

The sponsor (Jomo Kenyatta University of Science and Technology) may examine your records, as long as your name cannot be identified from these records.

Your records from this study may be submitted by the sponsor to the relevant regulatory agency, but your name will not be able to be identified from such records. No identity of any specific participant in this study will be disclosed in any public reports or publications.

8. Financial Consideration

You will not be paid for participating in this study.

9. Obtaining Additional Information

You are encouraged to ask any questions that occur to you at this time or to ask questions at any time during your participation in this study. You will be given a copy of this agreement for your own information. If you desire more information at a later date you may call Tel, 0722 237 600 during daytime and at night.

10. Basis for participation

You are free to withdraw your consent to participate in this study at any time.

PART B: CONSENT FORM

Please read the information sheet (part A) or have the information read to you carefully before completing and signing this consent form. If there are any questions you have about the study, please feel free to ask them to the investigator prior to signing your consent form. If you have any questions about the study in the future or in between visits, or for any enquiries or issues related to the study, please contact the following;

Elizabeth Mwaniki **OR** **The chairman**

P.O Box 184-00200 **Kenya Medical Research Institute**

Nairobi **Ethical committee**

Tel; 0722 237600 **Nairobi**

I …….the undersigned mother/care giver of

…….. Agree to take part in the proposed study.

Sign……..

Family Address……

Division /Area code…….

Mother's care givers initials……

Child's age……

Child's sex…….

Child's initials……

Thank you for agreeing to participate in this survey. Please note that there are no right or wrong answers.

APPENDIX TWO

QUESTIONNAIRE

NUTRITIONAL AND HEALTH SEEKING BEHAVIOUR OF CHILDREN IN ORPHANAGES AND NON-ORPHANAGE CHILDREN IN SELECTED SCHOOLS.

(A) IDENTIFICATION;

DIVISION: _____

LOCATION : _____

NAME & CODE: _____

NUMBER OF MALE/FEMALE: _____

CHILD'S BACKGROUND:

1. Indicate whether 1. Male

   2. Female

2. What is your age?

3. Which class are you in? Tick where appropriate.

Class	1	2	3	4	5	6	7	8

4. At what age did you come/were you brought to the orphanage? (if not a child in orphanages skip) (tick one)

   1= less than one year 2= 12-23 months 3=24-35months 4=more than 36 months (specify)

HEALTH AND HYGIENE (tick one)

5. How often do you take a bath? (Whole body).
   1= daily 2= 4-6 times a week 3= ≤ 4 times a week
   4=others

6. How often do you brush your teeth?
   1= 1-2 times a day 2= 4-6 times a week 3= ≤ 3 times a week
   4=others (probe why?)

7. (a) Did you wash your hands yesterday? tick one

   1=After visiting the toilet? (Yes /no)
   2= Before eating food? (Yes / no)

   (b) What did you use to wash hands?
   1= water only
   2=water and soap
   (Probe why)

8. Child Nutritional Status

   (a) Indicate whether
   1= children in orphanages

   2=non orphanage

   (b) Sex of child
   1= male

   2= female

   (c)

1st height of child in cm	
2nd height of child in cm	
Average height	
1st weight of child in kilograms	
2nd weight of child in kilograms	
Average weight in kilograms	

APPENDIX THREE

INTERVIEW GUIDE FOR CARE-TAKERS/ PARENTS.

(A) DEMOGRAPHICAL DATA;

1. Age of care-taker/parent. 

2. Sex: 1. Male 2. Female

3. Highest Educational level for respondent: tick one
   1=Illiterate /No Formal Education 2=1-8 years (Primary Education)
   3= 1-2 years (Post Primary) 4= 1-4 years (Secondary Education)
   5= 1-4 years (College/ University).

4. What did you do to earn a living last month?
   Father's occupation ……..
   Mother's occupation …….

5. Number of children under respondent's care/ How many children live with you in your family?

(B) FOOD CONSUMPTION AND ADEQUACY

1. (a) How many times do the children feed per day? Tick one
1= once a day 2=twice a day 3=thrice a day

4= more than thrice a day (specify)
(b) Is there a fixed meal schedule for each day? (Tick one)
   1. Yes 2. No

(c) If yes what are the meals given to the children on each day of the week?

	Breakfast	**Lunch**	**Supper**
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			

(d) Which specific foods were given to the child yesterday? (E.g. porridge, boiled rice)

Days meal (Breakfast, Lunch, Supper)	Name of food (e.g. Ugali, bread))	Food group(cereal, vegetables, legumes etc.	Description (all ingredients used to make the food)	Weight of the ingredients in grams

(e) What are the foods that the children frequently eat for:

1. Breakfast?

2. Lunch?

3. Supper?

4. Any other food /snack (specify)

2 (a) Do you hold birthday parties or celebrations on special occasions for the children? (Tick one)

1. Yes

2. No

If yes, what are the special occasions?

(b) What special foods are the children given on such occasions?

3. (a) Are all the children given the same meals daily? (Tick one)
1= Yes 2=No If no

(b) Who are given the different meals? (Tick one)
1=Boys 2=Girls

3=Children below 2 years 4=others. (Specify).

(c) Which are the different foods given to the above?

FOODS GIVEN	**WHEN GIVEN (time of the day, week etc.)**

(c)How many meals do the children take during school days? (Tick one)
1=1 2=2 3=3 4=4 5=others (specify)

4. (a) Has the child suffered any illness in the last 7days? (Tick one)
1 = yes 2 = no

(b) Which Symptom of the illness was observed (tick one)
1=Diarrhoea 2=flu/cough/cold 3=vomiting

4= fever/malaria 5= others (specify)

5. Were certain foods increased during illness? (Tick one)
1=yes 2=no; If yes specify which ones?

6. Were certain foods decreased during illness? (Tick one)
1=yes _____
2=no _____

If yes specify which ones?

7. a) Has the child been vaccinated? (Tick one) 1. =Yes 2= No

b) If so how many times? (Tick one)
1=once 2=twice 3=thrice 4= more than three times (specify)

8. (a) How many toilets/latrines are available for your families/children's use?
Girls----------
Boys----------

(b) How many bathrooms are available for the family's/ children's use?

Girls----------

Boys----------

9. (a) Are the toilets/latrines and bathrooms shared? (Tick one)
1= yes 2= no
(a) If yes above, how are they shared? (tick one)
1= boys and girls 2=Parents and children 3=neighbours and family 4=others (specify)
(b) How many people/ children share one toilet (tick one)
1= less than 10 people/children 2= 20-40 people/ children 3= 40-100 people 5=more than 100 people/children

10. Which schools do the children attend? Write the name of the school below.

School 1…….

2…….

3…….

4…….

11. How far are the schools from the orphanage/ home? (Tick one)
(a) Less than 1km (b) 1 km (c) 2-3km (d) 4km (e) More than 4km

12. How do the children get to school? (Tick one)
1-walk 2- use public means 3-use school transport 4-others (specify)

13. Which type of schools do the children attend? (Tick one)
1-Public 2-Muncipal council 3-Private school

4-Missionary/Church sponsored 5-others (specify)

APPENDIX FOUR

INTERVIEW GUIDE FOR OVERALL INCHARGE OF THE ORPHANAGE.

(A) Biographical data

1. Age of respondent _____
2. Marital status _____
3. Gender _____
4. Educational level of respondent. _____
5. Religious affiliation._____
6. Occupation._____
7. Total number of children in the orphanage.
   Number of males _____

   Number of females _____

(B) History of the orphanage

1. When was the orphanage started?

2. Why was it started? .....
.....
.....
.....

3. Who are the proprietors / sponsors?

(C) Sources of income and subsistence activities:

1. What are the orphanage's subsistence activities?
……..

2. (a) What is the main source of income for running the orphanage?
i……
ii…….……
iii……
iv……
(c) Apart from the main source, are there other sources of income? (Tick one)

1= Yes 2= No

3. a) Do you receive any other type of non-financial support? (Tick one)
1=Yes 2= No

b). If yes what form of non-financial support?

……

……
4. What is the source of this non-financial support?

……
……
……

5. a) what are the challenges faced in providing for the children? (Tick one)

1-Financial 2-Discipline of the children 3-Poor academic performance of the children

4-others
(specify)……

b) What would you recommend to be solutions to the above problems?

……
……
……
……
……
……

APPENDIX FIVE

Table for malnutrition with duration of stay in the orphanage

Prevalence of malnutrition(Z scores ≤-2.00)	Duration of stay in the orphanage				p-value
	< 12 months n (%)	12- 23 months n (%)	24-35 months n (%)	≥ 36 months n (%)	
Stunting	10 (4.8 %)	13 (6.3%)	24 (11.5%)	51 (24.5%)	0.000
Underweight	6 (2.9%)	12 (5.8%)	17 (8.2%)	34 (16.4%)	0.000
Wasting	3 (1.4 %)	5 (2.4%)	3 (1.4%)	8 (3.8%)	0.500

Table A: ENERGY CONTENTS OF SOME FOODS.

	In 100g edible portion of food
Food	kilo calories
Cereals	
Bread, white	261
Thin porridge	54
Thick porridge/Ugali	105
Polished boiled rice	123
Legumes	
Beans and peas dried, raw	333
Bean stew	150
Animal foods	
Cow's milk	61
Eggs	158
Meat with some fat	161
Chicken	140
Starchy roots and fruits	
Plantains raw	135
Irish potatoes raw	79
Oils, Fats and Sugar	
Edible oils	900
Butter/ Margarine	718
Sugar	400

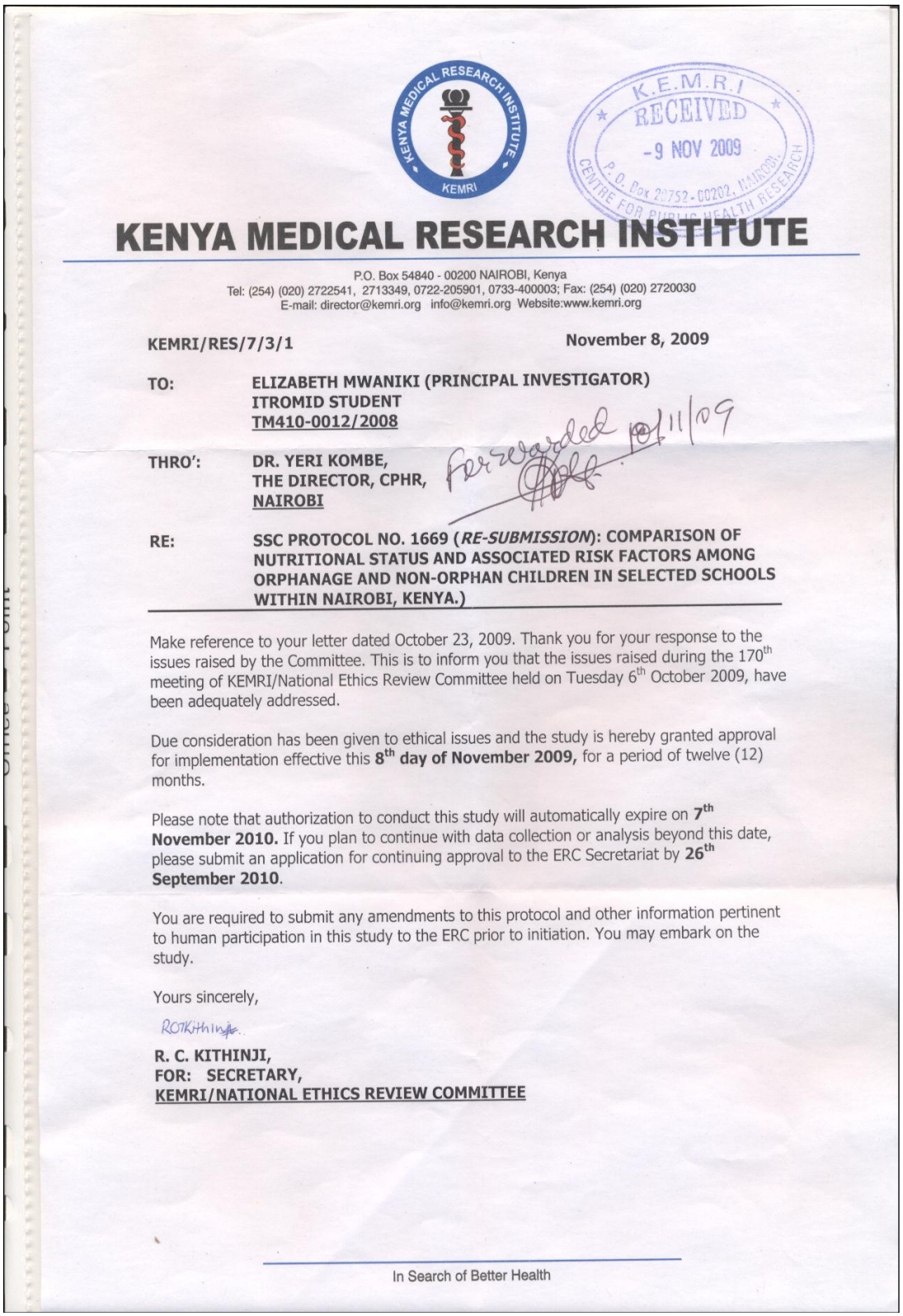
Source: FAO, 1993. Food and nutrition in the management of group feeding

Table B: RECOMMENDED INTAKES FOR ENERGY

Age in years	Energy in Kilo calories
Both sexes	
4-6	1352
7-9	1698
Girls	
10-17	2326
Boys	
10-17	2824

Source: Energy – FAO. 2004 Human energy requirements.

APPENDIX SIX



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KEMRI/RES/7/3/1 **November 8, 2009**

TO: **ELIZABETH MWANIKI (PRINCIPAL INVESTIGATOR)**
ITROMID STUDENT
TM410-0012/2008

THRO': **DR. YERI KOMBE,**
THE DIRECTOR, CPHR,
NAIROBI

Forwarded 10/11/09

RE: **SSC PROTOCOL NO. 1669 (*RE-SUBMISSION*): COMPARISON OF NUTRITIONAL STATUS AND ASSOCIATED RISK FACTORS AMONG ORPHANAGE AND NON-ORPHAN CHILDREN IN SELECTED SCHOOLS WITHIN NAIROBI, KENYA.)**

Make reference to your letter dated October 23, 2009. Thank you for your response to the issues raised by the Committee. This is to inform you that the issues raised during the 170th meeting of KEMRI/National Ethics Review Committee held on Tuesday 6th October 2009, have been adequately addressed.

Due consideration has been given to ethical issues and the study is hereby granted approval for implementation effective this **8th day of November 2009,** for a period of twelve (12) months.

Please note that authorization to conduct this study will automatically expire on **7th November 2010.** If you plan to continue with data collection or analysis beyond this date, please submit an application for continuing approval to the ERC Secretariat by **26th September 2010**.

You are required to submit any amendments to this protocol and other information pertinent to human participation in this study to the ERC prior to initiation. You may embark on the study.

Yours sincerely,

R.C.Kithinji

R. C. KITHINJI,
FOR: SECRETARY,
KEMRI/NATIONAL ETHICS REVIEW COMMITTEE

In Search of Better Health